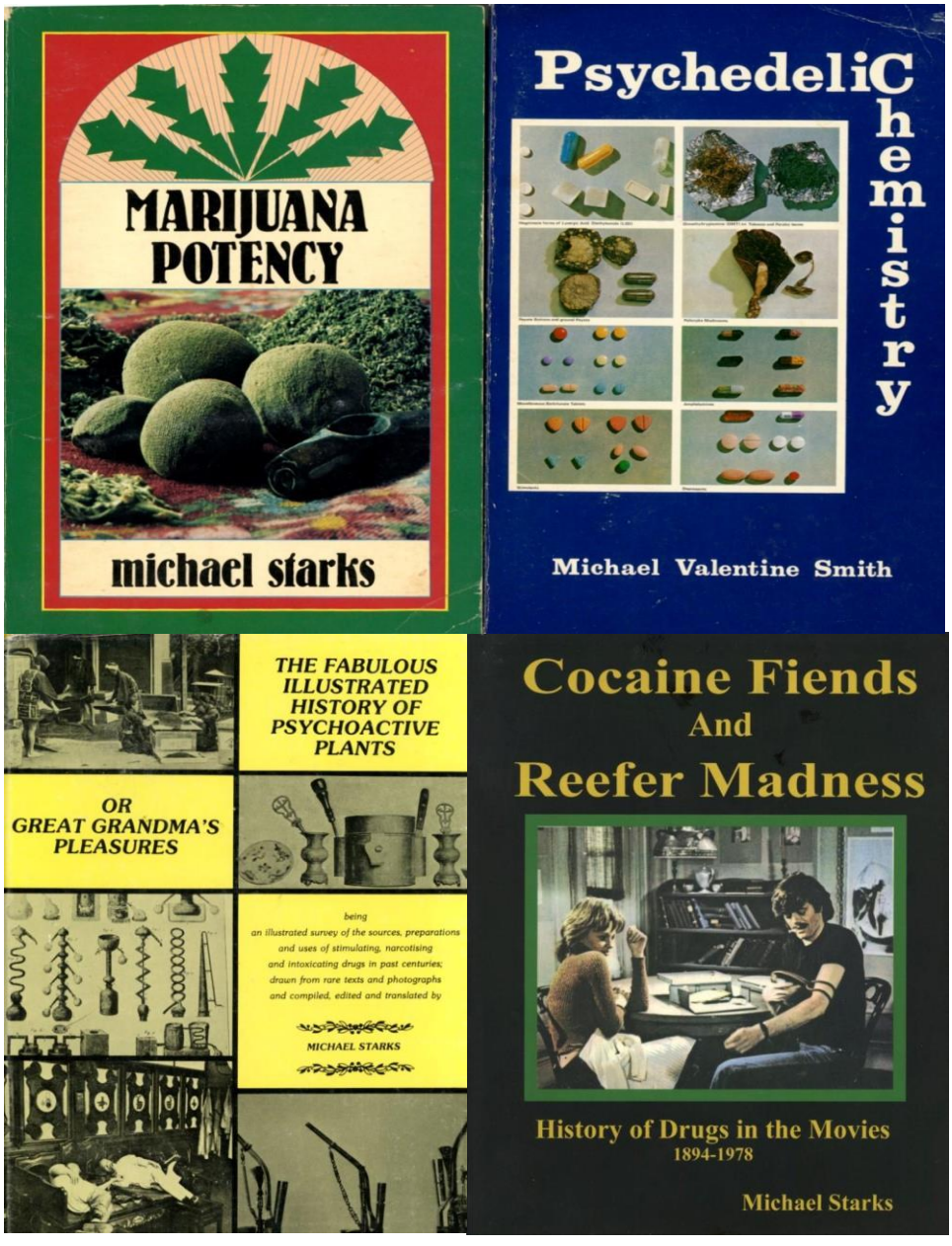
Psychoactive Drugs

Four Classic Texts on Botany, Chemistry, Sociology, Anthropology (1976-1982)

Michael Starks



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These books were written some 40 years ago, when the world was relatively simple. No cel phones, no internet, no PC's, no home VCR, CD or DVD--not even decent copy machines most places. As the psychedelic 60's helped my mind to expand far beyond the physiology department at Berkeley, I immersed myself in media of all kinds and was especially fascinated by early films dealing with psychoactive drugs. It was laborious in the extreme to do library research and I spent thousands of hours in the Berkeley University Library poring through books.

I saw many of the films in the film book on late night television and kept notes on file cards. I was especially interested in the older films and they were the hardest to find info about and often impossible to see--many had vanished. I purchased some from catalogs of 16mm films. My favorite find was "Hemp for Victory" which I found only in a catalog entry in the Library of Congress. They claimed no knowledge of it, so I wrote to the maker--The U.S. Dept. of Agriculture and finally got a 16mm print. I had it copied to 3/4 and VHS tape and it quickly spread worldwide. Now you can stream it from Youtube. There is even a Wikipedia entry, which fails to note that these came from me. I was invited to Amsterdam by a group funded by the government where I gave a lecture on drug films and showed a dozen which I had collected.

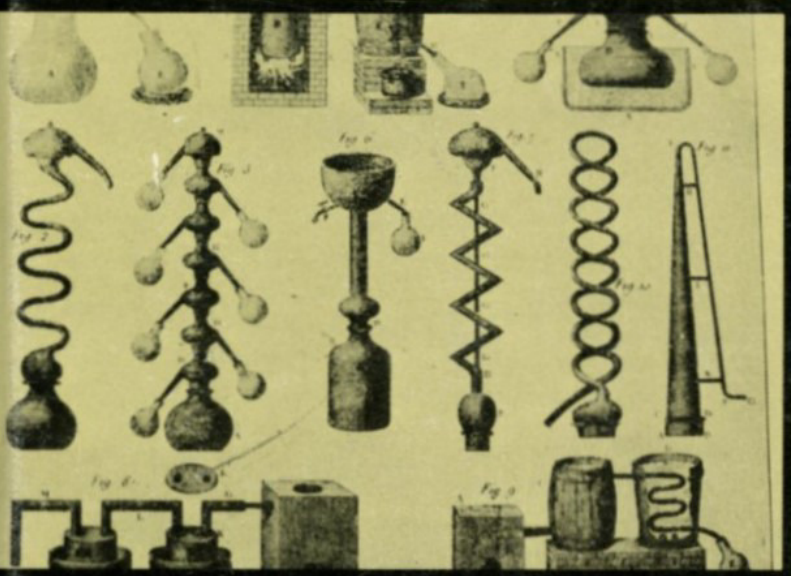
I researched many different topics simultaneously and the wrote other books The Fabulous Illustrated History of Psychoactive Plants, Marijuana Potency (now Marijuana Chemistry) and Psychedelic Chemistry. Eventually I gave all these research materials as well as much else on the history of psychoactives to the Fitzhugh Ludlow Memorial Library in San Francisco, which was sold to a European collector. I intended to write volumes on horror and science fiction films. It was a rare privilege living in Berkeley and San Francisco during the psychedelic revolution.

I had many other interests and eventually gave up on films and drugs in favor of 3D imaging and spent a year in the Berkeley Library hand searching the entire US Patent Index. In 1979 I cofounded StereoGraphics Corporation, which provided the first significant commercial video and computer systems for viewing 3D images with LCD shutter glasses and am coauthor of its first patent on 3DTV. Some 20 years later it was bought by RealD and its technology became the basis for the 3D digital cinema, which led directly to home 3DTV and the subsequent worldwide 3D mania. In 1989 I started 3DTV Corporation and made the front page of the Wall Street Journal when I introduced the world's first electronic home 3DTV system at the 1990 CES. This period of my life is covered in the ebook 3DTV and 3D Movie Technology Selected Articles 1996-2016 446p(2016).

Subsequently I indulged a lifelong interest in philosophy and psychology and science and have written about 60 detailed reviews and articles, especially of books by and about Wittgenstein, Searle and other students of behavior. This ten year period of my life from age 65 to 75 is covered in the ebook Philosophy, Human Nature and the Collapse of Civilization -- Articles and Reviews 2006-2016 662p (2016) and the philosophy work only in The Logical Structure of Philosophy, Psychology, Mind and Language in Wittgenstein and Searle 367p (2016).

THE FABULOUS ILLUSTRATED HISTORY OF PSYCHOACTIVE PLANTS

OR GREAT GRANDMA'S PLEASURES



being
an illustrated survey of the sources, preparations
and uses of stimulating, narcotising
and intoxicating drugs in past centuries;
drawn from rare texts and photographs
and compiled, edited and translated by

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I would like to thank Michael Aldrich, Curator of the Fitzhugh Ludlow Memorial Library of San Francisco. The Ludlow Library houses the world's largest collection of esoteric drug literature. All historians of psychoactive drugs owe a deep debt to the many who have contributed materials, funds and time to the Library, especially Michael Aldrich, Michael Horowitz, Robert Barker and William Daley. Serious *scholars interested in using the collection or those wishing to contribute materials, time or funds (badly needed) may contact the library through the author.*

DEDICATION

By Michael Starks (1981)

To Mordecai Cubitt Cooke, James F.W. Johnston, Carl Hartwich, Louis Lewin and Alexander Tschirch — pioneers in the study of consciousness-altering agents.

It has been said in truth that a picture is worth a thousand words. This belief, insofar as many illustrations of the psychoactive plants and their use is concerned, is absolutely true. Michael Starks' The Fabulous Illustrated History of Psychoactive Plants stands out as a superb --- and so far as I am aware the only --- example of a pictorial review of the history of the use of psychoactive drugs. A survey of the 189 pages of illustrations, mostly from the second half of the 19th Century, puts the reader in a really personal closeness to the sources, preparations and uses of stimulating, narcotic and other-wise intoxicating drugs of this and, to a lesser extent, earlier periods. It is a joy to become so familiar with what the Germans call the Genussmittel ("tool of enjoyment") through pictures critically chosen from the literature --- many of which come from obscure or rare sources unavailable to most readers.

The book is extremely valuable since it represents a tremendous knowledge of the literature and a critical handling of the information preserved for posterity in illustrative form. This contribution is appropriately dedicated to Mordecai Cubitt Cooke who, in 1860, published The Seven Sisters of Sleep, one of the earliest popular books on psychoactive drugs. There are portraits of some of the early leaders in the study of psychoactive drugs: Cooke, James F.W. Johnston, Carl Hartwich, Louis Lewin and Alexander Tschirch.

Michael Starks is to be congratulated in putting together this book --- a work of love, full of historical wealth and yet of current pertinence. I salute his dedication of this gift to the literature of psychoactive plants.

Richard Evans Schultes, Ph.D., FMLS Jeffrey Professor of Biology & Director, Botanical Museum of Harvard University (Emeritus)

Dedication

by M.C. Cooke (1860)

TO ALL LOVERS OF TOBACCO, IN ALL PARTS OF THE WORLD,
JUVENILE AND SENILE, MASCULINE AND FEMININE;
AND TO ALL ABSTAINERS,
VOLUNTARY AND INVOLUNTARY—
TO ALL OPIOPHAGI, AT HOME AND ABROAD,
WHETHER EXPERIENCING THE PLEASURES, OR PAINS
OF THE SEDUCTIVE DRUG—
TO ALL HASCHISCHINS, EAST AND WEST,
IN WHATEVER FORM THEY CHOOSE
TO WOO THE SPIRIT OF DREAMS—
TO ALL BUYEROS, MALAYAN OR CHINESE,
WHETHER THEIR SIRI-BOXES ARE FULL, OR EMPTY—
TO ALL COQUEROS, WHITE OR SWARTHY,
FROM THE BASE TO THE SUMMIT
OF THE MIGHTY CORDILLERAS—
TO ALL VOTARIES OF STRAMONIUM AND HENBANE,
HIGHLANDER, OR LOWLANDER—
AND
TO ALL SWALLOWERS OF AMANITA,
EITHER IN SIBERIA OR ELSEWHERE—
THESE PAGES COME GREETING
WITH THE BEST WISHES
OF THEIR OBEDIENT SERVANT.

CONTENTS

Author's Preface/1
Preface *(By L. Lewin – 1924)*/2
Glimpses of the Drug Trade from antiquity to the present/3

Opium *Papaver somniferum*/14
Betel Nut *Arecha catechu* & Betel Leaf *Piper betle*/45
Alcohol/56
Marijuana *Cannabis sativa*/74
Tobacco *Nicotiana tabacum*/83
Coffee *Coffea arabica*/109
Cocoa *Theobroma cocao*/118
Tea *Thea sinensis*/125
Maté *Ilex paraguariensis*/145
Coca *Erythroxylon coca*/155
Cola *Cola nitida*/166
Khat *Catha edulis*/171
Fly Agaric *Amanita muscaria*/173
Kava Kava *Piper methysticum*/179
Thorn Apple *Datura stramonium*/185
Summary/191

AUTHOR'S PREFACE

Psychoactive drugs are more popular than ever -- nearly everyone uses several and millions use ten or twenty. In the face of the massive use and abuse of psychoactive substances, there is great need for a detailed look at the origins and uses of the major mind altering plants. There is increasing interest in using natural plant drugs in ways which may enrich our lives and hundreds of millions have used coca, marijuana, opium and other plants for thousands of years without destroying their minds or bodies. Consequently, an examination of the ways in which our ancestors prepared and used psychoactive plants is very relevant to understanding and coping with our present situation.

I have relied almost entirely on pictures and descriptions from the second half of the 19th century. This is the earliest period for which considerable information is available, and for which good photos exist. It is neither too far removed from the present to be irrelevant, nor too close to prevent our obtaining a good historical perspective. It was roughly the era of great—grandparents for those under thirty and of grandparents for those over. The pictures show drug preparations and uses that they may have seen or participated in, accompanied by accounts from the standard reference works of that era. Editing has been restricted almost entirely to choosing readable text with maximum compatibility with present scientific knowledge.

Most of the photos here come from one of the great classic works of ethnopharmacology—*Die Menschlichen Genussmittel (1911)* by Carl Hartwich. He was head of the Pharmacology Department of the Swiss Polytechnical Institute at Zurich for 24 years.

Most of the 19th century photos not from Hartwich come from the works of the eminent German botanist Alexander Tschirch (1856-1939), especially his *Handbuch der Pharmakognosie* (3 Vols., 1909 - 1925; 2nd Edition 1930). Now rare, these volumes are another of the treasure troves of information on medicinal plants that I am bringing to attention with this book. One of the primary reasons for the publication of this volume is to honor these little-known pioneers of psychoactive plants. Since there is no hope of reissuing their original works, the present volume seemed the only feasible way to bring the fruits of their labors before the public. (In nearly all cases, I have translated the figure legends verbatim.)

The text in the *Cola* and *Khat* sections come from Louis Lewin's *Phantastica (1924)*. Like Hartwich, Lewin was a proper German professor who approached the field of psychoactive drugs from the pharmacologist's standpoint, though both men were interested in the historical and anthropological perspectives as well. Lewin wrote several classic books on drugs and poisons (also now rare and ignored) and was among the first to oppose Freud's endorsement of cocaine as a cure for morphine addiction. Most of the text given here was written by two prominent British scientists prior to the American Civil War. Mordecai Cubitt Cooke was a botanist and director of the Metropolitan Scholastic Museum and the author of *The Seven Sisters of Sleep: Popular History of the Seven Prevailing Narcotics of the World (1860)*. Although he was also responsible for several rather dry volumes on biology, his wit and facile style make this the most readable of the 19th century books on psychoacitve drugs. He wrote all of the material except that due to Lewin and Johnston. *Who Was Who* profiled him as follows:

> COOKE, Mordecai Cubitt, M.A.,LL.D.; A.L.S., retired from the Herbarium of the Royal Gardens. Kew; *b.* Horning, Norfolk, 12 July 1825 (parents kept the village general shop, such as is usual in country villages); *m.* 1846; three *s.* two *d. Educ.:* village school until nine, then by uncle, who was a Dissenting minister. Hon. M.A. St. Lawrence University, U.S., 1870; M.A. Yale, U.S., 1873; LL.D. New York, U.S., 1874. Appren— tice wholesale drapery trade; usher in boy's school; lawyer's clerk, nine years; certificated teacher in a National School; appointed 1860 to India Museum; transfered to Kew Gardens, botanical work, largely devoted to Cryptogamia; awarded Victoria Medal of Honour by the Royal Horticultural Society, and Linnean Gold Medal by Linnean Society, 1903. *Publications:* Illustrations of British Fungi, 8 vols.coloured plates, 1881—91; Introduction to the Study of Fungi, 1895; Fungoid Pests of the Flower Gardens, 1905; and forty other botanical works. *Recreations:* natural history rambles, angling. *Address:* 53 Castle Road, Kentish Town, N.W. *Died 27 Oct. 1913.*

James F.W. Johnston was an agricultural chemist whose book *The Chemistry of Common Life (1850)* was the first thorough treatment of psychoactive drugs. A pioneering text in the area that would later be called biochemistry, it ran through some dozen editions in many languages and was by far the most widely read book on the subject. It has escaped notice that Johnston clearly enunciated the notion of psychotomimetic drugs and their possible close relationship to natural (endogenous) psychotogenic substances in the brain (see summary). Over 100 years later, Osmond and others reactivated this concept while studying the LSD syndrome. The sections on alcohol, tea, coffee, cocoa, mate, and the summary come from the 10th edition of his book (1869).

Michael Starks
Berkeley, California *August, 1981*

PREFACE
BY L. LEWIN (1924)

Of the innumerable chemical substances other than foodstuffs which the world contains, none have a more intimate connection with human life than those whose history and effects are de—scribed in this work.

If human consciousness is the most wonderful thing on earth, the attempt to fathom the depths of the psychophysiological action of narcotic and stimulating drugs makes this wonder seem greater still, for with their help man is enabled to transfer the emotions of everyday life, as well as his will and intellect, to unknown regions; he is enabled to attain degrees of emotional intensity and duration which are otherwise unknown to the brain. Such effects are brought about by chemical substances. The most powerful of these are products of the vegetable kingdom, into whose silent growth and creative abundance man has not yet fully penetrated. By the exercise of their powers on the brain, they release marvellous stores of latent energy. They relieve the mentally tortured, assuage the racking pains of the sick, inspire with hope those doomed to death, endow the overworked with new vitality and vigour such as no strength of will could attain, and replace for an hour the exhaustion and languour of the overworked by mental comfort and content.

Miracles like these are performed throughout the world by these strange substances wherever men are in possession of any one of them. The savage in the jungle beneath a sheltering roof of leaves and the native of the storm—swept island secures through these drugs a greater intensity of life. The solitary dweller in a distant mountain cavern can with their aid relieve the dull monotony of his cramped existence. Various are the motives which induce civilized men to seek a transient sensation of pleasure. The potent influence of these substances leads us on the one hand into darkest depths of human passion, ending in mental instability, physical misery, and degeneration, and on the other to hours of ecstasy and happiness or a tranquil and medi—tative state of mind.

Professor Johnston's estimate of the number of persons indulging in the Seven principal Narcotics of the world (1855).

Tobacco	800,000,000
Opium	400,000,000
Hemp	200,000,000 to 300,000,000
Betel	100,000,000
Coca	10,000,000

Thorn-Apple (no estimate) Less than Coca.
Amanita (no estimate) Less than Coca.

Mordecai Cubitt Cooke (1825-1914)

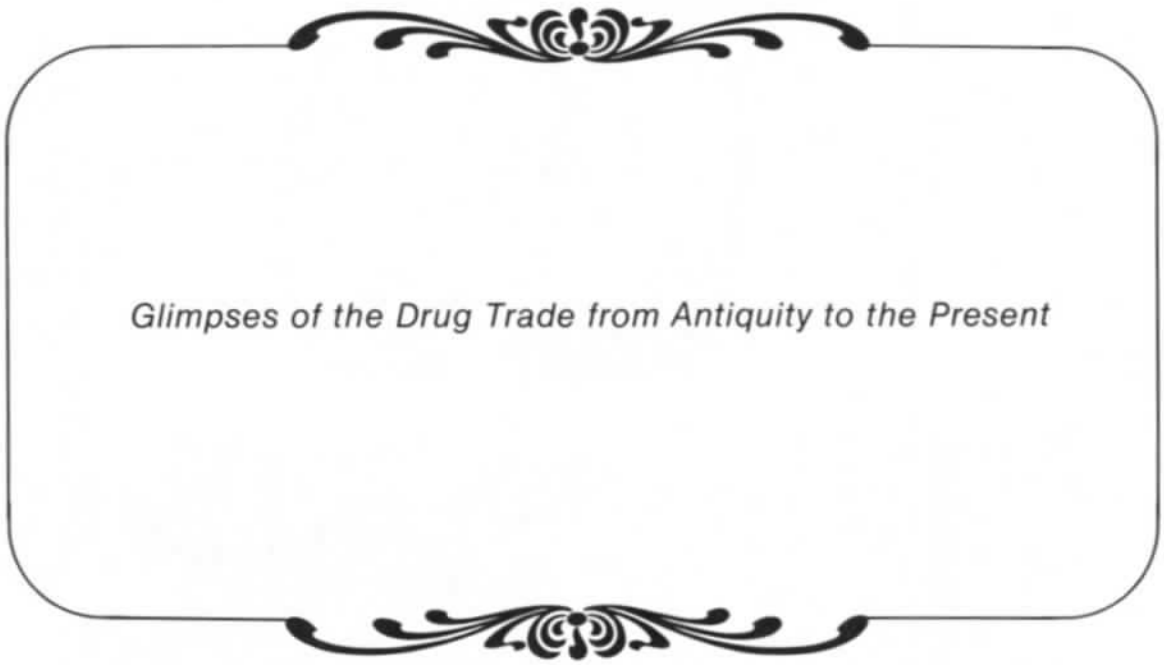
Carl Hartwich (1851-1917)

Louis Lewin (1850-1929)

Alexander Tschirch (1856-1939)

GLIMPSES OF THE DRUG TRADE FROM ANTIQUITY TO THE PRESENT

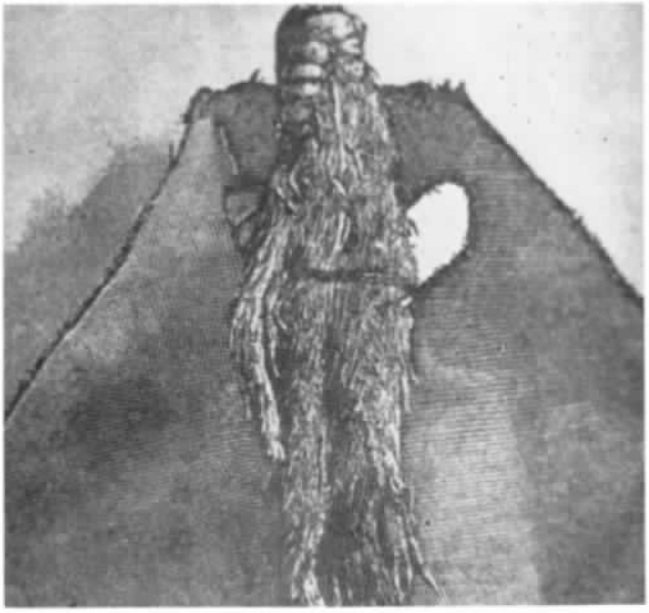
The oldest representation of drug packaging, about 600 B.C. Bales of ***Silphium*** *being weighed before King Arkesilas and then*


Glimpses of the Drug Trade from Antiquity to the Present

Hauß apoteck. Zů yeden leibs gebresten/für den gemainen man / vnd das arm Landuolck/ Durch Hieronymum Braun schweyg getrewlich zů samen tragen / vnd an den tag gegeben.

Medieval preparation of medicinal plants. Above: Title page of a work praising 15th century Strassburg surgeon Hieronymus Brunschwig, shown collecting herbs. Below: German herb garden and distillery. Wood cut from about 1530 from the Meister des Trostspiegels.

*Probably the oldest illustration of mandrake (**Mandragora,**) a human shaped root containing belladonna type compounds. Heuresis hands the root to Dioscorides. The dog cowering at their feet probably refers to the use of animals to pull the root since it was believed that when pulled up the plant uttered a shriek that drove listeners mad. From the Vienna Codex Constantinopolitanus, compiled about 512 A.D.*



Five representations of the mandrake root as a humanoid.

Nicholas Monardes whose "Joyfull News Out of the New Found World" was one of the first to describe coca, tobacco, chocolate and other psychoactive plants. It was first published in Latin in 1574.

Frontispiece of Faber's ***Strychnomania*** *(1677).*

Renaissance painting from Holland showing a doctor preparing an herbal medication. Most medications at this time were still mixtures of herbs. Not until the advances of chemistry in the 18th and 19th centuries did pure chemicals begin to replace herbs.

Nineteenth century Javanese drugstores (Tukang Rempa-Rempa) for plant drugs (above) and animal drugs (below). Many of the latter are molluscs. From Tschirch.

Wholesale drug warehouse on the London docks in the early 20th century: copal for the manufacture of varnish, blocks of wax (right), and a cannister of geranium oil. From Tschirch.

OPIUM—

Papaver somniferum

"MASH ALLAH!"—THE GIFT

"Farewell ye odours of earth that die,
Passing away like a lover's sigh;
My feast is now of the Tooba tree,
Whose scent is the breath of eternity."
MOORE'S *Lalla Rookh.*

"The tree Tooba that stands in Paradise, in the palace of Mahomet."—*Sale.* "Tooba signifies beatitude or eternal happiness."—sig- —*D'Herbelot.*

That opium is the milky juice of the capsules of a species of poppy, evaporated by exposure to light and air, is a fact so well known, as scarce to require repetition. This species of poppy contains two well marked varieties, the *black* and the *white*, a circumstance noticed by Hippocrates long enough ago. The black variety derives its name from the colour of its seeds. The original home of the poppy is Asia and Egypt. But it is extensively cultivated for the sake of its juice in British India, Persia, Egypt, and Asia Minor, and might be cultivated, were it more remunerative, in England, France, and Germany, where good samples of opium have been obtained experimentally. Dr. Royle states that the black variety is cultivated in the Himalayas, but generally the white is preferred. The poppy is grown in Europe for the sake of the dapsules and seed: from the latter a mild oil is extracted.

The cultivation of the poppy in British India is confined chiefly to the large Gangetic tract, about six hundred miles in length, and two hundred miles in depth, extending from Goruckpore in the north to Hazareebaugh in the south; and from Dingepore in the east, to Agra in the west. This extent of country contains the two agencies of Behar and Benares, the former sending to the market about treble the quantity of the latter. In the Benares agency, there are about 21,500 cultivators, and the total number of under cultivators of the opium poppy 106,147 (1860).

After all the preliminaries of preparing the land, sewing, and cultivating the plant, all of which are much more interesting to the parties concerned than ourselves, if all goes well, the whole field of poppies presents a sheet of white bloom, which generally occurs about the month of February. When nearly ready to fall, the white petals are gathered, and made into circular cakes; these are preserved to form the outer converings of the balls of opium. In a few days after the "leaves" of the flower are collected, the capsules or poppy heads are ready for operation. At from three to four o'clock in the afternoon, individuals go into the fields and scratch or cut the poppy heads with iron instruments called "nushturs." This instrument consists of three or four thin narrow strips of iron, about six inches in length, and about the thickness and width of a pen—knife at one end, but extending in width to nearly an inch at the opposite extremity, where it is deeply notched. These plates are bound together by means of thread, each plate being kept a little distance from its neighbour by means of thread passed between them. Thus completed, it has the appearance of a scarificator with four parallel blades. This instrument, which has the angles sharpened, has one of its sets of points drawn down the poppy capsule from top to bottom, or rather upwards from the base to the summit, making three or four parallel incisions, corresponding to the number of blades in the poppy head. These only pass through the outer coating or pericarp. Each capsule is scarified from two to six times, according to its size, two or three days intervening between each operation. In Asia Minor, a different course is pursued. One horizontal incision is made nearly round the capsule, with a single blade. After the scarification of the capsules, the juice exudes and thickens on them during the night, which is collected early the next morning, by means of little iron instruments called "seetooahs," and which resemble small concave trowels. When sufficient is collected into the trowel it is emptied into an earthen pot which the collector carries at his side.

When all the opium is collected which the plants will yield, the capsules are gathered and broken, and the seed preserved for the extraction of their oil. Of these seeds comfits are also made resembling carraway comfits, and, without doubt, great comforts they are to naked little squalling Hindoos whenever they can be obtained. After the extraction of the oil, the dry cake, called Khari, is either made into unleavened cakes for the very indigent, or cattle are fed upon them, or when necessity requires, it is converted into poultices after the manner of linseed meal.

In poor districts, where the people connot afford the luxury of opium, the broken capsules are made into a decoction and drank instead, says Mr. Impey. This liquid is termed "post," from the Persian name of the capsule. There is also another use for the capsules. They are ground into fine powder, and sold under the name of "boosa," and sprinkled over the *buttees* of opium to prevent their adhesion. In the Benares' agency, the stems and leaves, when perfectly dry, are collected and crushed into a coarse powder called "poppy trash" which is employed in packing the opium cakes.

One acre of well-cultivated ground will yield from 70 to 100 lbs. of "chick" or inspissated juice, the price of which varies from six shillings to twelve shillings per pound; so that an acre will yield from twelve to sixty pounds worth of opium at one crop. Three pounds of chick will produce one pound of

opium, from a third to a fifth of the weight being lost in evaporation.

When freshly collected, the mass of juice is of a pinkish colour. This is placed in shallow vessels to drain. A coffee-coloured liquid, called "*pussewah,*" is drained off, which is used to cement the poppy leaves round the cakes of opium, under the name of *lewah.* After exposure to the air in the Benares agency, the opium is made up into balls. In Turkey it is the custom to beat up the juice with saliva. In Malwa it is immersed as collected in linseed oil. In Benares it is brought to the required consistence by exposure in the shade only.

Opium is prepared in different forms, in the various localities for market. Bengal opium is made into balls of about three and one half pounds weight, and packed in chests, each containing forty balls. They are about the size of a child's head, coated externally with poppy petals, agglutinated with *lewah* to the thickness of about half an inch. Garden Patna opium is in square cakes, about three inches in diameter, and one inch thick, wrapped in thin plates of mica. Malwa opium is in round flattened cakes, of about ten ounces in weight, packed in "boosa," or in coarsely-powdered poppy-petals, or in some instances without any coating at all. Cutch opium is in small cakes, rather more than an inch in diameter, enclosed in fragments of leaves. Kandeish opium is imported in round flattened cakes, of about half a pound weight. Egyptian opium occurs in round flattened cakes, about three inches in diameter, covered with the vestiges of some leaf. This kind is very dry, but it is considered inferior in quality to the Turkish kinds. Persian opium is in the form of sticks, about six inches in length, and half an inch in diameter, enveloped in smooth shining paper, and tied with cotton. Smyrna opium occurs in regular rounded or flattened masses, of various sizes, rarely exceeding two pounds in weight, sometimes covered with the capsules of a species of dock. Constantinople opium is either in large irregular cakes, or small, regular lenticular-formed cakes, covered with poppy-leaf, and from two to two and a half inches in diameter.

Formerly the balls of Bengal opium were covered with tobacco-leaves; but Mr. Flemming introduced the practice of covering them with poppy-petals, which service the Court of Directors of the East India Company acknowledged by presenting him with 50,000 rupees. Sometimes these balls are so soft as to burst their skins, when much of the liquid opium is lost. The quantity of opium produced annually in Bengal exceeds five millions of pounds, and the income derived by the Hon. East India Company from this source is not less than £5,003,162.

The kinds of opium most approved in the English market is the Smyrna, and in China and the East generally, the preference is given to the produce of

undergoes a course of preparation, the following being the method pursued in Singapore, as described by Mr. Little.

Between three and four in the morning the fires are lighted. A chest is then opened by one of the officers of the establishment of the opium farmer, and the number of balls delivered to the workmen proportioned to the demand. The balls are then divided into equal halves by one man, who scoops out with his fingers the inside or soft part, and throws it into an earthen dish, frequently during the operation moistening and washing his hands in another vessel, the water of which is carefully preserved. When all the soft part is carefully abstracted from the hardened skins or husks, these are broken up, split, divided, and torn, and thrown into the earthen vessel, containing the water already spoken of, saving the extreme outsides, which are not mixed with the others, but thrown away, or sometimes sold to adulterate chandu in Johore and the back of the island.

The second operation is to boil the husks with a sufficient quantity of water in a large, shallow, iron pot, for such a length of time as may be requisite to break down thoroughly the husks, and dissolve the opium. This is then strained through folds of China-paper, laid on a frame of basketwork, and over the paper is placed a cloth. The strained fluid is then mixed with the opium scooped out in the first operation, and placed in a large iron pot, when it is boiled down to the consistence of thickish treacle. In this second operation, the refuse from the straining of the boiled husk is again boiled in water, filtered through paper, and the filtered fluid added to the mass, to be made into chandu. The refuse is thrown outside, and little attended to. It is dried and sold to the Chinese going to China for from ten to seventeen shillings the hundredweight, who pound it, and adulterate good opium with it. The paper that has been used in straining contains a small quantity of opium, it is carefully dried and used medicinally by the Chinese.

In the third operation, the dissolved opium being reduced to the consistence of treacle, is seethed over a fire of charcoal, of a strong and steady, but not fierce temperature, during which time it is most carefully worked, then spread out, then worked up again and again by the superintending workman, so as to expel the water, and, at the same time, avoid burning it. When it is brought to the proper consistence, it is divided into half-a-dozen lots each of which is spread like a plaister on a nearly flat iron pot, to the depth of from half to three-quarters of an inch, and then scored in all manner of directions to allow the heat to be applied equally to every part. One pot after another is then placed over the fire, turning rapidly round, then reversed, so as to expose the opium itself to the full heat of the red fire. This is

the proper heat are judged of by the workman, from the effluvium and the colour, and here the greatest dexterity is requisite, for a little more fire, or a little less would destroy the morning's work, or eighty or a hundred pounds' worth or opium. The head workmen are men who have learned their trade in China and from their great experience, receive high wages.

The fourth operation consists on again dissolving this fired opium in a large quantity of water, and boiling it in copper vessels till it is reduced to the consistence of the chandu used in the shops. The degree of tenacity being the index of its complete preparation, which is judged of by drawing it out with slips of bamboo.

By this long process, many of the impurities in the opium are got rid of, and are left in the refuse thrown out, such as vegetable matter, part of the resin and oil, with the extractive matter. By the seething process, the oil and resin are almost entirely dissipated, so that the chandu, as compared with the crude opium, is less irritating and more soporific. The quantity of chandu obtained from the soft opium is about seventy-five per cent., but from the opium, including the husk, not more than 50 to 54 per cent.

The Egyptians make several conserves composed of hellebore, hemp, and opium, and several aromatic drugs which are in much more common use than the simple opium. One of these conserves is called "magoon," and the person who makes or sells it, is called "magoongee." The most common kind is called "barsh" or "berch." There is one kind which, it is said, makes the person who takes it manifest his pleasure by singing, another which will make him chatter, a third which excites to dance, a fourth which particularly effects the vision in a pleasurable manner, and a fifth which is simply of a sedative nature. These are sold at certain kind of shops called "mahsheshehs," solely appropriated to the sale of intoxicating preparations.

In China, opium is either swallowed or smoked in the shape of *Tye*. In Bally it is first adulterated with China paper, and then rolled up with the fibres of a particular kind of plantain. It is then inserted into a hole made at the end of a small bamboo and smoked. In Java and Sumatra it is often mixed with sugar and the ripe fruit of the plantain. In Turkey it is usually taken in pills, and those who do so, avoid drinking any water after having swallowed them, as this is said to produce violent colic; but to make it more palatable, it is sometimes mixed with syrups or thickened juice; in this form, however, it is less intoxicating, and resembles mead. It is then taken with a spoon or is dried in small cakes, with the words "Mash Allah," the "Work of God," or the "Gift of God" imprinted on them. When the dose of two or three drams a day no longer produces the beatific intoxication so eagerly sought, they mix corrosive sublimate with the opium till the quantity reaches ten

In Singapore there are representatives of almost every Eastern nation, indulging in the luxury according to the fashion of the country of which he is a native. The Hindoo, fresh from the continent, prefers the mode there in use, and swallows the soul-soothing pill; while the Chinese, with a gusto which no worshipper of the meerschaum can compete with, inhales the smoke, not only into his mouth, but into his lungs, where it becomes breath of his breath, and where retained, it acts on the nervous fibres that are spread over the extensive membrane which lines every cell of the lungs until exhaled through nose and mouth—yea, even in some cases, through ear and eye, it is replaced by another puff.

The Gates of Paradise

"Thou only givest these gifts to man; and thou hast the keys of Paradise. O just, subtle, and mighty opium."—Confessions of an Opium-Eater.

The most direct road and speediest conveyance to Paradise, according to the testimony of all confirmed opiophagi, is by means of that subtle drug, opium. The most common form in which it is taken is that of vapour, inhaled through a peculiarly-constructed pipe. Those used by the Siamese resemble in form the common narghile, or hubble-bubble of the Levant. They consist of an empty cocoa-nut shell, in an orifice in the top of which a hollow wooden tube is inserted, and the opening hermetically closed, so as to prevent the escape of either air or smoke. In another hole in the side of the cocoa-nut shell, a common little bamboo tube about eighteen inches long, is tightly fixed;a little earthen bowl, perforated at the bottom like a sieve is filled with opium, and one or two pieces of fire being placed thereon, this bowl is fitted on the top of the wooden tube. The man who hands round this pipe holds with one hand the bottom of the cocoa-nut (which is half full of water), and with the other hand he presents the bamboo tube to the smoker, who, putting it to his mouth, inhales three or four whiffs of this most intoxicating narcotic. The effect is almost instantaneous. He sinks gently against the cushion set at his back, and becomes insensible to what is passing around. The pipe is passed round from mouth to mouth, so that half an hour generally intervenes between the first whiff taken by the first smoker, and the last sigh heaved by the last man, as he revives from his short, pleasant dream, into which the whiffing has thrown him. One old and inveterate Siamese, smoker declared to a recent resident among them, that if he knew his life would be fortified by the act, he could no more resist the temptation than he could curb a fiery steed by a thread bridle. It carried him into the seventh heaven—he heard and saw things no tongue could utter, and felt as though his soul soared so high above things earthly, during those precious moments of oblivion, as to have flown beyond the reach of its heavy, burthensome cage.

Opium smoking is not generally conducted on a plan so social. The Siamese may be considered as an

Hong-Kong, of which we have received an account from a competent authority, is more a type of the opium-smoker in general, and the method he pursues.

In a reclining position, on boards placed on tressels, ranging around long, disgustingly dirty rooms, may be seen, at all hours of the day, haggard beggars, with putrefying sores, whose miserable feelings of desperation and woe drive them here to obtain a partial alleviation, by steeping their senses in forgetfulness. The stem of the pipe used for smoking is made of hard wood, and would be taken for an English paper-ruler, about eighteen inches long, and an inch in diameter. The earthenware bowl or head screws on and off, at about three inches from the end. An assistant of the divan, sitting in a corner of the room, is constantly engaged in scraping and cleaning these heads, which, from the small size of the hole through which the opium is inhaled (about the size of a pin's head), are apt to get clogged. The quantity of opium intended to be smoked, varying at a time from twenty to a hundred grains, is dipped carefully out of small gallipots, laid on a leaf, and charged for at the rate of a dollar per ounce. The opium is used by dipping into it the pointed end of a small wire, which is then applied to the flame of a lamp. In ignition it inflates into a bubble, and is then, with a dexterity obtained only by constant pracitce, rolled on the pipe head until it assumes the shape and size of a small orange-pip cut in half, and the hardness of wax. It is then placed over the orifice in the head of the pipe like a small chimney, through which the flame of the lamp is drawn into the bowl, converting the opium, in its passage, into a blue smoke, which is inspired by long continuous whiffs, and without removal of the pipe from the mouth, respired through the nostrils. Two or three pipes may be taken by persons unaccustomed to the habit without leaving any other unpleasant feeling than a harshness in the throat. There are in Hong-Kong ten regular licensed divans for the smoking of opium, and nearly all these are in the Chinese portion of town.

This picture would, however, be incomplete, without a few more particulars concerning the individuals who give themselves up to indulgence in the drug. And for this we must again seek the aid of an experienced medical man, who for years lived and laboured in the midst of opium smokers. "Nothing on earth," he states, "can equal the apparent quiet enjoyment of the opium smoker. As he enters the miserable scene of his future ecstasy, he collects his small change, the labour, or begging, or theft of the day, with which he supplies himself with his quantity of Chandu; then taking the pipe, which is furnished gratis, he reclines on a board covered with a mat, and with his head resting on a wooden or bamboo pillow, he commences filling his pipe. As he entered, his looks were the picture of misery, his eyes were sunk, his gait slouched, his step trembling, and his voice quivering, with a sallow cast of countenance, and a dull unimpressive eye. He who runs might read that he is an opium-smoker, and, diving still deeper below appearances, would declare him an opium sufferer. But now with pipe in hand, opium by his side, and a lamp before him, his eye already glistens, and his features soften in their expression, while he is preparing the coming luxury. At last it is ready, and the pipe being applied to the lamp, there is heard a soughing noise, as with a full and hearty pull, he draws in all that opium and air can give. Slowly is the inspiration relaxed, but not until all the opium that is in the pipe is consumed; then, allowing the vapour, impregnated with the narcotic influence, to remain in his chest until nature compels him to respire, he gently allows it to escape, seeming to grudge the loss of each successive exit, until all is gone, when exhausted and soothed—

> " 'Like one who wraps the drapery of his couch About him, and lies down to pleasant dreams,"

he withdraws the pipe, reclines his head, and gives himself up to the first calming effect of the drug. His next attempt confirms the comfort, and now no longer does he complain of racking limbs or aching bones; no longer does the rheum run from his eyes, and relaxed is the tightness of the chest, as he dwells with fond affection on the inspiring pipe. His second pipe being finished, he can now look around, and has time to gaze on what is going on; but his soul is still wrapped in the bliss that is anticipated from what remains of his allowance, for not until a third or fourth whiff do the feelings of positive pleasure arise. Then is felt a lightness of the head, a tingling in every limb—the eyes seem to be enlarged, and the ears sharpened to hearing, an elasticity, an inclination to mount on high is experienced—all pains are gone, and pleasure now remains—all weariness has left, and freshness takes its place. The loathing of food that was lately experienced is channeled to a relish for what is piquant, and a great desire is frequently felt for some particular food. The tongue is now loosened, and tells its tale. For whatever is secret becomes open, and what was intended for one becomes known to all. Still there is no excitement, but a calmness, soft, soothing, and sedative. He dreams no dreams, nor thinks of the morrow but with a smile in his eye; he fills his pipe with the last of his allowance; slowly inhaling it, he seems to brighten up. The smile that was sparkling in his eye, extends to other features, and his appearance is one of complete, yet placid enjoyment. Presently the pipe is slowly displaced, or drops by his side; his head, if raised, is now on the pillow—feature after feature gives up its smile—the eye becomes glazed—now droops the upper eyelid, and falls the chin with the lower lip, deeper and deeper inspirations follow—all perception is gone; objects may strike the eye, but no sights are seen; sounds may fall on the ear, but no sensations are excited. So he passes into sleep, disturbed and broken, from which the wretched being

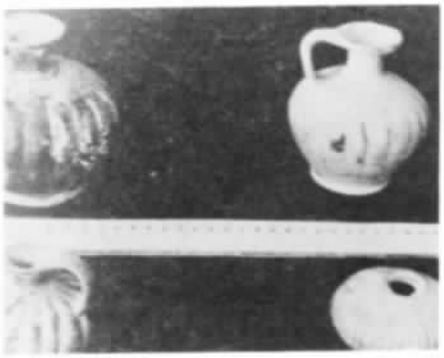
awakes to a full conception of his misery. 'To sleep, perchance to dream!'—and what dreams!—what ecstatic delights!—what ravishments!—what illusions!

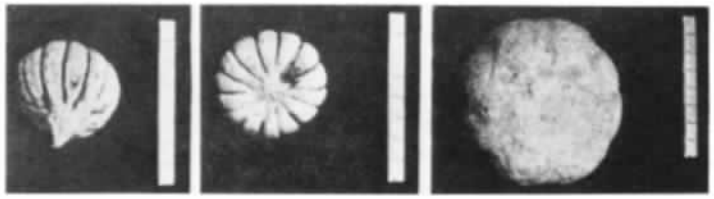
" *'Things*
Seen for the first time, and things, long ago
Seen, which he ne'er again shall see, do blend
Strangely and brokenly with ghastly things
Such as we hear in childhood, scorn in youth,
And doubt in manhood, save when seen.' "

Opium and Its Substitutes

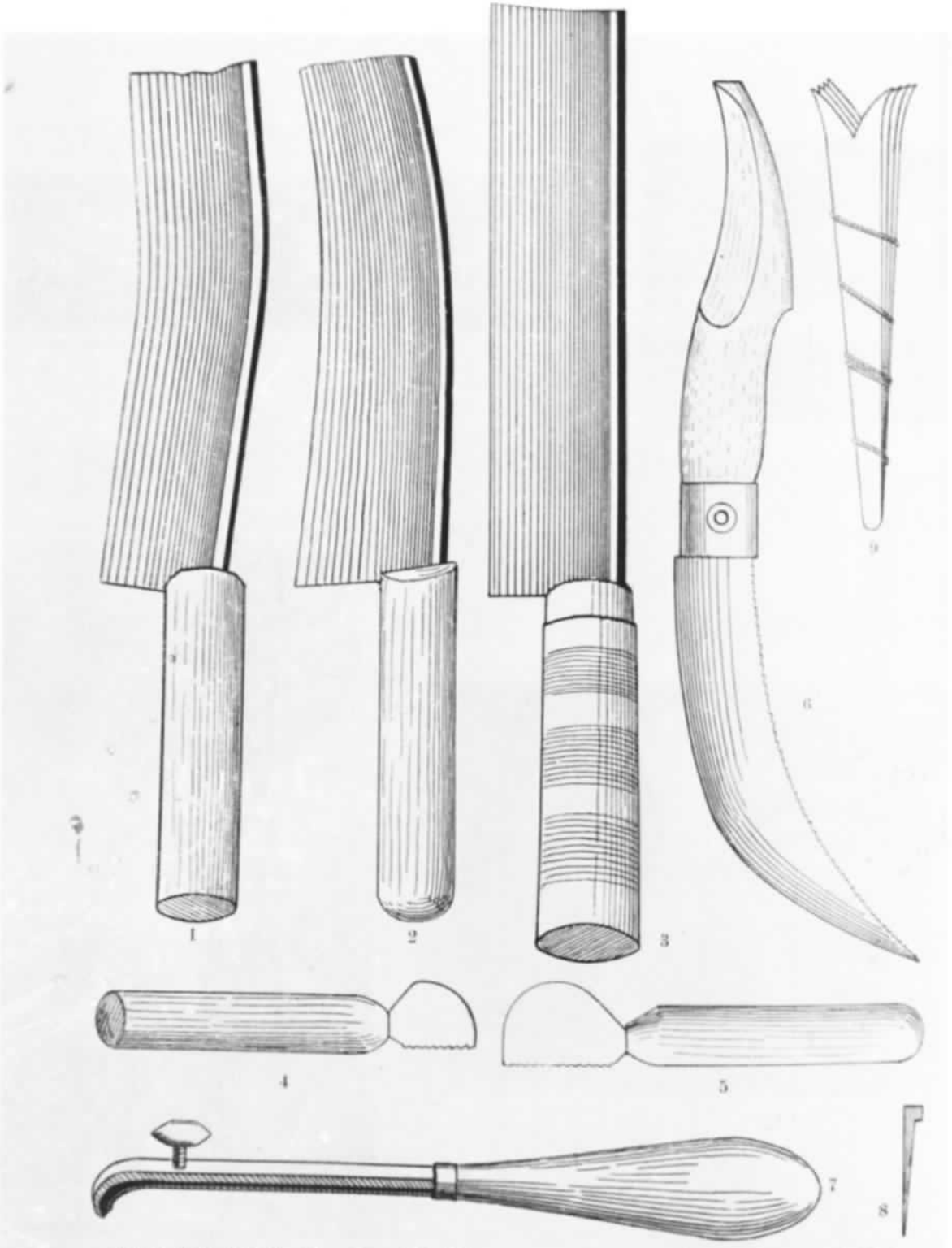
Smyrna opium	Papaver somniferum	Levant	Smoked, &c.
Constantinople	"	Turkey	"
Egyptian	"	Egypt	"
Trebizond	"	Persia	"
Bengal	"	India	"
Garden Patna	"	India	"
Malwa	"	India	"
Cutch	"	India	"
Kandeisb	"	India	"
English	"	England	"
French	"	France	"
German	"	Germany	"
Lactucarium	Lactuca sativa	Britain	Subs. for opium.
"	Lactuca virosa	Britain	"
"	Lactuca scariola	Britain	"
"	Lactuca altissima	Britain	"
"	Lactuca sylvestris	Britain	"
"	Lactuca elongata	Britain	"
"	Lactuca taraxacifolia	Guiana	"
Dutchman's Laudanum	Murucuja ocellata	Jamaica	"
Ditto	Murucuja orbiculata	Barbadoes	"
Syrian rue seeds	Peganum harmala	Turkey	To produce intoxication.
Seeds of	Sterculia alata	Silhet	Subs. for opium.
Seeds of	Scopolia mutica	Arabia	To produce intoxication.
Juice of	Chondrilla juncea	Lemnos	Subs. for opium.

As we take farewell of the "gift of God" to pass through the portals of Paradise, let us do so in the words of that most celebrated of English opium eaters, Thomas de Quincey:—"O just, subtle, and all-conquering opium! that, to the hearts of rich and poor alike, for the wounds that will never heal, and for the pangs of grief that 'tempt' the spirit to rebel.' bringest an assuaging balm; eloquent opium! that with thy potent rhetoric stealest away the purposes of wrath, pleadest effectually for relenting pity, and through one night's heavenly sleep, callest back to the guilty man the visions of his infancy, and hands washed pure from blood. O just and righteous opium! that to the chancery of dreams, summonest for the triumphs of despairing innocence, false witnesses, and confoundest perjury, and dost reverse the sentences of unrighteous judges; thou buildist upon the bosom of darkness, out of the fantastic imagery of the brain, cities and temples, beyond the art of Phidias and Praxiteles—beyond the splendours of Babylon and Hekatompylos; and from the 'anarchy of dreaming sleep, callest into sunny light the faces of long-buried beauties, and the blessed household countenances, cleansed from the dishonours of the grave.' Thou only givest these gifts to man, and thou hast the keys of Paradise, O just, subtle, and mighty opium!"





Ancient examples of the poppy in art of the near east. Above: vases and weights in the shape of poppy capsule from Greece. Lower left: a Minoan goddess from ca. 1,500 B.C. with poppy capsules in her hair. Lower right: an Egyptian pendant found at Bibanel-Molouk.

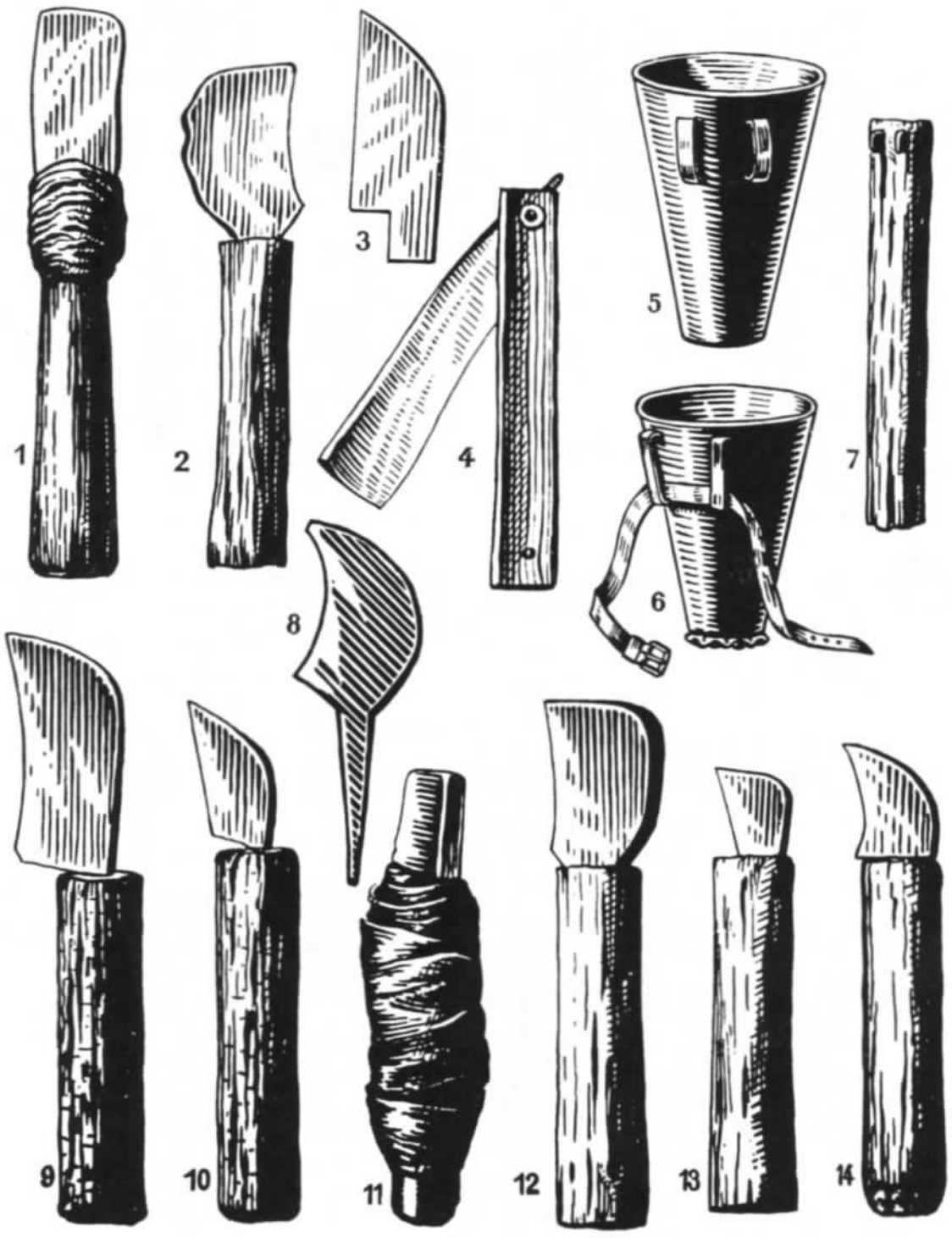


Tschirch, Handbuch der Pharmakognosie. 2. Aufl., Bd. I. Verlag von Bernhard Tauchnitz, Leipzig

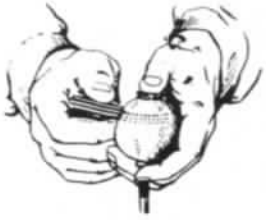
Opiumabkratzer und Mohnritzer.

1—3 Türkische Opiumabkratzer, in Kleinasien gebräuchlich. 1/2 natürl. Größe. 4—6 Türkische Mohnritzer, in Kleinasien gebräuchlich, mit Sigeklinge 4 und 5 1/2 natürl. Größe, 6 Klinge 15 cm lang. (Nach Linde.)
7 Mohnritzer nach Hesse, natürl. Größe. 9 Ostindisches Nasehtar.

Tools for incising poppy capsules and scraping off the opium. 1-3 are Turkish scrapers, and 4-6 are Turkish incisers, all 1/2 natural size. 7 and 9 are incisers from Hesse and East India respectively, both natural size.



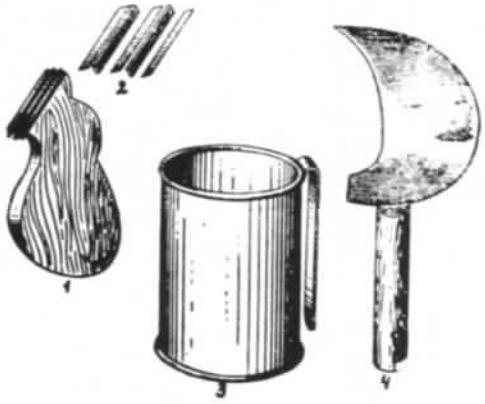
Nineteenth century opium tools from the Balkans. All the knives can be used for incising the ripe capsules, while the curved ones are also used to scrape the dried opium from the surface of the incisions. Number 7 has two incising blades. 5 and 6 are iron buckets ("tenekija") for collecting opium. 1, 4, 5 and 6 are from Petric, Bulgaria. 2, 12 and 13 are from Veles, Macedonia. 3 originated in Tikves. 7, 9, 10 and 14 are from Prilep. 11 is from Dzumaja, Bulgaria.



Position of hands for incising capsule

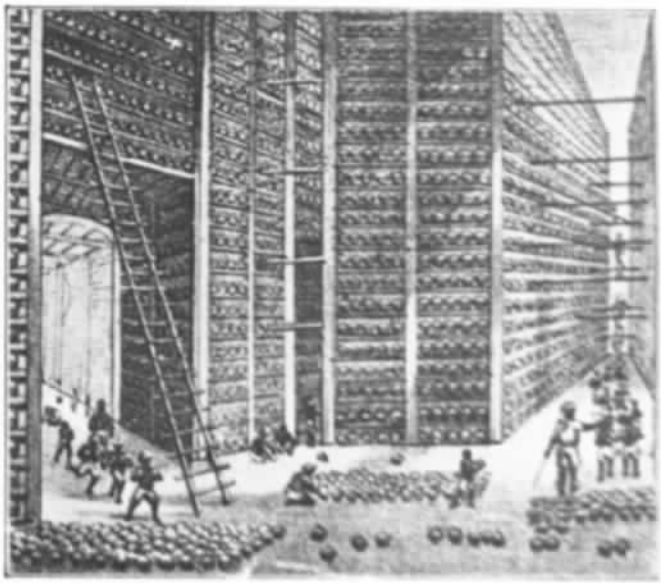
Position of incisions on capsule

Removal of opium



Method of collecting opuim widely used to the present day. The ripe poppy capsule is incised with the multibladed tool and the crude opium scraped off later with the round tool on the right.

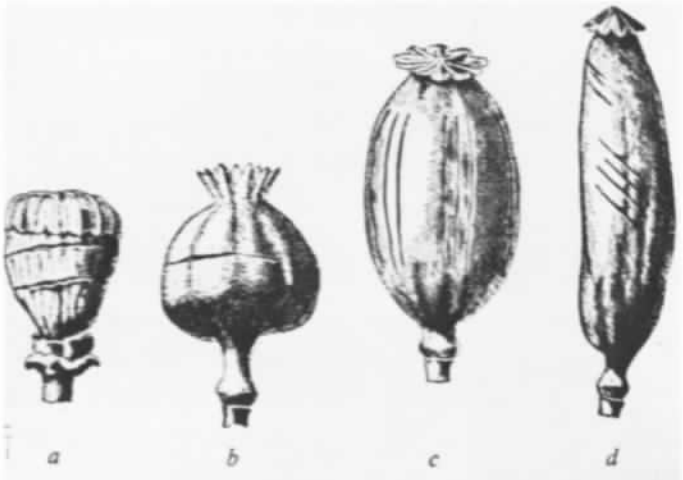
19th Century Chinese workers kneading opium into balls.



Opium production in Bengal, India about 1880. The opium is kneaded (above, left), formed into balls (below left), dried (above right) and stacked in huge magazines (below, right).

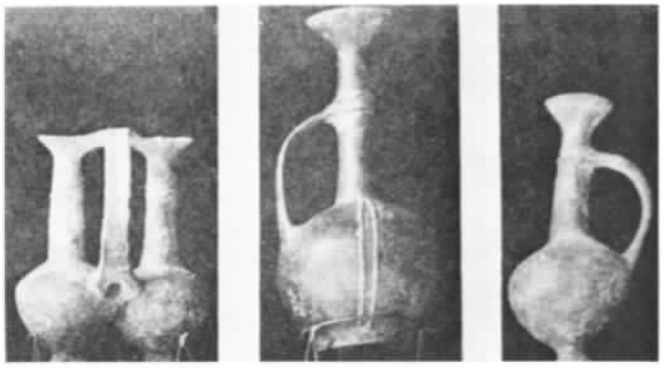
The town of Afiun-Karahissar in Turkey, a major opium producing center in the 19th century. Turkey has been a poppy cultivating center for at least 2,000 years.

Incision of poppy capsules for obtaining opium. The first three are from Turkey and the fourth from India, where the capsules are sometimes incised vertically. Two and four show the opium oozing out while one shows the scar remaining after the opium has been scraped away.



31. *Various methods of notching the poppy capsule (Wasicky)*

Collecting opium. Left: various methods of incising the capsule. Right: Iranians scraping the dried opium from the surface of the capsule in the early morning after incising the previous day.



The opium poppy in ancient greek art. Poppy shaped vases from Cyprus (1600-1400 B.C.), gold signet ring from Mycenae showing figure holding poppy capsules and coins. Metapontian coin (a) depicts poppy and wheat: Coin from Ephesus (d) shows Concord holding poppy and wheat ears (79-81 A.D.), while that from Ankyra Phyrgia (b) from the 2nd century A.D. shows poppy and ears of corn.

Preparation of opium in Patna, India ca. 1890. The sequence shows opium being kneaded, mixed with oil, formed into cakes and rolled into balls for storage and shipment, mainly to China.

Opium in 19th century Iran. Left: weighing opium in the Teheran marketplace. Right: forming crude opium into cakes by rubbing on boards in the courtyard of a caravanserai (desert inn).

A 19th century poppy field in Szechuan, China.

The main poppy growing areas of Iran in the 19th century. Poppies have been grown in the adjacent countries but Afghanistan has been better known for hashish.

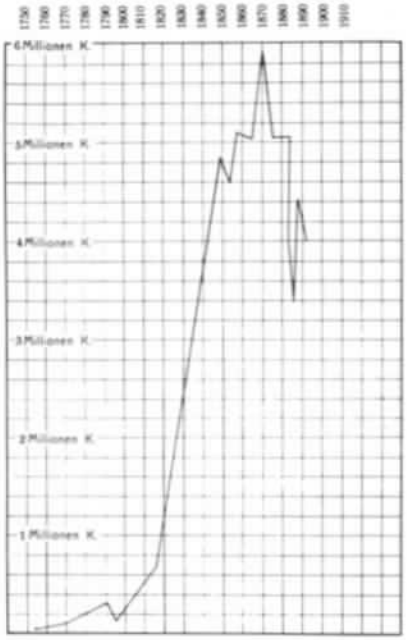
Opium smoker in action holding his pipe over the flame of the alcohol lamp. "A" is the tools for scraping the dross (residue of smoked opium) from the pipe bowl. "B" is the needle for transferring opium to the opening of the pipe bowl. "C" shows a cross section of the bowl in use as the flame burns the opium at "D".

Instruments for cutting the poppy capsule and scraping off the opium. From the upper left they are: (1) cutting knife from Burma with two blades made from sharpened pieces of Chinese coins. (2, 3) cutting tool and scraper from Turkey. (4) cutting tool from Wurttemburg, Germany with three pairs of circular rotating blades fixed in the moveable arms. The capsule fits inside the arms and the tool is pulled laterally to create six horizontal cuts. Those incredible mechanically minded Germans! Below are a scraper (left) and a cutter (right) from Bulgaria. All about one third natural size.

Title page of Wedel's "Opiologia" (1674), one of the earliest treatises on opium. Showing a Turk incising poppy capsules.

Ancient Chinese drawing of two opium smokers on a carpet. The left hand one cleans a pipe bowl while the right one lights a tobacco pipe. Above the lamp are pipe cleaning tools and scissors for trimming the wick.

Poppy growing area of India in the 19th century. It has been speculated that poppy cultivation was introduced by the troops of Alexander the Great, though the evidence is weak and it may have been done by Arabs a thousand years later.



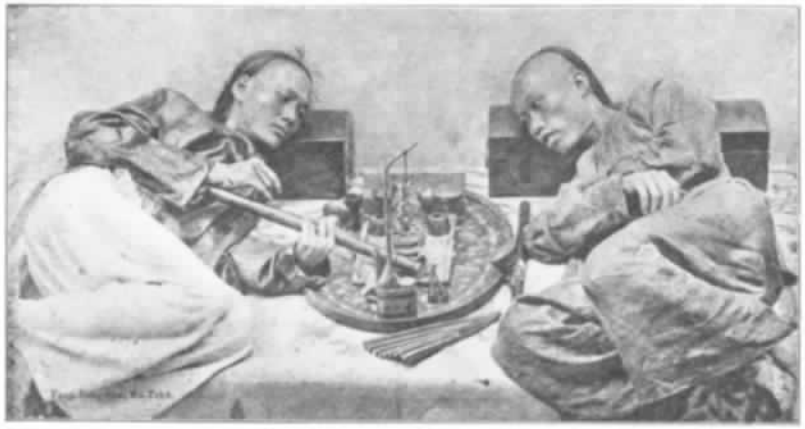
Annual export of opium from India to China in millions of kilograms. Although China had a substantial problem with opium addiction long before the British arrived, Britain made large profits from, and used force to continue opium trade.

Opium preparation in India. Above: kneading with hands and feet for small scale processing. Below: kneading, shaping and sorting at a factory in Patna. From Tschirch.

Production of opium in British India. Indians with their collected crude opium waiting for the grading which determines the price (top). Rough grading done mostly by feeling it (middle). Government chemists performing careful analysis (below). From Tschirch.

A frequent beginning and end for opium. Above: a huge field of Turkish poppies stretching out to the horizon. Note that the capsules have already been incised once. Below: public burning of confiscated opium smuggled into China. The site is the marketplace of Kashgar in the presence of high Chinese and Mohemmadan officials and the European General Consul. Both photos taken about 1890.

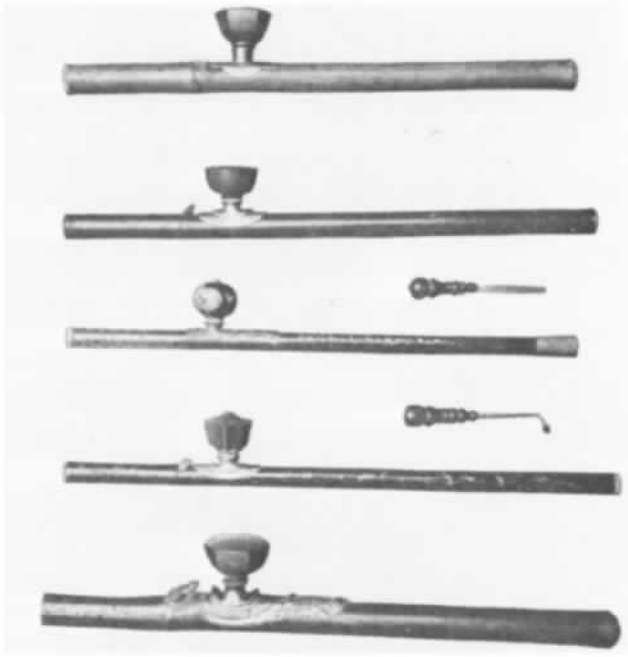
A long time smoker in the last stages of opium addiction. Picture taken in Java about 1900.



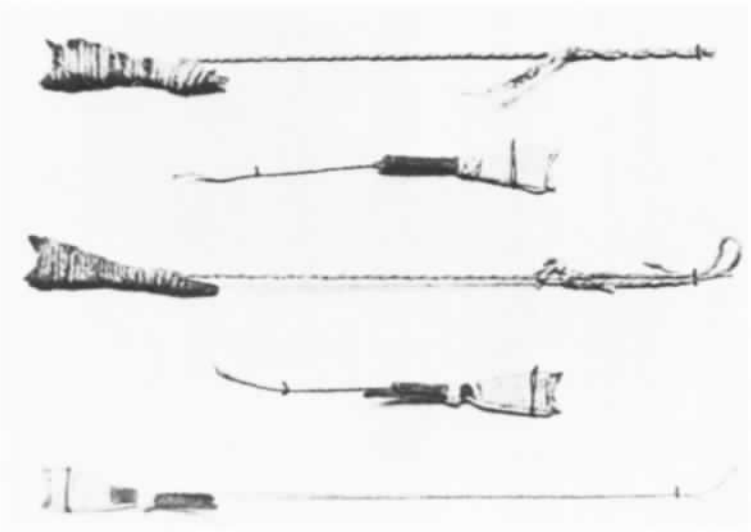
Vietnamese opium smokers using Chinese apparatus about 1890. The man on the left holds a needle for taking up the opium. Above the bowl of the pipe is a horn box for holding opium and in front of it a waterpipe, alongside which lie instruments for cleaning the bowl. In the middle of the round tray is an alcohol lamp and between it and the two instruments is a porcelain dish with a rag for cleaning the pipe bowl. Behind the lamp is a stand with two pipe bowls. Another pipe lies in front of the smoker on the right.

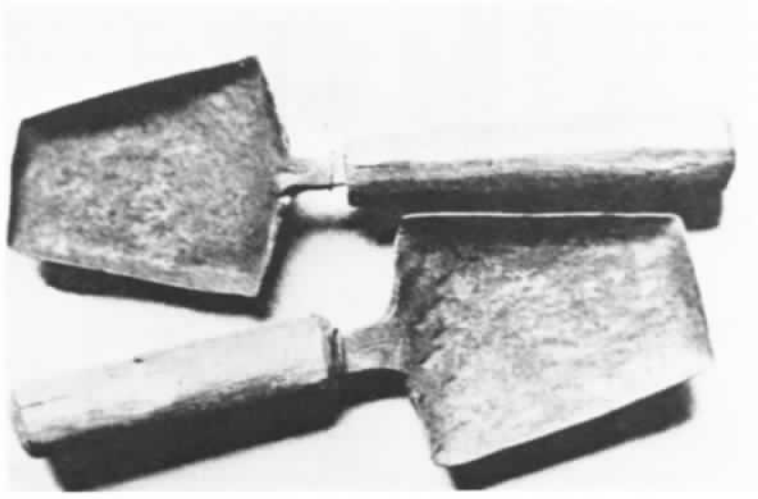
An opium factory in the former Portugese colony of Macao. Like the British and others, the Portugese used force to maintain their lucrative opium trade.

Inside of a Hongkong opium factory about 1890. The fluid opium is thickened in the large dishes.



Nineteenth century Chinese opium pipes. The upper small tool is used for scraping the bowl opening and the lower one for scraping the inside. The dross obtained from the scraping is sold to poorer addicts, saved for hard times, or mixed with other opium.

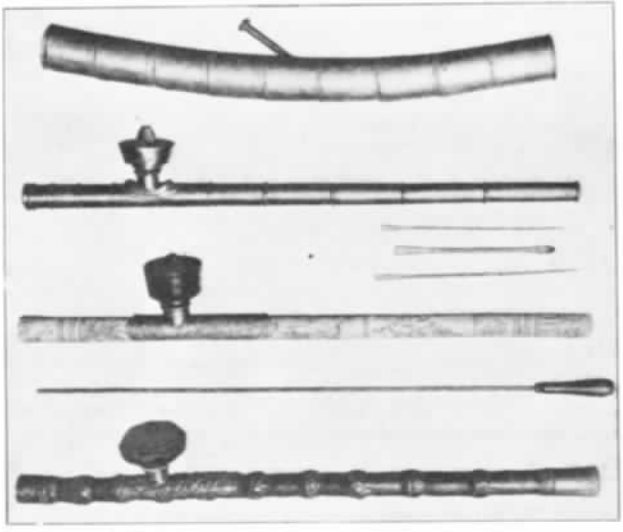




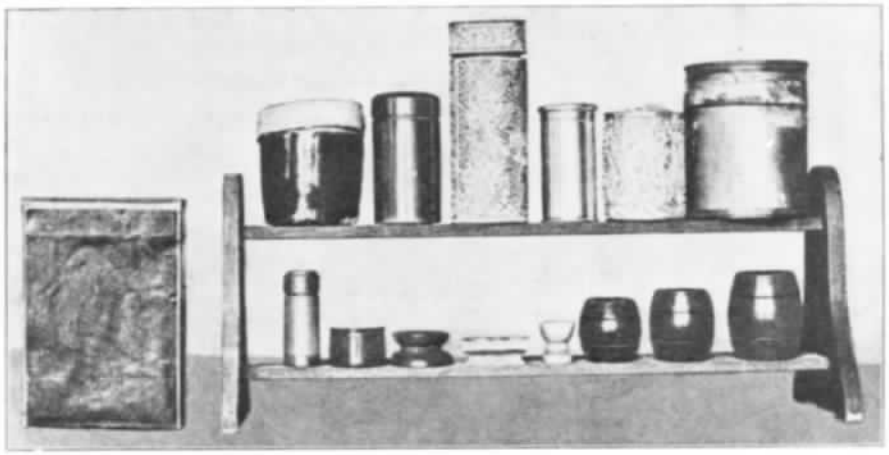
Nineteenth century opium collecting tools. Above: Indian "nashtars" ("nush-turs," "mahurnees") wrapped with thread, used for incising the poppy capsules. Below: Indian scoops ("situahs") for scraping the exuded juices from the surface of the incised capsules.

Opium pipes from southeast Asia. 1 and 2 are Cachin (Chingpaw) pipes of bamboo. 3 is a Shan pipe with a clay bowl. 4 is a Shan bamboo container for needle and scraper, with a wooden box for opium. All about 1/4 natural size.

Boxes made by the Shan people of Thailand for holding the cloths used to clean opium pipes and one such cloth.



Chinese opium pipes from the 19th century. From the top they are: a metal pipe from San Francisco, copying the bamboo type common in China; a metal pipe that can be taken apart; an intricately carved ivory pipe; a bamboo pipe. The small needles are for introducing the wad or "pill" of opium into the bowl and the spatula and large needle are for cleaning the pipes.



Nineteenth century Chinese opium containers. At the left is a tin of opium from the Hongkong Opium factory. Top shelf left to right: horn box with ceramic top from Macao (the commonest form); silver boxes and an iron box. Lower row: small containers for immediate needs. From the left: three of bone, two of soapstone, and three of wood. All about 1/3 natural size.

Chinese opium lamps. The one at the lower left is portable while the one at the lower right lacks the glass cylinder which ensures an even flame.

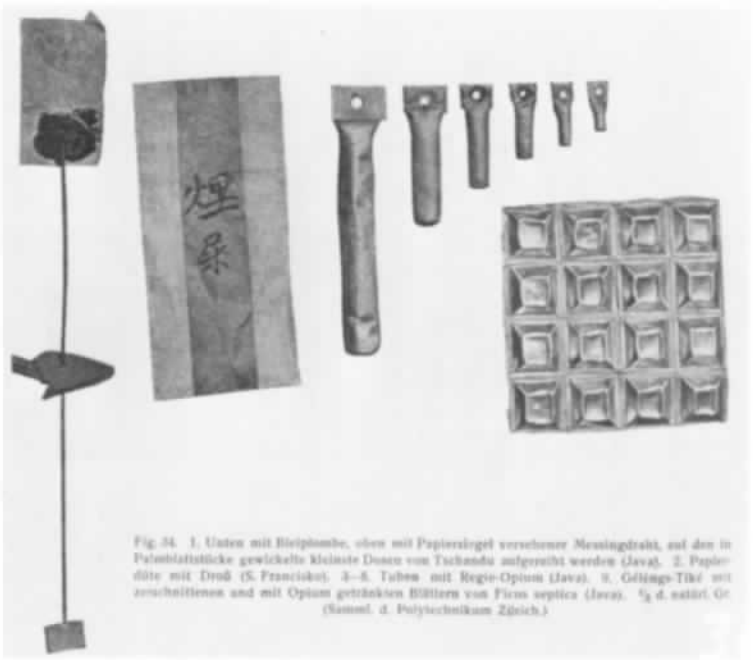


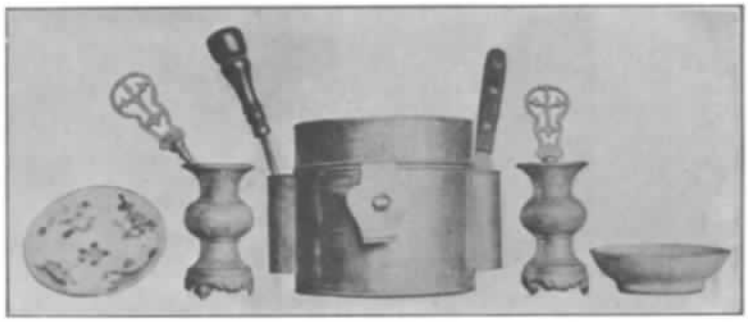
Fig. 34. 1. Unten mit Bleiplombe, oben mit Papierriegel versehener Messingdraht, auf den in Palmblattstücke gewickelte kleinste Dosen von Tschandu aufgereiht werden (Java). 2. Papierdüte mit Druß (S. Francisko). 3—6. Tuben mit Regie-Opium (Java). 9. Gelüngs-Tikí mit zerschnittenen und mit Opium getränkten Blättern von Ficus septica (Java). $^{1}/_{3}$ d. natürl. Gr. (Samml. d. Polytechnikum Zürich.)

*Opium artefacts from Java. At the left is a scale for small pieces of opium wrapped in palm leaf. It has a piece of paper at one end and a piece of lead at the other. The paper envelope which contains dross (opium pipe scrapings) was purchased in San Francisco about 1900. The metal tubes show the typical appearance of opium supplied by the Javanese government monopoly. The square block is a preparation of opium and the leaves of a fig tree (**Ficus septica**) used as a beverage.*

Javanese bamboo opium lamp with clay dish and bowl. About 1/2 natural size.

Opium pipe bowl stands for the wealthy. The upper one is inset with colored marble and the lower with mother of pearl.

Elegant opium den in Hankow, China about 1900. Even the wealthiest "lie on the hip" on hard wood, not only because it is easy to keep clean and free of vermin, but also because it feels as soft as feathers a few minutes after smoking.



Opium tools. The porcelain dishes at the left and right hold the rag or sponge for washing the pipe bowl, while the two vases and the metal container hold tools for scraping the residue (dross) from the pipe bowl.

Complete apparatus of a Chinese opium smoker. At the left front is a metal box for storing scissors used to trim the lamp wick. Behind it is a metal vessel with two scrapers for holding the dross or residue from the pipe bowls. Next to it are the lamp and two small containers, one of wood and one of horn, for holding opium. Behind these are the pipe and two extra pipe bowls on a stand. In front, the needle for transferring opium from the box to the pipe bowl rests on two glass animal figurines. Behind the needle lies the long rod for cleaning the barrel of the pipe. At the right is a porcelain dish with cover for holding a wet cloth used to clean the pipe bowl. About 1/3 natural size.

Opium pipes from around the world. At the top are a needle for opium and a tweezers, for holding coals to light the pipe, both from Iran. Below these are an Iranian **tschibugh** *with a plaster cup and an opening on the side for opium. The second and third pipes are also from Iran and have a porcelain and clay bowl, respectively. Next there are the bowl of a Vietnamese pipe and the midsection of a Chinese pipe. Below this are pipes from Java, Bulgaria, and two from Borneo and one from Sumatra.*

Heavy opium smokers from the turn of the century Hongkong. Photos supplied by Mr. Chan-Sai-Ming, Secretary of the Hongkong Opium factory.

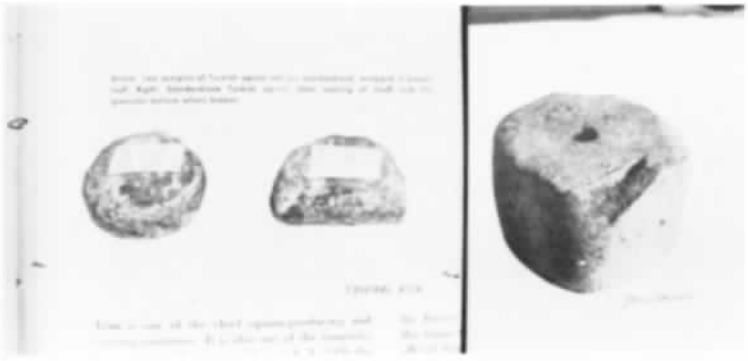
Aleister Crowley, shown here fondling an opium pipe a few years before his death, was a pioneer in many areas including use of psychoactive drugs. He scandalized Europe for decades with his communities centered around drugs, sex and magic and his autobiographical novel ***Confessions of a Drug Fiend*** *did nothing to dispell the scandal. He extensively investigated the culture of the East over half a century before it again became fashionable.*

Opium for the rich and the poor. An elegant den in Shanghai (left), and the bare necessities in San Francisco (right), about 1890.

White opium smokers in a San Francisco opium den about 1900. San Francisco was a center of opium smuggling and use at this time, due to its being a Western seaport and having a large Chinese population.

Left: Standardized Indian opium, black in colour. Below: Smuggled from India—flat cakes in oily paper.

Official UN photo



Twentieth century Asian opium samples.

Poppy field beside an open road

Poppies taller than a man

A stack of burning poppy plants

Ploughing under the poppies

Poster, showing notice of seizure

Photos showing aspects of the California opium poppy revolt that occurred during the second world war. The state allowed farmers to plant several thousand acres for poppy seeds but pressure from the federal government led to their eventual destruction.

Labels from some nonprescription medicines containing heroin that were widely available in much of the world at the end of the 19th and the early 20th century. Heroin was even present in medicines sold to cure opium addiction!

BETEL NUT
Arecha catechu
and
BETEL LEAF
Piper betle

"He took and tasted, a new life
Flowed through his renovated frame;
His limbs, that late were sore and stiff,
Felt all the freshness of repose;
His dizzy brain was calmed,
The heavy aching of his lids
At once was taken off;
For Laila, from the bowers of Paradise,
Had borne the healing fruit."—Thalaba.

The widely distributed race of Malays, occupy not only the Malayan Peninsula, and, though not exclusively the islands of the Indian Archipelago, but has penetrated into Madagascar, and spreads itself through the islands of the Pacific from New Zealand, the Society, the Frendly Isles, and the Marquesas, to the distant Sandwich and Easter Isles. Whatever may have been the starting point, it is essentially a shore-dwelling race, peopling only islands, or such portions of the continent as border the ocean, and never penetrating into the interior, or passing the mountains running parallel to the coast. Their energies are most conspicuous in maritime occupations, and to this predilection their extensive diffusion may be attributed. These people, supposed by some to have an affinity to, or alliance with the Hindoo and Chinese races, whence they have been called Hindoo-Chinese, present as many points of difference as of resemblance; and while some of the customs of the inhabitants of southern or eastern Asia may be found amongst them, they have also others peculiarly their own. The indulgence in opium is not unknown to the Malays, but the national indulgence of the race is the areca or betel nut, a havit characteristic of a sea-loving people. The use of a pipe, and especially an opium-pipe, would be a hindrance to the freedom of their motions on board their vessels, and require a state of inactivity or repose incompatible with a maritime life, in order to be enjoyed. This may in part account for the prevalence of chewing tobacco in our navy, and of the "buyo" by the Malays.

The areca palm is one of the most beautiful of the palms of India. It has a remarkably straight trunk rising forty or fifty feet, with a diameter of from six to eight inches, of nearly an equal thickness throughout. Six or seven leaves spring from the top, of about six feet in length, hanging downwards from a long stalk in a graceful curve. This palm is cultivated all over India, in Cochin-China, Java, and Samatra, and other islands of the Archipelago, for the sake of the and consists of an outer, firm, fibrous rind of husk, about half an inch thick, and an inner kernel, somewhat resembling a nutmeg in size, but more conical in shape. Internally the resemblance to a nutmeg, with its alternate white and brown markings, is even greater. When ripe, the fruit is of a reddish yellow colour, hanging in clusters among the bright green leaves. If allowed to hang until fully ripe, it falls off and sows itself in the ground, but this is not allowed. The trees are in blossom in March and April, and the fruits may be gathered in July and August, when the sliced nut can be prepared from them, but they do not fully ripen till September and October.

The nuts vary in size, their quality, however, does not at all depend upon this preperty, but upon their internal appearance when cut, intimating the quantity of astringent matter contained in them. If the white or medullary portion which intersects the red, or the astringent part be small, has assumed a bluish tinge, and the astringent part is very red, the nut is considered of good quality, but when the medullary portion is in large quantity, the nut is considered more mature, and not possessing so much astringency, is not deemed so valuable.

This palm is cultivated in gardens and plantations. The latter are usually close to the villages, and are extremely ornamental. Like the Malays themselves, the areca palm prefers the neighbourhood of the sea, which is most conducive to the perfection of the fruit, as the coca shrub of the Peruvian mountaineers delights in the slopes of the Andes. It is stated that a fertile palm will produce, on an average, eight hundred and fifty nuts annually, the average production in the plantation is about fourteen pounds weight for each palm, or ten thousand pounds per acre. The price they realize to the grower is about two shillings the hundredweight.

From the report of P. Shungoomry Menowen, we derive the following account of the preparation of the nuts. There are various kinds in use. That used by families of rank is collected while the fruit is tender; the husk, or outer pod, is removed, the kernel, a round fleshy mass, is boiled in water. In the first boiling of the nut, when properly done, the water becomes red, thick, and starch like, and this is afterwards evaporated into a substance like catechu. The boiled nuts being now removed, sliced, and dried, the catechu-like substance is rubbed thereto, and dried again in the sun, when they become of a shining black colour, and are ready for use. Whole nuts, without being sliced, are also prepared in the same form for use. Ripe nuts, as well as young nuts in the raw state, are used by all classes of people, and ripe nuts preserved in water are also used by the higher classes.

Nuts prepared in Travancore for exportation to

pared in thin slices, coloured with red catechu or uncoloured. For Tinnevelly and other parts of the country, the nuts are prepared by merely cutting them into two or three slices and drying them. For Bombay, and other parts of the Northern Country, the nuts are exported in the form of whole nuts dried with the pods.

1853-4—	484 cwt.	valued at £199 4s.
1854-5—	1,364 cwt.	valued at 698 8
1855-6—	2,008 cwt.	valued at 2,297 2
part of 1856-7—	658 cwt.	valued at 270 8
Or in 3½ years—	5,414 cwt.	valued at £4,265 2

The nut is chewed by both sexes indiscriminately in Malabar as well as on the Coromandel coast. In Malabar they mix it with betel leaf, chunam, and tobacco; but in Tinnevelly and other parts, tobacco is never added. The three ingredients for the betel, as commonly used, are, the sliced nut, the leaf of the betel pepper, in which the nut is rolled, and chunam, or powdered lime, which is smeared over the leaf.

The areca nut is commonly known by the Malay name of *Pinang*, but in the Acheenese language it is called *Penu*, and the palm producing it *Ba Penu*. The ripe nut is called also *Penu massa*, and the green *Penu mudr*. The leaf of the betel pepper is called either *Ranu* or *Siri*, and the lime *Chunam* or *Gapu*. Tobacco, when used, is called *Bakun*.

In China, the principal consumption of the nut as a masticatory is in the provinces of Quangton, Quangse, and Che-keang; and it may be seen exposed for sale on little stalls about the suburbs of Canton with the other additional articles used in its consumption. It is also used in dyeing. In the central provinces of Hoo-kwang and Kang-si the nut is, after being bruised and pounded, mixed with the green food of horses as a preventive against diarrhoea, to which some kinds of food subjects them. The Chinese state that it is used as a domestic medicine in the North of China, some pieces being boiled, and the decoction administered. From them is also prepared a kind of cutch, or catechu, which is exported in great quantities, and is now used largely in this country, together with other kinds, as a tanning an dyeing material.

No estimate can be given of the absolute quantity of areca nuts which are used as a masticatory. Johnston calculates that they are chewed by not less than fifty millions of people, which, at the rate of ten pounds per year, or less than half an ounce per day, would amount to two hundred and twenty thousand tons, or five hundred millions of pounds, a quantity greater than that of any other narcotic except tobacco.

Areca nuts have been strung and made into walking sticks (there is a stick of this kind in the Museum of Economic Botany at Kew Gardens) and, in this country, turned and formed into ornamental bracelets, as well as burnt into charcoal for tooth powder. We have engirdled the earth with pigtail, let us apply the same kind of calculation to the estimated annual consumption of areca nuts, and strung together in the form of a bracelet, we have a string 505,050 miles in length, enough to go around the world 21 times; or, supposing these nuts to be arranged side by side, they would cover a road fourteen feet wide for the distance of not less than 3,000 miles. If arranged in like manner in the form of a square, they would occupy at least 5,000 acres of land.

The areca palm has given its name to the island of Penang, not from its growing there in larger numbers, or more luxuriant than elsewhere, but because it was the tree chiefly cultivated by the Malays who first occupied the island. It now better deserves the title, being the emporium for the betel nut raised on the east coast of Sumatra.

In Sumatra many of the common drinking and baking utensils in the boats, and vessels for holding water, not dissimilar to those made by the Australian natives from the bark of the gum trees, are made from the spathe of this palm, it is also nailed upon the bottoms of the boats, and often small bunches of the abortive fruit may be seen placed as an ornament at the stem and bows of the native vessels. The male flowers are deliciously fragrant, and are in request in the island of Borneo on all festive occasions; They are considered a necessary ingredient in the medicines and charms employed for healing the sick. In Malabar an inebriating lozenge is prepared from the sap of this palm.

Manuel Blanco thinks that the areca might be used for making red ink, and it is not improbable that it is thus employed in India. With other combinations it makes black ink of moderate quality. The lower part of the petiole is used for wrapping instead of paper, for which purpose it is sold in the Philippines. The heart of the leaves is eaten as a salad, and has not a bad flavour. The convicts confined in the Andaman Islands masticate the nuts of another species of areca. The Nagas and Abors of Eastern Bengal,use those of a third species, and the natives of the mountainous districts of Malabar those of a fourth. There are about twenty species of the areca genus, of which several are thus used.

Ardent as the admirers of the areca may be in their admiration of the "buyo," we have never seen more than one translation of a Malayan poem in which the masticatory was extolled, and this, unfortunately, we are unable to present to out readers. The gods have either not made the votaries of betel so poetical as the servants of the pipe, or the peans in praise thereof are locked up from us in the cabalistic characters of their national language. The unmistakeable marks left by the habit on the lips, teeth, and gums, are certainly extolled by them as

marks of beauty. In the poem already referred to, the lover addresses his mistress in praise of the redness of her teeth and lips, and the fragrant odour of her breath, produced by the sweet "buyo" secreted in the hollow of her cheek. White teeth are therefore held in abomination, and as this is also the opinion of certain African tribes, who stain theirs with the juice of flowers, our *must* be a barbarous nation to respect such albino masticators.

Under the Palms

"A wind blew warm from the east, and it lifted its arms hopelessly; and when the wind, love-laden with most subtle awareness, lingered, loth to fly, the palm stood motionless upon its little green mound, and the flowers were so fresh and fair, and the leaves of the trees so deeply hued, and the native fruit so golden and glad upon the boughs, that the still warm garden air seemed only the silent, voluptuous sadness of the tree; and had I been a poet my heart would have melted in song for the proud, pining palm."—G.W. Curtis

Two species of a kind of pepper vine are estensively cultivated, with the areca palm, in all the countries of the East where chewing the betel is indulged in. These belong to the same family of plants as those producing the common black pepper and the long pepper of commerce. They are known to botanists as *Piper betle*, and *Piper siraboa*. They are similar in their habits, being trailing plants, with some resemblance to the ivy, but more tender and fragile. The betel palms may be often seen with the pepper, climbing and twining around their tall, straight, slender trunks, or they are trained about poles of bamboo in the manner of hops in the hop gardens of Kent. Almost every one with a piece of land cultivates the pepper for his own consumption. In the markets incredible quantities of the leaves are offered for sale, in piles carried about in baskets. In Northern India, sheds are constructed for the growth of the pepper. These are from twenty to fifty yards in length, and eight or twelve broad, of bamboo, to shelter the plants from the sun. Great attention is paid to the cultivation, and the plants are carefully attended to, and cleaned every morning.

Betel leaf cannot be preserved in a sound state beyond eight days without preparation, but by being prepared over a fire, and rolled into balls, in which state it is called *chenai*, it will keep a year, only the quality is much deteriorated. In Penang the old men carry about with them a sort of metal tube, having a ramrod-looking pestle, with which they busy themselves in pounding the mixture for chewing. The young daily make nut-crackers of their jaws, and although the mixture, perhaps, rather tends to preserve the teeth, still the exercise on the nut must be a little too violent for them, and the Malays say it injures the sight. The Chinese are not much addicted to the use of the betel.

Another substance entering into the composition of the "buyo" is the extract of the leaves of the gambir *(Uncaria gambir)*. There are different qualities of extract: the first and best is white, brittle, and has an earthy appearance when rubbed between the fingers, which earthy appearance gave it the name of Terra Japonica, being supposed, at first, also, to come from Japan, and is formed into very small round cakes. This is the most expensive kind, and most refined, but it is not unfrequently adulterated with sago; this kind is brought in the greatest quantity from the island of Sumatra. The second quality is of a brownish yellow colour, is formed into oblong cakes, and when broken has a light brown earthy appearance; it is also made into a solid cubic form; it is sold in the bazaars in small packets, each containing five or six. The third quality contains more impurities than the preceding, is formed in small circular cakes, and sold, in packages of five or six, in the bazaars.

The method employed in making the extract is thus described in the *Singapore Chronicle:*—The leaves are collected three or four times a year; they are thrown into a large cauldron, the bottom of which is formed of iron, the upper part of bark and boiled for five or six hours, until a strong decoction is inspissated, it is then allowed to cool, when the extract subsides. The water is drawn off, a soft, soapy substance remains, which is cut into large masses; these are further divided by a knife into small cubes, about an inch square, or into still smaller pieces, which are laid in frames to dry. This catechu has more of a granular uniform appearance that that of Bengal, it is, perhaps, also less pure. The younger leaves of the shrub are said to produce the whitest and best gambir, the older a brown and inferior sort. The men employed in the gambir plantations generally indulge freely in the use of opium.

Chewing the Coon

"It ascends me into the brain, dries me there all the foolish, and dull, and crudy vapours which environ it; makes it apprehensive, quick, forgetive, full of nimble, fiery, and delectable shapes, which, delivered over to the voice (the tongue), which is the birth, becomes excellent wit." —Sir John Falstaff.

"In Burmah," says Howard Malcolm, "almost every one, male and female, chews the singular mixture called *coon*, and the lacquered of gilded box containing the ingredients is borne about on all occasions. The quid consists of a slice of areca nut, a small piece of cutch, and some tobacco rolled up in a leaf of betel pepper, on which has been smeared a little tempered quicklime. It creates profuse saliva, and so fills up the mouth that they seem to be chewing food. It colours the mouth deep red, and the teeth, if not previously blackened, assume the same colour. From the combination of the three ingredients this colour seems to proceed, since the leaf and nut, without the lime, fail to produce it. This hue, comminicated to the mouth and lips, is esteemed ornamental, and an agreeable odour is imparted to

the breath. The juice is usually, though not always, swallowed.

The mastication of the betel is considered very wholesome by those who are in the habit of using it, and it may be so, but the black appearance it gives to the teeth, although it is said to be an excellent preserver of them, together with the brick red lips and mouth, cause anything but an agreeable appearance. Its use certainly does not impart additional beauty to the native females, who habituate themselves to an extent equal to that of the opposite sex.

The custom, Marsden states, is univeral among the Sumatrans, who carry the ingredients constantly about them, and serve them to their guests on all occasions; the prince in a gold stand and the poor man in a brass box or mat bag. The betel-stands of the better ranks of people are usually of silver, embossed with rude figures. The Sultan of Moco-Moco was presented with one by the India Company with their arms upon it, and he possesses another besides, of gold filagree. The form of the stand is the frustum of an hexagonal pyramid, reversed, about six or eight inches in diameter. It contains many smaller vessels, fitted into the angles, for holding the nut, leaf, and chunam, with places for the instruments employed in cutting the first, and spatulas for spreading the last.

Captain Wilkes also describes that of the Sultan of Sooloo. "On the left hand of the sultan sat his two sons, on the right his councillors, while immedicatley behind him sate the carrier of his betel-nut casket. The casket was made of filagree silver, about the size of a small tea-caddy, of oblong shape, and rounded at the top. It had three divisions, one for the nut, another for the leaf, and a third for the lime. Next to this official was the pipe-bearer, who did not appear to be held in equal estimation."

A circumstance is also narrated in connection with the son of this same Sultan, which exhibits the use of betel in another phase. This son, shortly after taking a few whiffs from the opium-pipe was overcome, and became stupid and listless. When partially recovered, he called for his betel nut to revive him by its exciting effects, and conteract the influence of the opium. The pinang or buyo was carefully chewed by his attendant to a proper consistency, moulded into a ball, and then slipped into his mouth. Hence we may learn two things. First, that chewing the betel counteracts the ill effects of an over-dose of opium. Secondly, that it is extermely convienient to have an attendant with a good set of teeth, since he could not only masticate betel nut for you, and relieve you from a large amount of labour; but in the event of your joint not being so tender as it should be, the amount of milling to be expended at dinner could be divided between you, the attendant masticating the tough dishes, and yourself the tender, and thus, by division of labour, a good dinner could be procured with little expenditure

In Sumatra, when the first salutation is over, which consists in bending the body, and the inferior putting his joined hands between those of the superior, and then lifting them to his forehead, the betel is presented as a token of hospitality and an act of politeness. To omit it on the one hand, or to reject it on the other would be an affront, as it would be, likewise, in a man of subordinate rank to address a great man without the precaution of chewing it before he spoke.

The Tagali maidens, says Meyen, regard it as a proof of the uprightness of the intentions of a lover, and of the strength of his affection, if he takes the buyo from his mouth. In Luçon, a little box or dish is kept in every house, in which are kept the betel rolls prepared for the day's consumption, and there a buyo, or betel roll, is offered to every one who enters, just as a pinch of snuff or a pipe might be with us. Making the buyo is a part of the occupation of the females, who may be seen in the forenoon stretched on the ground rolling them. Enough for the day's consumption is generally carried, in a siri box of metal or japanned ware, by those whose occupation call them from home; ever one who can afford the expense, puts a fresh roll in his mouth every hour, which he continues to chew and suck for about half an hour or more.

Betel holds an important place in the marriage ceremonies of the Tagals. When once a young man has informed his father and mother that he has a predilcetion for a young Indian girl, his parents pay a visit to the young girl's parents upon some fine evening, and after some very ordinary chat, the mamma of the young man offers a piastre to the mamma of the young lady. Should the future mother-in-law accept, the young lover is admitted, and then his future mother-in-law is sure to go and spend the very same piastre in betel and cocoa wine. During the greater portion of the night, the whole company assembled upon the occasion, chews betel, drinks cocoa wine, and discusses upon all other subjects but marriage. The young men never make their appearance till the piastre has been accepted, because in that case they look upon it as being the *avant-courier*, that is, the first and most essential step towards their marrage.

During the fast of Ramadan, the Mahometans abstain from the use of the betel while the sun continues above the horizon, but, except at this time, it is the constant luxury of both sexes from an early period of childhood till old age, when, becoming toothless, they are unable to masticate the nut, and are reduced to the alternative of having all the ingredients previously reduced to the form of a paste for them, so that, without effort, they may disolve in the mouth.

When Lady Raffles had reached Merambung in Sumatra, being much fatigued with walking, and the

directions, she lay down under the shade of a tree, when a Malay girl approached, with great grace of manner, and of being asked if she wanted anything, replied, "No! but as you were quite alone, I thought you might like to have a little talk, so I came to offer you some *siri* (betel), and sit beside you."

The darker the teeth the more beautiful is a Siamese belle considered; and in order that their gums should be of a brilliant red, to form a pleasant contrast to the black lips and teeth, they restore to the pastime of chewing betel from morning till night. The constituents of the betel being rolled up into something very much like a sailor's quid, it is then thrust into the lady's cheek, and is munched, and crunched, and chewed so long as the slightest flavour is to be extracted, and, as they never swallow the juice, the results are very detrimental to the cleanliness of the floors of the houses, and of themselves generally. They commonly make use of two such quids during the day, and this mixture has the effect of dyeing their gums and the whole of the palate and tongue of a blood-red colour. Old crones, and very ancient *chronoses* (for both men and women use the betel), who have no longer any teeth to masticate the mixture with, are attended by servent, who have a species of small pestle and mortar always about them, wherein they reduce the betel into a proper form for the delicate gums of their aged patrons.

The betel pepper is cultivated at Zanzibar, where the use of betel prevails, as it does at the Comoro Islands and at Bombay. But the custom is not in vogue in Arabia. The betel palm is also grown for the sake of its fruits in the island of Zanzibar.

The habit of masticating betel nut in combination with hemp has of late come into vogue in the United States of America, and doubtless Brother Jonathan will soon eclipse Malaya in his predilection for the "buyo."

From the areca nut another kind of catechu is prepared, which is generally preferred as a masticatory. Heyne thus describes the process of its manufacture, "Areca nuts are taken as they come from the tree, and boiled for some hours in an iron vessel. They are then taken out and the remaining water is inspissated by continued boiling. This process furnishes *kassu, or most stringent terra japonica*, which is black, and mixed with paddy husks and other impurities. After the nuts are dried, they are put in a fresh quantity of water, boiled again, and the water, being inspissated like the former, yields the best or dearest kind of catechu, called *coury*. It is yellowish brown, has an earthy fracture, and is free from the admixture of foreign bodies." It is probable that the flat round cakes, covered with paddy husks, met with in commerce is the *kassu* of Heyne.

The husk which surrounds the nut, and which is of a fibrous nature, resembling the coir of the cocoa nut is thrown away by tons, and allowed to rot. This substance has lately been experimented upon for the manufacture of paper, for which purpose it appears to be available, and, as there is no want of the raw material, perhaps at some future time it will become utilized as extensively as the "coir" of Ceylon.

The Bombay catechu is obtained from *Acacia catechu*, and the Bengal catechu from *Uncaria gambir*. The Bonbay produce is of a dark brownish red colour, and is stated to be the richer of the two in tannin. The Bombay variety is commonly called "cutch," while the Bengal produce is of a lighter brown colour, and is termed "terra." Catechu of good quality is also obtained from Pegu.

The catechu exported from Madras to England, Bombay, France, and Ceylon was—

1856 was 8,536 tons.
1857 was 11,047 tons.
1858 was 11,205 tons.
1859 was 13,762 tons.

Of this quantity we exported in—

1856—1,031 tons.
1857—1,427 tons.
1858— 974 tons.
1859—1,809 tons.

But this is only a small proportion of the catechu consumed in England alone, since in 1849 we imported 169,140 cwts. of that substance for tanning purposes, and the quantity has since increased.

These articles, therefore, make no insignificant item in our East Indian trade, which, valued at the intermediate rate of 15s. and 30s. per cwt., would amount to the sum of £153,375 in 1858.

The areca nut palm ***Areca catechu.*** *A fruiting tree is shown in the middle and its base at the left. At the bottom a fruit is shown in cross section along with a whole fruit and some of the flowers. At the right is a top view of the fruit showing the remaining flower parts (perianth).*

Plant sources of the betel. Above is shown a young specimen of the betel nut palm ***Areca catechu*** *growing in Ceylon and below the source of betel leaves, the pepper plant* ***Piper betle*** *growing up a tree in the center (Java).*

Areca nuts. From the top left: a fruit cut in half, showing the central split in which the cotyledon (seed leaf) grows at the time of germination; an entire areca fruit; five conical seeds showing some of the variation. Left: the fruit hull split open showing the seed. Middle row: five seeds showing further variations. Bottom row: Two small, strange looking Chinese areca nuts still in their hulls and two larger seeds with coverings removed to show yellow endosperm and dark venation. All about 1/3 natural size.

Betel palm plantation at harvest time. At the left are piles of freshly picked betel nuts (areca nuts).

A fruiting branch of ***Piper betle.*** *The leaves of this species of pepper are usually used with the areca nut. It belongs to the same genus as the plants which yield pepper and kava kava.*

A house of the Indagari of Sumatra surrounded by coconut and areca nut palms.

Female betel chewers in Sikkim about 1900. The conical packages contain the constituents of the betel cud, usually ground betel nut, betel leaves and lime.

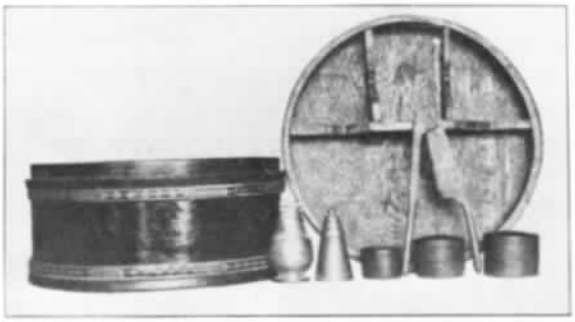
A wooden betel container from Buitenzorg, Java. The outside is black with gold decoration, the inside red. The three round jars hold areca nuts, tobacco and gambir and the cylindrical one holds lime. A compartment for betel leaves is in the back. About 1/3 natural size.

Elegant Javanese silver betel parapernalia from the mid 19th century.

Four wheeled brass betel apparatus from Malayasia. At the right is the half opened tray, and at the left the two arms of the areca nut scissors protrude in front of the tobacco bowl. In the center is the lime bowl with the vase-shaped betel leaf holder behind it. The bowl at the right has prepared areca nuts.

Elaborate brass betel container from Sumatra.

Brass betel box from Burma. An iron sheers inlaid with silver (for cutting betel nuts) leans against it. The small brass box holds lime. Many people around the world independently discovered the use of lime to help extract alkaloids from plants. About 1/3 natural size.



Wooden betel paraphernalia from Vietnam. The boxes are for tobacco, gambir and lip pomade, while the shears are for cutting up the areca nuts. The shears leans against the insert from the box which has compartments for betel leaves and nuts. The two bell-shaped objects are the lime container and its cover. About 1/6 natural size.

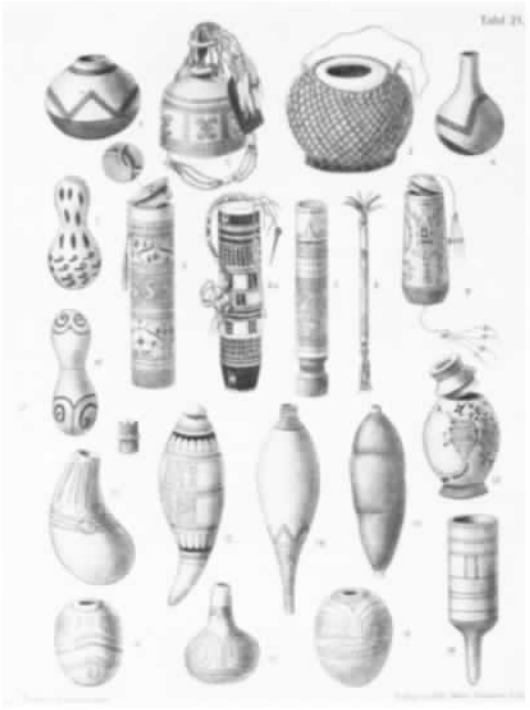
Laquered bamboo betel containers. The larger containers have their carved lids displayed. About 1/5 natural size.

Silver betel apparatus from the middle Mekong delta of Vietnam. From the left: lip pomade jar, lime vessel, cuff shaped betel leaf holder and tobacco jar. Below is the knife for cleaning the areca (betel) nuts. About 1/2 natural size. Pomade was roughly equivalent in nature and function to vaseline (petrolatum) and is necessary because the lime tends to dry and crack the lips.

Lime and lip pomade containers used by betel chewers. At the top are copper lime containers from Ceylon, the right one with brass rim and silver ornamentation. Below from the left are an iron lime holder of the Orang-sakei of Indochina, a lip pomade jar of red wood from Vietnam, and a Ceylonese lime container with attached spatula. About 1/4 natural size.

A richly engraved Javanese betel apparatus. At the left is a cylindrical lime jar in front of the larger, vase shaped betel leaf holder. In the middle, in front of the column with the bird is a bowl for areca nuts. At the right is a tobacco container shaped like a fruit with stem and leaves. All about 1/5 natural size.

Elegant betel apparatus from Indian area. The vessel is a spitoon, a very necessary item indoors since the chewers expectorate constantly. The brass lime container with attached spoon is probably from Pakistan. About 1/3 natural size.

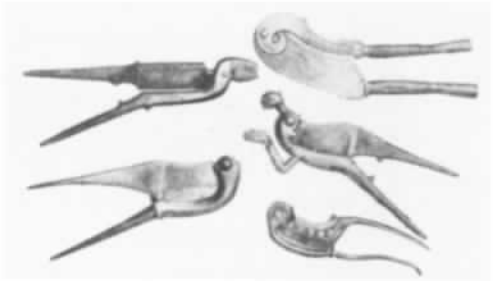


Lime containers from around the world. 1. Gourd from Fauro (Solomon Islands) 20 cm wide. 2. Bamboo container from Flores Islands. 3. Coconut with woven net also from Flores Island. 4. Gourd from Fauro colored red with black lines and white beads. 5. Gourd from the Matty Islands decorated with fish and fish hooks. 6. Bamboo from West Borneo with dark decorations. 6a. Bamboo from Mbawa (Flores Islands). 7. Bamboo of the Kaibobo people from Seran, Malacca. 8. Bamboo of the Lisabatta people of Seran, decorated with chicken and cockatoo feathers, glass beads and mother of pearl. 9. White antelope horn with wooden top and bottom, 10.5 cm long, from the Amarasi of Timor. 10. Polynesian gourd. 11. Gourd from the Solomon Islands. 12, 13, 14. Containers of the Tobada people of Celebes. 12 is a gourd, 13 is brass ana 14 is animal skin. 15. Bamboo nodule container of the Amarasi of Timor. 16, 17, 18. Gourds from the Eastern coast of New Guinea, 20 to 30 cm high. 19. Bamboo from the Philippines.

Wooden lime spatulas. The two right hand ones are from New Guinea.

Richly ornamented areca nut scissors. 1, 3, 4 from Bali and 2 from Java.

Mortars for grinding areca nuts from Buitenzorg, Java. At the left is an unworked stone used as a pestle with the mortar in the middle. The one at the right is made of



Burmese areca nut scissors. The handles serve as prongs for removing the fibrous hull of the nuts. The two on the left are bronze, the bottom one with steel blades. The three in the middle are of iron, the top one from Pakistan and the bottom one inlaid with silver. The two on the right are of iron inlaid with gold and silver. About 1/3 natural size.

Vulgar Name	Botanical Name	Where Used Or Cultivated	How Used
Betel nuts	Areca catechu	Malay Penin	Chewed
Betel nuts	Areca laxa	Andaman Island	Chewed
Betel nuts	Areca Fagensis	E. Bengal	Chewed
Betel nuts	Areca Dicksoni	Malabar	Chewed
Kassu (extract)	Areca catechu	India	Chewed
Cowry (extract)	Areca catechu	Mysore	Chewed
Kutt or catechu	Acacia catechu	India	Chewed
Gambir	Uncaria gambir	Singapore	Chewed
Gambir	Uncaria sp.	Singapore	Chewed
Betel pepper leaves	Piper betle	Malay Penin	Chewed with betel
Betel pepper leaves	Piper siraboa	Malay Penin.	Chewed with betel
Blk. pepper leaves	Piper nigrum	Singapore	Chewed with betel
Ava pepper	Piper methysticum	South Seas	Chewed with betel
Roots of	Derris pinnata	South Seas	Subs. for betel
Roots of	Cocos nucifera	Ceylon	Subs. for betel
Guayabo bark	Psidium guayaba	Philippines	Subs. for betel
Antipolo bark	Psidiuni guayaba	Philippines	Subs. for betel

More areca scrapers and their containers. The first two from Sumatra, the next two from Bali.

Tubes and scrapers for cleaning areca nuts. At the left is a brass tube with wooden stopper, in which fits the second item, a scraper with brass grip and iron blade. In the middle is a tube of sheet metal with a wooden plug below and an iron scraper with wooden handle above. At the right are a brass tube and its accompanying brass scraper. All are from Java. About 3/5 natural size.

ALCOHOL

The liquors we ferment are all directly produced, either from the natural sugars which we extract from plants, or from the sugars which we prepare by art. I shall briefly advert to the most interesting and important of these liquors now in use in different parts of the world. The way in which these drinks are prepared, their chemical composition, and their chemico-physiological action upon the system, are more or less connected with the common life of almost every people.

The Beers—When grape sugar is dissolved in water, and a little yeast is added to the solution, it begins speedily to ferment. During this fermentation, the sugar is split up into three different substances—alcohol, water, and carbonic acid gas escapes in bubbles into the air.

When common cane sugar is dissolved in water and mixed with yeast in a similar way, fermentation is induced as before. The cane sugar is first changed into grape sugar by the action of the yeast, and then the grape sugar is split up into alcohol, water, and carbonic acid. These changes take place in close as well as in open vessels, so that the presence of air is no way necessary to their perfect and rapid completion.

If starch be converted into grape sugar by the action of diluted sulphuric acid, or of a mixture of malt and yeast be then added to the sweet solution, the same changes and the same production of alcohol take place. From potato starch, treated in this way, large quantities of spirit (potato brandy) are manufactured in France, Germany, and the northern countries of Europe.

But by a still more beautiful process the starch of barley and other grains is converted into grape sugar before it is removed from the seed, and is then split up as before, by means of yeast, into alcohol, water, and carbonic acid.

It has been shown that these grains consist essentially of two principal substances—starch and gluten. When moistened, in favourable circumstances, the grain begins to sprout. The starch and gluten it contains are, of course, intended to form the first food of the young plant; but these substances are insoluable in water, and therefore cannot, in their natural state, pass onwards from the body of the seed to supply the wants of the growing germ. It has been beautifully provided, therefore, that both of them should undergo chemical changes as the sprouting procedes. This takes place at the base of the germ—exactly where and when they are wanted for food. The gluten is changed, among other products, into a white soluble substance, which has been distinguished by the name of *diastase*, and starch into soluble grape sugar. Hence the sweetness of sprouted corn.

Starch can be transformed into sugar by the agency of a minute quantity of sulphuric acid. It is so transformed also by this diastase. Produced in the sprouting seed in contact with the starch, the diastase changes the latter into sugar, and makes it soluable in the sap just as it is required. By this means the infant plant is fed.

The maltster, brewer, and distiller avail themselves of this natural change in the constituents of sprouting grain, and on a large scale call into action the remarkable chemical influence of diastase. This is abundantly illustrated by the chemical history of the art of brewing.

Malt beers are so called because they are prepared, either in whole or in part, from infusions of malted barley. The manufacture of these drinks involved two distinct chemical processes: *first*, The change of the starch of the grain into sugar; and, *second*, The change of the sugar into spirit-of-wine of alcohol. With a view to the first of these ends, the grain is manufactured into malt; to attain the second, it is submitted to fermentation through the medium of yeast.

The malt.—The maltster moistens his barley in heaps, and spreads it on a floor in a dark room to heat and sprout. When the germ (*acrospire*, he calls it) is about to burst from the envelope of the seed, he arrests the growth by drying the grain gently on the floor of his kiln. It is now malted barley, and has a sweet taste, showing that it already contains sugar. Other grains—such as wheat, oats, and rye—may be converted into malt by a similar process. Even Indian corn is malted in North America; and in South America this malt has been used for making beer form the remotest times. In Europe, however, barley has been found by long experience to be best adapted for this process—through malted rye and wheat are employed along with the barley for the manufacture of some particular kinds of beer.

The beer.—The brewer or distiller bruises the malt and introduces it into his mash-tun, with water gently warmed to 157° or 160° Fahr. This water dissolves first the sugar which has already been formed in the seed, and afterwards the diastase. This latter substance then acts upon the rest of the starch of the seed, converting it first into a species of soluble gum, and finally into grape sugar. If the process has been well conducted, little but the husk of the grain is left undissolved, and the liquor or wort has a decidedly sweet taste.

Three circumstances are remarkable in regard to this diastase. *First*, That even in good malt, about one pound of diastase only is formed for every hundred parts of starch contained in the grain. *Second*, That this one pound of diastase is suffieicnt to change a thousand pounds of starch into grape sugar. And *third*, That by heating the solution containing it to the

boiling point, the diastase is killed, as it were: its power of changing starch into sugar is wholly destroyed.

The first and second of these circumstances enable the brewer, if he choose, to mix with his malt a certain portion of starch, or of unmalted grain. The diastase of the malted portion is sufficient to transform into sugar, not only the whole starch of the malt, but all the starch also of the raw grain. Thus both the expense and the waste which would attend the malting of the latter is avoided. In this country the brewer rarely avails himself of this opportunity of adding raw grain. Continental brewers, however, and our home-distillers, both practice it largely.

The third circumstance determines the time when the wort may be safely boiled—which is the next stage in the manufacture of beer. The change of all the starch into sugar being effected, the diastase is no longer of service, and the wort may be heated to boiling, with advantage. By this higher temperature the action of the diastase is stopped, and at the same time the albumen which the water has disolved out of the grain is coagulated and separated in flocks. Advantage is taken also of this boiling, to introduce the hops; and these, besides imparting their peculiar bitterness and aroma to the liquid, help further to clarify it. Both the length of the boiling and the quantity of hops added to the liquid vary with its richness in sugar, and with the quality of the beer it is intended to make.

The boiled liquor is run off into shallow vessels, and cooled as rapidly as possible to the best fermenting temperature, which lies between 54° and 64° Fahr. It is then transferred to the fermenting tun; a sufficient quantity of yeast is added—obtained, if possible, from the same kind of beer it is desired to make—and it is allowed to ferment slowly for six or eight days. During this fermentation, the sugar of the wort is split up into the carbonic acid gas which, for the most part, escapes from the surface of the liquid and mingles with the surrounding air.

Three things are notable in this process: *first*, That the quantity of yeast which is added, and the temperature at which the liquor is afterwards kept to ferment, vary with every kind of beer; *second*, That the yeast has a tendency to reproduce a beer which, in flavour, &c., shall resemble that from which it has been obtained; and *third*, That the whole of the sugar contained in the wort is never in practice transformed into alcohol. Good beer—however clear, hard, bright, and bitter—always retains a pleasant sweetish taste. From one-half to three-fourths only of the sugar in the wort is decomposed. Were the fermentation not so regulated as to leave this residue of undecomposed sugar, the beer would refuse to keep. It would turn sour in the cask.

I do not follow further the manufacture of this important beverage. But I cannot dismiss the beautiful series of operations of which it consists, without calling the attention of my reader for a moment to the remarkable place which the minute yeast plant occupies among the agents by which the final result is attained. I have already described this plant; how small it is; how mysteriously it appears, and how rapidly it grows.

As sulphuric acid and diastase, by mere contact apparently with starch, convert it wholly into sugar; so yeast, by a similar species of contact, converts the sugar wholly into alcohol, water, and carbonic acid. How either of these transformations is effected by the agents employed, we cannot explain.

There is this interesting difference in the way in which these three agents operate—that, while the sulphuric acid employed to transform starch into sugar remains unchanged in quantity, and while the diastase itself changes and disappears, the yeast lives, multiplies, grows, increases in quantity, and augments in size and vegetable development. The munuteness of the yeast plant, consisting in tis simplist form of only a single cell, long prevented it from being generally regarded as a form of living matter. But the changes it undergoes in the fermenting tub, day by day, as shown by the microscope, prove it to be unquestionably a growing vegetable.

The increase in the quantity of yeast during such fermentation is so great, that 35 lb. of dry yeast employed in brewing 1250 gallons of beer, have been known to increase to, or yield, 247 lb.

But that the yeast lives and increases in the fermenting liquid, does not explain its action upon the sugar. The mystery remains none the less. How this plant, in growing rapidly itself, should induce the sugar at the same time to split itself up as I have described, and that without combining with or otherwise appropriating any of the new substances produced—this is still altogether inexplicable. Neither chemistry nor physiology can as yet hazard even a plausible, light bringing conjecture upon the subject. It is something, however, to be able to see, in regard to any point that we have reached, the actual limits of our positive knowledge.

The composition of the beer, obtained as I have described, varies with almost every sample.

When beer is evaporated or boiled to dryness, it leaves behind a certain quantity of solid matter, usually spoken of as malt extract. This consists of undecomposed sugar, of soluable gluten from the grain, of bitter substances derived from the hop, and of a certain proportion of mineral matter. It varies in quantity from less that 4 to upwards of 8 lb. in every 100 lb. of good beer. In fine wine-like beers, such as our modern English bitter beers, it is large. Good Edinburgh ale contains about 4 per cent., or nearly half a pound to the gallon. The German Brunswick beers are remarkable in this respect. A sweet small-

beer of that city contains 14 per cent. of extract; and a scarcely half-fermented black drink, called Brunswick *mumme*, as much as 39 per cent.—about 5 lb. to the gallon. The nutritive qualities of beer, which are often considerable, depend very much upon the amount and nature of this extract.

But beer contains alcohol also, the result of the fermentation; and this varies in quantity quite as much as the extract. Thus—

Small beer contains	1 to 1½	per cent. by weight.
Porter, ...	3½ to5½	" "
Brown stout, ...	5½ to 6½	" "
Bitter and stong ales, ...	5½ to 10	" "

By measure, these proportions of alcohol are about one-fourth more than the numbers above given.

Upon this alcohol depends the purely intoxicating effect of malt liquors. And in this respect our strong ales have about the same strength and influence as hock and the light French wines. But they contain, in addition, and as distinguishing them from the wines,

First, The nutritive matters of the extract which are derived from the grain.—These, as I have said, vary from 4 to 8 per cent. In milk, the model food, the nutritive matter amounts to 12 per cent., and is, besides, somewhat richer in curd, the ingredient which corresponds to the gluten of plants. Beer, therefore, is food as well as drink. A little beef eaten with it makes up the deficiency in gluten, as compared with milk; so that beef, beer, and bread—our characteristic English diet—are most philosophically put together, at once to strengthen, to sustain, and to stimulate the bodily powers.

Second, The bitter narcotic principle of the hop.—By this, not less than by its nutritive quality, beer is distinguished from wine.

Chica, or Maize Beer.—The use of malt beer in Germany, and probably also in England, is very ancient; but that of chica or maize beer in South America appears to be equally remote. It was a common drink of the Indians long before the Spanish conquest.

The usual way of preparing chica is to water or moisten Indian corn, as the English maltster does his barley—to leave it till it sprouts sufficiently, and then to dry it in the sun. It is now maize malt. This malt is crushed, mashed in warm water, and then allowed to stand till fermentation takes place. The liquor is of a dark yellow colour, and has an agreeable, slightly bitter, acid taste. It is in universal demand throughout the west coast of South America, and is consumed in vast quantities by the mountain Indians. Scarcely a single hut in the interior is without its jar of the favourite liquor.

In the valleys of the Sierra, however, the most highly-prized chica is made in a somewhat different manner. "All the members of the family, including such strangers as choose to assist in the separation, seat themselves on the floor in a circle, in the centre of which is a large calabash, surrounded by a heap of dried maize (malt). Each person takes up a handful of the grain and thoroughly chews it. This is deposited in the calabash, and another handful is immediately subjected to the same process, the jaws of the company being kept continually busy until the whole heap of corn is reduced to a mass of pulp. This, with some minor ingredients, is mashed in hot water, and the liquid poured into jars, where it is left to ferment. In a short time it is ready for use. Occasionally, however, the jars are buried in the ground, and allowed to remain there until the liquor acquires, from age, a considerable strength, and powerfully intoxicating qualities.

Chica thus prepared is called *chica mascada*, or chewed chica, and is considered for superior to that prepared from maize crushed in the usual manner. The Serrano believes he cannot offer his guest a greater luxury than a draught of old chica mascada, the ingredients of which have been ground between his own teeth.

Disgusting as this process of manufacture appears to the European, it is nevertheless founded in reason, and presents a sort of instinctive or experience-born application of a beautiful chemico-physiological principle.

We have seen that grain is malted in order that diastase may be produced, and that it is then bruised and digested in warm water, in order that this diastase may convert the starch into sugar. But the saliva of the mouth possesses a similar property of converting starch into sugar. Mix starch intimately with saliva, and keep the mixture moderately warm for a time, and sugar will gradually be produced.

This is what the Indian does in preparing his chica mascada. He chews the grain thoroughly: this reduces it to a fine pulp, and at the same time mixes it intimately with saliva. When set aside, this pulp sweetens and afterwards ferments.

The maize he makes his liquor from is a large grain. The diastase produced during the malting—which is not always well conducted—is often insufficient to convert the whole of the starch into sugar, but the mixture of saliva aids the diastase, and insures the change. It also aids in producing and promoting the fermentation which succeeds.

It is very interesting to discover so beautiful a chemico-physiological reason for a practice so disagreeable and apparently so unaccountable.

Chica is not always made from maize. It is prepared also from barley, rice, pease, yuccas, pine-apples, grapes, and even bread—(Von Tchudi). The name, originally restricted to the liquor obtained from maize, appears to have been gradually applied to the

fermented drinks of various kinds which are in use in different parts of South America. A variety of chica mascada is made in some places from the pods of the *Prosopis algaroba*, which are very sweet, mixed with the bitter stalks of the *Schinus molle*. Old women are employed to chew these pods and stalks. The chewed pulp is mixed with water, and the mixture soon ferments and forms an intoxicating beer. The addition of the bitter ingredients in this case is interesting, not only because it resembles our own more recent practice of adding hops and other bitters to our beer, but because it intimates the existence of a remarkable similarity in natural taste among tribes of men most remote in situation, and most unlike in understanding and habit.

Bouza, Murwa, or Millet Beer.—is a favourite drink of the Crim Tarters. They prepare it from fermented millet-seed, to which they add certain admixtures which render it excessively astringent. They call it Bouza.

The Arabians, Abyssinians, and many African tribes give the same name to a fermented drink which they usually prepare from *teff*, the seeds of the *Poa abyssinica*. They occasionally employ millet-seed, however, and even barley, for the purpose. Their bouza is described as a sour, thick drink.

In Sikkim, on the southern slopes of the lower Himalaya, millet beer, under the name of *murwa*, is in very general use. It is prepared by moistening the millet-seed (*Eleusine coracana*), and allowing it to ferment for some days. On a portion of this, considered sufficient for the occasion, or for the day's consumption, hot water is then poured. It is usually drunk while still warm—is served in bamboo jugs, and sucked through a reed. When quite fresh, it tastes "like negus of Cape sherry, rather sour." It is very weak, but in a hot day's march is described as a very grateful beverage—

With the chemical peculiarities of these different forms of millet beer we are at present unacquainted. The speciality in their preparation seems to be, that they are fermented in the grain, and not in the wort, as is the case with European beer; and that the fermentation is spontaneous, and not produced by yeast. Under these circumstances, three chemical changes will be proceeding in the moist grain at the same time:—

First, The starch of the grain will be transformed into sugar by the agency of the diastase, which is formed during the sprouting that ensues after the grain is moistened.

Second, This sugar is partly changed into alcohol by the fermentation which spontaneously commences.

Third, A part of the sugar is changed also into lactic acid, or the acid of milk, through the action of the gluten of the millet, which, during the spontaneous fermentation, possesses the peculiar property of producing this change.

The drink obtained by infusing this altered grain in water agrees with our European malt-liquors, therefore, in containing nutritive matters derived from the starch and gluten of the grain. But it differs from them in containing lactic instead of acetic acid. The Indian *murwa* differs from them also in being drunk like tea soon after it is infused, and in containing no bitter addition resembling our hop. The astringency of the bouza of the Crim Tartars seems to indicate that *they* use something in preparing it besides the fermented millet-seed.

It is a singular coincidence that the mode of infusing in hot water and sucking through a tube, practised on the Himalayas, is exactly the same as is practised in South America in preparing mate' or Paraguay tea. In each of these remote districts the beverage prepared is taken hot, and is in universal use; and yet, so far as I am aware, this mode of drinking is adopted only in North-Eastern Asia and in Southern America. Is there anything more than a mere coincidence in this?

Quass, or Rye Beer.—a favourite Russian drink, is a sharp, acid, often muddy liquor, which, in taste and appearance, resembles some of the varities of bouza. It is made by mixing rye-flour, and occasionally barley-flour, with water, and fermenting. It may possibly contain lactic acid, but I am not aware that its composition has yet been made the subject of special chemical inquiry.

This is one of the cases in which un-malted grain is employed in the manufacture of beer on the continent of Europe.

Koumiss, or Milk Beer.—Milk, as I have explained in the preceding chapter, contains a peculiar kind of sugar, less sweet than cane sugar, to which the name of milk sugar is given. This sugar, when dissolved in water, does not ferment upon the addition of yeast; but when dissolved in the milk, along with the curd and butter it readily ferments, is transformed into alcohol and carbonic acid, and gives to the liquor an intoxicating quality. This fermentation will take place spontaneously, but it is hastened by the addition of yeast or of a little already fermented mild. The fermented liquid is the koumiss of the Tartars. Mare's milk is richer in sugar than that of the cow, and is usually employed for the manufacture of milk beer. It is prepared in the following manner:—

To the new milk, diluted with "a sixth of its bulk of water, a quantity of rennet, or, what is better, a sour koumiss, is added, and the whole is covered up in a warm place for twenty-four hours. It is then stirred or churned together till the curd and whey are intimately mixed, and is again left at rest for twenty-four hours. At the end of this time it is put into a tall vessel and

agitated till it becomes perfectly homogeneous. It has now an agreeable sourish taste, and, in a cool place, may be preserved for several months in close vessels. It is always shaken up before it is drunk. This liquor, from the cheese and butter it contains, is a nourishing as well as an exhilarating drink, and is not followed by the usual bad effects of intoxicating liquors. It is even recommended as a wholesome article of diet in cases of dyspepsia or of general debility."

By distillation, ardent spirits are obtained from this koumiss, and, when carefully made, a pint of the liquor will yield half an ounce of spirit. To this milk-brandy, when only once distilled, the Kalmucks give the name of *arraca*, and from the residue in the still they make a kind of hasty-pudding.

The Arabians and Turks prepare a fermented liquor, or milk beer, similar to the koumiss, which the former call *leban* and the latter *yaourt*. In the Orkney Islands, and in some parts of Ireland and of the north of Scotland, buttermilk is sometimes kept till it undergoes the vinous fermentation and acquires intoxicating qualities.

This milk beer has never, I believe, been chemically investigated; but we know, *first*, That it agrees with the malt beers in containing a considerable proportion of nutritive matter. The butter and cheese of the milk remain as nutritious ingredients of the beer. *Second*, That it differs from the malt beers in containing more acid, and in owing its sourness not to acetic acid but to the peculiar acid of milk, the lactic acid. In both these respects it agrees remarkably with millet beer.

The Wines.—Wines are distinguished from beers chiefly by three characters: *First*, they contain little of that solid nutritious matter which enables our home-brewed beer to feed the body as well as quench the thirst and exhilarate the spirits. *Second*, They are free from any bitter or narcotic ingredient, such as the hops we add so largely to many of our English ales. *Third*, They are all fermented, without the addition of yeast, by a spontaneous fermentation; and in consequence they contain other acids besides the acetic acid, or vinegar, to which sour beer owes its acidity.

Apple and Pear Wines.—Cider and perry are well-known fermented drinks. The former especially is largely prepared and consumed in England, France, and North America.

The expressed juices of the apple and the pear contain grape sugar already formed. When left to themselves they soon begin to ferment, without the addition of yeast; and during this fermentation, the sugar is converted into alcohol in the way already described.

Cider differs in flavour, in acidity, in strength, and consequently in quality, with many circumstances. The kinds of apples which are grown and used for the purpose, the degree of ripeness they are allowed to attain before they are gathered, the time given them to mellow or ferment before they are crushed, the skill with which the several varieties are mixed before they are put into the mill, the nature of the climate, the character of the season, the quality of the soil, the mode in which the trees are managed—all these circumstances materially affect the quality of the expressed juice as it flows from the crushing-mill; and then the after-treatment of the juice as it flows from the crushing-mill; and then the after-treatment of the juice may introduce a hundred new shades of difference among the several ripe ciders produced from the same juice.

In Normandy, not less than five thousand differently-named varieties of the acid or bitter apple are known, and grown for the manufacture of cider! Some of these varieties are distinguished by as many as eighteen different names in different parts of the country. In that province also it is remarked, that the cider produced upon chalk soils, from the same varieties of apple, differs in flavour form that of sandy districts, and both from that of clay soils; so that the flavour of the soil (*gout de terrain*) is in Normandy a familiar expression in reference to the qualities of this fermented drink.

Amid these differences in quality, however, there are certain general chemical characters in which all ciders agree. They contain little extractive or solid nutritious matter. No bitter or narcotic ingredient has been added to them. They contain, on an average, about nine per cent. of alcohol—thus resembling in strength the common hock, the weaker champagnes, and our stronger English ales. They are also chemically distinguished from malt liquors by containing lactic instead of acetic acid. In this latter respect they agree with the spontaneously-fermented bouza, or murwa beer of Abyssinia and the Himalayas, and with the milk beer of the Tartarian steppes.

Cider is further distinguished by the great facility with which it becomes sour, or runs to acid. Hence the frequency of hard cider, the difficulty of transporting it unchanged from place to place, and the frequent disappointments which attend the efforts to keep it sound for any length of time.

Grape Wine.—The name of wine is usually given among us, by way of eminince, to the fermented juice of the grape. This juice, like that of the apple, contains grape sugar ready formed; and, like the juices of the apple, the pear, the gooseberry, and most other fruits, it enters easily and speedily into spontaneous fermentation. Within half an hour, in ordinary summer weather, the clearest juice of the grape begins to appear cloudy, to thicken, and to give off bubbles of gas. Fermentation has already commenced; and within three hours a distinct yellow layer of yeast has collected on the surface, and a

sensible quantity of alcohol has been formed in the body of the liquid. It is still a mystery in what way the germ, seed, or sporule of the yeast plant obtains admission into the liquid juice, and in such quantity as to give rise to an almost instantaneous fermentation.

Grape wine differs in composition and quality with a thousand circumstances. The climate of the country, the nature of the season, the soil of the locality, the variety of grape, the mode of culture, the time of gathering, the way in which the fruit when gathered is treated and expressed, the mode of fermenting the juice or *must*, the attention bestowed upon the young wine, the manner in which it is treated and preserved, the temperature at which it is kept, the length of time it is preserved,—upon these, and numerous other conditions, the composition and quality of wine are dependent. All grape wines, however, contain—

A notable proportion of alcohol, or pure spirit of wine. This proportion is different in different kinds of wine, and varies considerably also in wines of the same kind. Thus the proportion of absolute alcohol, by measure, in our best-known wines is as follows:—

	In 100 measures.		In 100 measures.
Port	21 to 23	Rhenish	8 to 13
Sherry	15 to 25	Moselle	8 to 9
Madeira	18 to 22	Malmsey	16
Marsala	14 to 21	Tokay	9
Claret	9 to 15	Champagne	5 to 15
Burgundy	7 to 13		

The wines we commonly drink in this country are, therefore, two or three times stronger in spirit than those of France or Germany.

A more or less sensible quantity of grape sugar, which has escaped the decomposing action of the fermentation. This gives to wines their sweet taste and *fruity* character. Wines are called *dry* when they contain little sugar. The order of sweetness in certain wines as they are brought to the English market, is as follows:—

Claret, Burgundy, Rhine, and Moselle wines contain no sensible quantity of sugar.
Sherry ..... contains 4 to 20 grains in the ounce.
Madeira .... contains 6 to 20 grains in the ounce.
Champagne . contains 6 to 20 grains in the ounce.
Port ..... contains 16 to 34 grains in the ounce.
Malmsey ... contains 56 to 66 grains in the ounce.
Tokay .. contains 74 grains to the ounce.
Samos .... contains 88 grains to the ounce.
Paxarette ..... contains 94 grains to the ounce.

The four last-named are called sweet wines, and the extreme fruitiness of some port wines is indicated by the large proportion of sugar which this variety of wine sometimes contains. Sugar is added to the juice necessary, not only to give it body, but to keep it sparkling, and to prevent its becoming sour. And it is remarkable that the selection of the kind of sugar which is added has great influence upon the flavour of the wine. If doubly-refined cane and beet sugars be added respectively to the same champagne, the one will give the liquor the aroma and pleasant flavour of the cane-juice, the other the disagreeable *gout* of the beet-root. In the wine, the senses of taste and smell readily discover traces of impurity derived from the sugar, which neither eye, nose, nor mouth can detect in the purified sugar itself.

A variable proportion of free acid, which imparts to them a more or less distinctly sour taste. We have seen that neither malt, beer, nor cider are ever quite free from acid, and the same is the case with wine. Only the grape wine is made sour by tartaric acid (*Tartaric acid is the acid which gives its sourness to cream-of-tartar, and which we use along with soda in making artificial seidlitz powders. It is so named, because it is extracted from the tartar or crust which deposits itself on the sides of wine casks or bottles, by long standing.). Thus—*

Acetic acid (vinegar) is the acid of *malt beer.*
Lactic acid is the acid of *millet beer, milk beer, and cider.*
Tartaric acid is the acid of *grape wine.*

In all the three liquors, acetic acid is present if greater or less quantity, as this is always produced when the fermentation of alcoholic liquors is allowed to proceed too far. But lactic acid is found neither in malt beer, nor in grape wine, in sensible quantity; nor is tartaric acid found in beer or cider. These acids, therefore, characterise the liquors in which they especially exist, and establish a marked chemical distinction among the three classes of fermented drinks to which they severally belong.

Wines made from unripe grapes sometimes contain another peculiar acid which resembles the acid of lemons (citric acid), but this acid disappears from the fruit as it ripens.

Tartaric acid exists in the juice of the grape in combination with potash, forming what is called bi-tartrate of potash, or cream-of-tartar—a substance which has a well known sour taste. When the fermented juice is left at rest, this bi-tartrate gradually separates from the liquor, and deposites itself as a crust or tartar on the sides of the casks and bottles. Hence by long keeping good wines become less acid, and every year added to their age increases, in proportion, ther marketable value.

In regard to acidity, our common wines arrange themselves in the following order:—

Sherry is the *least acid.*
Port comes next.
Champagne next.
Claret next.

Maderia next.
Burgundy next.
Rhine wines next.
Moselle is *most acid.*

A minute proportion of an ethereal substance to which the name of *oenanthic* ether is given, and to which grape wines owe the agreeable vinous odour which characterises them all. When obtained in a separate state this ether is a very fluid liquid, of a sharp, disagreeable taste, but having an odour of wine so excessively powerful as to be almost intoxicating. It does not exist in the juice of the grape, but is produced during the fermentation. It seems also to increase in quantity by keeping, as the odour of old wines is stronger than that of new wines. So powerful is the odour of this substance, however, that few wines contain more than one-fourth-thousandth part of their bulk of it! Yet it is always present, can always be recognized by its smell, and is one of the general characteristics of all grape wines.

Besides the general vinous flavour derived from this oenanthic ether, all wines contain one or more odoriferous, more or less fragrant, substances, to which the peculiar *bouquet* or scent of each is due. As these give the special character to the wine, they are more or less different in each variety. They are present even in more minute quantity than the oenanthic ether, and their chemical nature is as yet very little understood.

Grape wine is the principal fermented drink of the southern European nations. The consumption in the United Kingdom in 1853 amounted to upwards of seven millions of gallons. This is chiefly consumed by the upper class. In England, beer is the poor man's substitute, while in Scotland and Ireland, whisky, more or less diluted with water, takes its place.

Palm Wine, or Toddy.—The sap of many palm trees is rich in sugar. In some countries this sugar is extracted from the expressed juice of the sugar cane. In other countries the juice is allowed to ferment, which it does spontaneously, and in hot climates within a very short period of time. This fermentation converts the sugar into alcohol, and the juice which contains it into an intoxicating liquor.

In the islands of the Indian Archipelago, the Moluccas, and the Philippines, an intoxicating liquor is prepared in this way from the sap of the gommuti palm, *Saguerus saccharifer*. It is called *neva* in Sumatra, and the Batavian arrack is distilled from it. The cocoa palm, *Cocos nucifera*, produces the palm wine, known in India and the Pacific by the name of *toddy*. The mode of collecting it in the islands of the Pacific is thus described by Capt. Wilkes:—

"The caraca or toddy is procured from the spathe of the cocoa-nut tree, which is usually about four feet long and two inches in diameter. From this spathe the flower and fruit are produced; but in order to procure form taking her course in bringing fourth the fruit. With this view they bind up the spathe tightly with sennit, then cut off the end of the spathe and hang a cocoa-nut shell to catch the sap as it exudes. One tree will yield from two to six pints of karaca. When first obtained from the tree it is like the milk of the young cocoa-nut, and quite limpid, but after it stands for a few hours it ferments and becomes acid. When the sap ceases to drop, another piece is cut off the spathe, and every time the flow ceases the same process is repeated until the spathe is entirely gone. Another spathe is formed soon after, above this, which is suffered to grow, and when large enough is treated in the same manner."

This method of cutting the spathe, or flowering head, is a very common one for procuring the sweet sap of the palm trees. In some countries, however, it is obtained, like that of the sugar maple and the manna ash, by simply making an incision near the top of the tree. This custom prevails in the interior of Africa, and in the Indian province of Bahar, where the abundant date-palm is yearly bled for the favourite toddy. Dr. Hooker thus describes a grove of date palms in which he encamped on the banks of the Soane river in that province:—

"All were curiously distorted, the trunks growing zig-zag, from the practice of yearly tapping the altenate sides for toddy. The incision is made just below the crown, and slopes upwards and inwards. A vessel is hung below the wound, and the juice conducted into it by a little piece of bamboo. This operation spoils the fruit, which, though eaten, is smaller and much inferior to the African date."

In India, generally, it is the fan palm *(Borassus)* which is chiefly bled for toddy. But in Bahar the date tree is preferred, because its sap more readily ferments. In the fertile oases which are sprinkled over the desert Sahara of Northern Africa, where date-tree forests cover the soil, and form the chief food and wealth of the inhabitants, this variety of palm is constantly tapped in the flowering season by the Arab and other Mahommedan tribes. They call the sap *lagmi*, and from two to three pints are yielded by each tree in a single night. But wine of the best quality is said to be yielded by the oil palms (*Cocos butyracca* and *Elais guineensis*) which grow on the west African coast; while for abundant yield few excel the *Caryota urens*, the most beautiful of Indian palms, which will often yield a hundred pints of toddy in the twenty-four hours!—

In the oasis of Tozar, a dependency of Tunis, the date wine is to be found in every house, and reeling Arabs are frequently to be seen in the streets of its principal towns. They are strict Mahommedans; but they justify their apparent disobedience to the Prophet by saying, "Lagmi is not wine, and the Prophet's

The juice of the palm tree varies in quality with the species of palm, and with the locality in which it is grown.

As it flows from the tree it is sweet, and void of intoxicating properties; but when allowed to stand for a short time it usually ferments, and becomes first intoxicating, and afterwards acid. Upon the tendency to ferment, the place of growth appears to have an influence. This is shown by the circumstance, that while the juice of the fan palm produces the usual toddy of India, that of the date tree is preferred to it among the hills of Bahar, because there the sap of the fan palm does not readily ferment-(Hooker).

The date juice, in the Sahara, when drunk immediately, tastes like genuine rich milk; but when allowed to stand for a night, or at most for twenty-four hours, it ferments, and except that it continues whitish, it acquires the sparkling quality and flavour of champagne. This quality no doubt differs with the kind of tree, and with the place of growth. By distillation the fermented juice yields a strong brandy, which is almost everywhere extracted from it in Africa, as well as in Asia. At Monghyr, on the banks of the Ganges—which is celebrated not only for its iron manufactures but for its drunkenness—Dr. Hooker observes that the abundance of toddy palms was quite remarkable.

In Chili, on the American coast, wine is made from a species of palm; in India, and other parts of Africa it is almost the only fermented liquor in very general use. Though we know so little of it in Europe, therefore, the wine of the palm tree is drunk as an exhilarating liquor by a larger number of the human race than the wine of the grape.

Sugar-cane Wine, or Guarapo.—Like the sap of the palm tree, that of the sugar cane ferments spontaneously, and produces an intoxicating liquor. To this cane-wine the negros give the name of Guarapo, and they hold it in high esteem. It contains, of course, all the ingredients of the cane juice, except those which are changed or naturally disappear during the fermentation, and those which subside when it clarifies. I am not aware, however, that any special chemical examination of this drink has hitherto been made.

Pulque, Octli, or Agave Wine—is the favourite drink of the lower classes in the central part of the tableland of Mexico. It is produced by fermenting the sap of the Maguey or American aloe *(Agave americana* or *mexicana),* which is cultivated in plantations for the purpose. This plant is of slow growth, but when full grown its leaves attain a height of five to eight feet, and even more. It flowers on an average only once in ten years, and, as in the case of palm wine, it is from the flower-stalk that the juice is extracted. In the plantations, the Indian watches each plant as the time of its flowering approaches, and just when the central shoot or flower-stem is about to appear, he makes a deep cut, and scoops out the whole heart (*el corazon*) or middle part of the stem, leaving nothing but the outside rind. This forms a natural basin or well, about two feet in depth and one and a half in width. Into this well the sap, which was intended to feed the shoot, flows so rapidly that it is necessary to remove it twice, and sometimes three times a-day. To make this more easy, the leaves on one side are cut away and the central basin laid open.

The sap as it flows has a very sweet taste, and none of that disagreeable smell which it afterwards acquires. It is called *aguamiel* or honey-water. It ferments spontaneously, and a small quantity of old fermented juice speedily induces fermentation in that which is newly drawn, as sour leaven does in new dough. It is usual, therefore, to set aside a portion of sap, to ferment separately for ten or fifteen days, and to add a small quantity of this to each vessel of fresh juice. Fermentation is excited immediately, and in twenty-four hours it becomes pulque in the very best state for drinking. A good maguey yields from eight to fifteen pints a-day, and this supply continues during two and often three months—

The chemical changes which take place during the fermentation of this juice are the more interesting as they are in some respects peculiar.

First, Alcohol is produced as in other fermented liquors. This is shown by the slightly intoxicating qualities of the drink, and by its yielding, when distilled, an ardent spirit. To this brandy the name of *mexical* is given, or of *aguardiente de maguey.* The average proportion of alcohol in the pulque is not stated.

Second, An acid is formed also—the pulque, as a drink, being described as resembling cider. But what is the nature of the acid has not been determined.

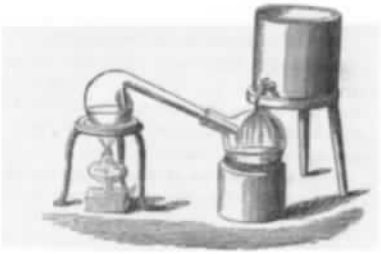
Third, The most remarkable result of the fermentation is, that the nearly smell-less juice acquires a fetid and disagreeable odour of tainted meat. This makes the liquor be looked upon at first with disgust, especially by Europeans. It is so cool, agreeable, and refreshing, however, that this first disgust being overcome, the pulque is preferred, even by Europeans, to every other liquor.

The nature of this evil-smelling ingredient, and the chemical changes by which it is produced in the living plant, have not been investigated. It is probably similar in kind to that which gives the bad smell of putrid fish *(Trimethylamine).* Substances of this kind are sometimes produced in the living plant. The Bladder-headed *Saussurea,* for example, which grows in the Himalayas, emits as it grows the smell of putrid meat; and the *Stapelias* are called carrion flowers, because of the disagreeable putrid odours they exhale.

The natives of Mexico ascribe many good qualities to their national drink. It is an excellent stomachic, promotes digestion, induces sleep, and is esteemed as a remedy in many dieseases. It is chiefly in the neighborhood of large towns, like Puebla and Mexico, that the maguey plantations exist. The pulque so soon passes that state of fermentation at which it is most pleasant to drink, that the manufacture only pays where a speedy sale is certain. The brandy or aguardiente, which is not liable to this inconvenience, is largely manufactured, and more widely consumed than the pulque itself.

The Brandies, or Ardent Spirits.—When fermented liquors, such as those above described, are put into an open vessel and heated over a fire till they begin to boil, the alcohol they contain rises in the form of vapour, along with a little steam, and escapes into the air. If this boiling be performed in a close vessel, from which the vapours as they rise are conducted by a pipe into a cooled receiver, they condense again into a liquid state. This is the process called distillation, and the vessel in which it is carried on is called a still.

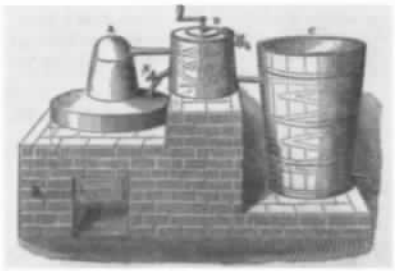
The Distillation.—A retort connected with a receiver, over which a stream of cold water is kept flowing represents the simplest form of such a still; but



many more complicated forms of apparatus have been contrived for the purpose of conducting the process with economy and efficiency. The following illustration represents a form of still, of common use in our laboratories, for distilling water.

The kettle A, which contains the water, is covered by the movable dome B, from which the pipe *b c* conducts the vapour into the receiver R, which is surrounded with cold water. Thence the condensed liquid descends through a continuation of the tube, bent spirally, called the *worm*, by which it is exposed to the prolonged action of the cold water, till at length it flows quite cool into the bottle placed to receive it. Into the worm-tub a stream of cold water constantly enters by the pipe *p p*, while a similar stream of warm water as constantly escapes by the pipe *q*.

Arrangements somewhat different are made in the large distilleries, chiefly with the view of economising time and fuel. The following represents a common form of apparatus, where the process of spirit-distillation is conducted on a large scale.



The principal peculiarities in this are—*first*, The broad flat bottom of the pot or still A, by which the effect of the heat is more quickly and fully obtained; and, *second*, The adoption of two worms, B and C, in different vessels. In the first of these vessels cold wort is put which is heated by the vapours as the distillation proceeds, and when hot is run at once by the stopcocks into the still. The second vessel contains cold water as before, and as this water heats it is run off, and is employed in mashing the grain. Thus heat is economised in various ways.

The spirit which passes off and condenses in the worm is more or less mixed with water, but by means of successive distillations—or *rectifications*, as they are called—it may be obtained quite free from water. It is then what chemists call absolute alcohol. This pure or absolute alcohol has a peculiar penetrating smell; a hot, fiery, and burning taste; is about one-fifth part lighter than water; burns readily, but with a pale flame when kindled in the air, and is intoxicating in a high degree. It is used only for chemical purposes. The spirit-of-wine, or common alcohol of the shops, which we burn in our lamps, and employ for other familiar uses, is already diluted with a considerable proportion of water.

In the brandies, or varieties of ardent spirits which we consume as exhilarating drinks, the alcohol is still further diluted with water.

Thus the proportions of alcohol per cent., in some of the common varieties of commercial spirits, are as follows (at 62° Fahr.):—

	ALCOHOL	
	By weight.	By measure.
British proof-spirit contains	50	57
Commercial Cognac		50 to 54
Rum		72 to 77
Geneva		50
Whisky		59

So that on an average, we may say that the ardent spirits we consume contain only half their weight, or three-fifths of their bulk of absolute alcohol. They are about twice as strong as our port, sherry, and Madeira wines.

Every different fermented liquor, when distilled, yields an ardent spirit which has a flavour, and is generally distinguished by a name of its own. Thus wine yields what we call brandy or cognac: fermented molasses yields rum; Indian corn, potatoes, and rye, yield liquors which are distinguished as corn, rye, and potato brandies; while malt liquors give our Scotch and Irish whiskies. If juniper berries be added previous to distillation, as is usually done in Holland, a flavour is imparted to the spirit which is characteristic of gin or Hollands; and if the malt be dried over a peat fire, the smell and taste of the peat (the peet-reek) accompany the spirit prepared from it; and these, in the estimation of the initiated, impart a peculiar value to peer-reek whiskey.

The Distillers' Processes.—But though malt and other liquors, fermented in the usual way—indeed, in almost any way—will yield brandy by distillation, yet the distiller by profession conducts his fermenting operations in a somewhat different way from the brewer, whose object is merely the production of beer. Thus—

First, We have seen that, in fermenting the wort for the manufacture of beer, a large proportion of the sugar is left in the liquor unchanged. The fermentation is stopped before this sugar is transformed into alcohol, in order that the beer may be pleasant to drink, and that it may keep in the cask without turning sour. But the distiller's object is to obtain the largest possible quantity of spirit from his grain; he therefore prolongs the fermentation until the whole of the sugar is transformed, as nearly as possible, into alcohol and carbonic acid. To leave any of it unchanged would not only involve a loss of spirit, but, during the subsequent distillation, might injure the flavour and general quality of the spirit he obtained. The securing of this point, therefore, requires on his part an attention to minute circumstances, different a little in kind, but not less nice and delicate than those which determine the success of the brewer's operations.

Again, the most agreeable and generally esteemed grain spirit is obtained when malted barley only is employed in the manufacture. This yields in Scotland and Ireland the best malt whiskey. The profit of the distiller, however, is often promoted by mixing with the malt a greater or less proportion of unmalted grain, or even of potato starch. To the reason of this I have already briefly alluded but it is worthy of a fuller explaination.

We have seen that it is the diastase, produced during the germination of the barley, which subsequently transforms the starch of the grain into sugar. This diastase is capable of so transforming nearly a thousand times its own weight of starch; but good malt contains only a hundred of starch to one of diastase. The latter ingredient, therefore, will transform into sugar ten times as much starch as it is associated with in the best malt. Hence a large quantity of starch, either in the form of crushed unmalted grain, or of potato starch, may be mixed even with ordinary malt in the mash-tub, with the certainty that the diastase of the malt will transform it all into sugar.

This is what the distiller does in making *grain* whisky; and the profit of it consists in this—that he saves both the expense of malting his grain and the loss of matter (usually 8 per cent.), which barley always undergoes in malting. He is able, also, to use for these additions of grain an inferior or cheaper material than is usually employed for conversion into malt.

*Thus, in come of the Scotch distilleries, such a mixture as the following is employed–

Malt	42 bushels at 40 lb. a bushel
Oats	25 bushels at 47 lb. a bushel
Rye	25 bushels at 53 lb. a bushel
Barley	158 bushels at 53 lb. a bushel
	TOTAL 250

The diastase in the 42 bushels of malt converts into sugar the starch of the whole 250 bushels, weighing eight times as much as the malt itself. This quantity of grain yields on an average 583 gallons of proof whisky, or 14 gallons from 6 bushels of the mixture.

The sweet wort obtained in this way, when fermented and distilled, yields a spirit of somewhat harsher and less pleasant flavour that when malt alone is used.

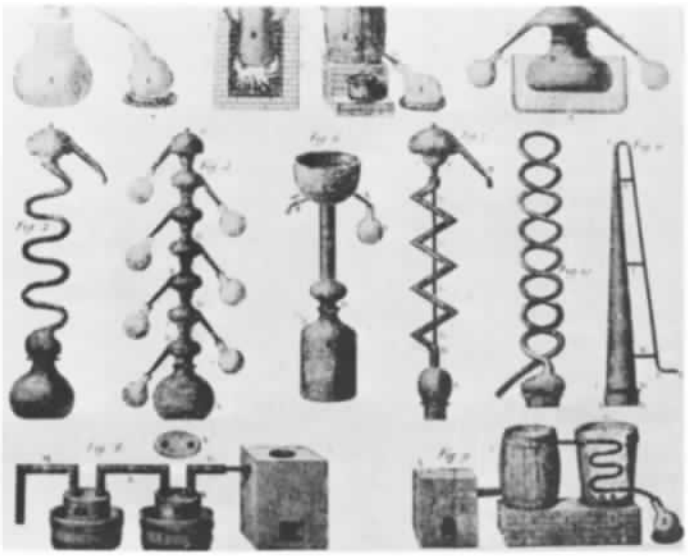
Along with the spirit, during the distillation of fermented liquors, there always passes over a small but variable proportion of one or more volatile oily liquids, which mix with the spirit and give it a peculiar flavour. These volatile oils vary in kind, in composition, and in sensible properties, with the source of the sugar which has been submitted to fermentation, and with the substances which are present along with it in the wort. Hence the spirit obtained from almost every different fermented liquor is distinguished by itw own characteristic flavour. Thus wine, brandy, or cognac, derives its vinous flavour from the juice of the grape; and cognacs of different districts their special flavours from the kinds of wine which are distilled in each. Rum obtains its smell and taste from molasses, the scorched and altered juice of the sugar cane;

Whiskey its peculiarities from the barley-malt or grain that is mixed with it; potato brandy, from the mashed potato or its skin; (Potato brandy is contaminated, among other substances, by a volatile spirit called *amyle alcohol.* And it is a singular circumstance that the cognac distilled in the south of France from the grape husks—known as Eau de vie de marc de raisin—also contains the same amyle alcohol. In the one case it is probably derived from the skin of the root, in the other from the skin of the fruit); palm brandy, from the fermented toddy; the aguardiente of Mexico, from the strong-smelling pulque; and the arraca of the Kalmucks, from their fermented milk. And so with other varieties of spirit. In each case a volatile substance, peculiar in kind, accompanies the spirit; and though this substance is always very small in quantity, it is yet sufficient to impart to each different variety a flavour at once characteristic and peculiar to itself.

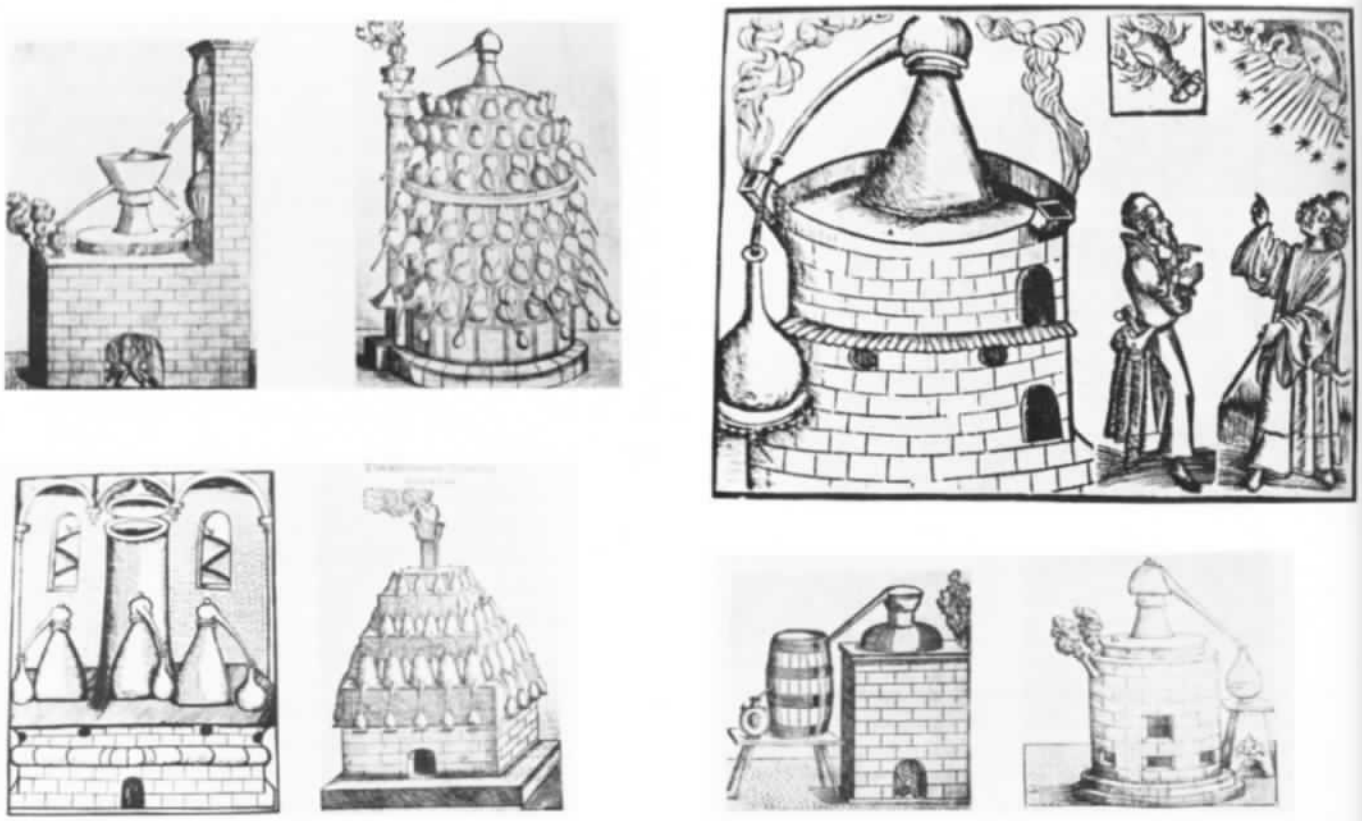
It is chiefly from malted and raw grain of various kinds that ardent spirits are distilled in the British islands, in Northern Europe generally, and in the North American states and colonies. Maize or Indian corn is most ex tensively employed for this purpose in the United States. Potatoes are used to a considerable extent on the continent of Europe; and sugar is occasionally employed in our own distilleries.

Medieval woodcut showing alcohol distillery and public house. A maiden is placing fuel in the oven, which has no cooling coils. The alcohol distills from wine in a vessel (not shown), condenses on the walls of the clay vessel and leaves the spout at the left. The man is handing the woman a coin in payment for the distilled spirits. From Hans Sporer-"Von Allen Geprante Wassern" (On All Shining Waters), published in Erfurt, Germany about 1498.

Abulcasis, one of the earliest to describe distillation (in the 10th century) is shown in this 1964 postage stamp from Iran.



More distillation devices from the middle ages. Above: an apparatus with a vertical cooling column from a woodcut in the book 'Liber de Arte Destillandi' by Hieronymus Brunschwygk (1500). The discovery of distillation for concentrating alcohol and other substances was made many times.

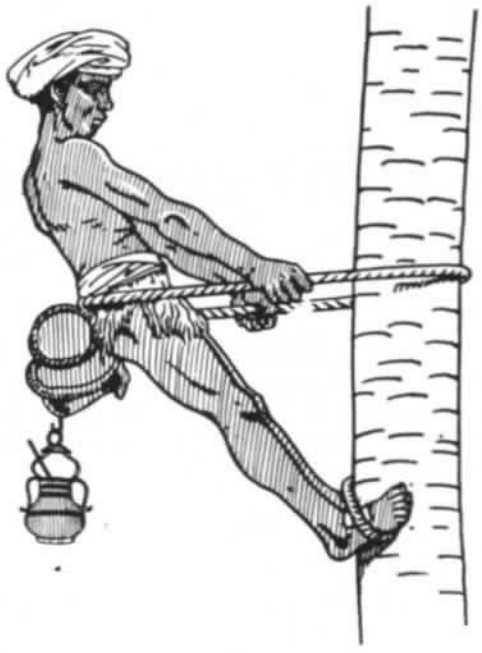


Various mideval distillation apparati from the book by Matthiolus (1563).

Roman wine utensils. Most of them are from graves north of the alps. 1. Bronze vessel 38.5 cm high found at Bietkow, Germany with 5 and 9. 2. Bronze pitcher 20 cm high found at Rondsen. 3. Bronze dipper 26 cm long from Zirzlaff. 4. Bronze sieve 12 cm long from Ladekopp. 5. Bronze sieve 39 cm long. 6. Beaker of light green glass 21 cm high from Kosswen. 7. Glass beaker 14 cm high from Elbing. 8. Glass beaker 9.5 cm wide with greenish white fused ridges, from Arnswalde. 9. Blue-green glass bowl. 10. Green glass with green panther, grey stag and red lion. Wine was poured from 1 into 2, then ladled from 3 through 4 or 5 (to remove the sediment) into 6 through 10, from which it was drunk.

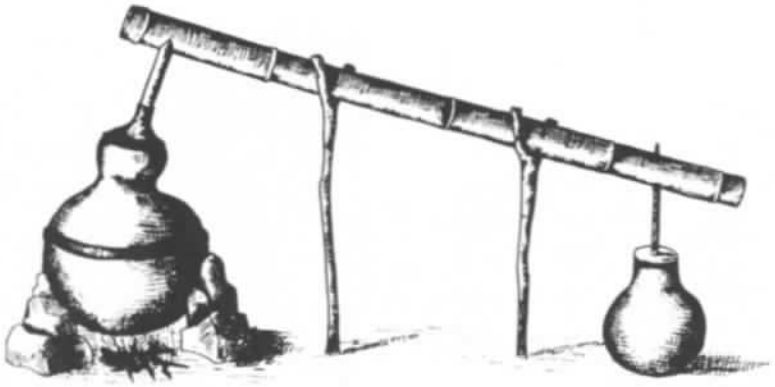
Utensils for palm wine manufacture on the Malabar coast of India. 1. The cut sheaths (spathes) of the palm flowers bound together with rattan fibers. 2. Bone implement for binding spathes. 3. Bamboo container for storing palm wine. 4. Whetstone for sharpening the cutter. 5. The cutter for severing the spathe. 6. Climbing rope for the hands fashioned from coco fibers. 7. Watertight container (made of leaf sheaths of the betel nut palm) for collecting the palm juice. 8. Climbing rope for the feet. 9. Coconut for holding the juice which oozes out of the cut in the palm. 10. Larger coconut container for lime.

A wooden still being used to prepare hard liquor in 19th century China.



Method of climbing the palm to obtain juice for making palm wine.

A Mexican collecting juice of ***Agave americana*** *for the preparation of pulque, an alcoholic beverage. Mescal is another drink prepared from a related species.*



Crude apparatus for distilling palm wine in Amboina, Malaysia. The clay vessels are from Saparua.

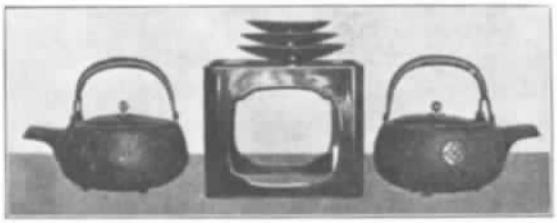
***Agave americana** plantation in Mexico.*

*Nineteenth century Japanese farmers taking a **sake** break. **Sake** vessel is at the left. A rice bowl and chopsticks is below the vessel, while a tea pot is in use at the right. The wooden bowl at the right contains a tobacco pouch and pipe.*

*Japanese **sake** kettles (o-cho-oshi). About 1/5 natural size.*

*Japanese **sake** kettle of red lacquer with woven bamboo covering. About 1/3 natural size.*

*Japanese **sake** utensils. On the left are two porcelain flasks (kan-dokuri) in wooden containers (tokurino-hakama). The glazed clay vessel (hai-sen) is for rinsing the 6 **sake** dishes (saka-dsuki) which rest on a porcelain stand (saka-dsuki-dai).*



Japanese sake utensils for weddings. The kettles (choshi) are of iron while the four sided stand (mitsu-gumi no sakazuki) and three sake dishes (saka-dsuki) are of red lacquer. 1/6 natural size.

Japanese sake containers. At the left is a small keg with a stopper which is opened in the temple (sake-taru). At the right is a gourd (sui-tsutsu). About 1/4 natural size.

Natives in German East Africa brewing beer about 1890.

MARIJUANA—

Cannabis sativa

Hemp is one of those plants which adapts itself well to any climate: there is scarce a country in Europe where it cannot be, or might not, be cultivated. From Poland and Russia in the North, to Italy in the South, the fibre is supplied to our markets. In North America it is grown for its fibre, and in South America for its narcotic properties. Throughout Africa, it may be found chiefly as an article for the pipe. In most of Asia it is known, and it has been cultivated in Australia. Thus, in its distribution, it may now be considered as almost universal.

Twenty-five centuries ago, Herodotus wrote of its cultivation by the Scythians:—"They have a sort of hemp growing in this country very like flax, except in thickness and height; in this respect the hemp is far superior—it grows both spontaneously and from cultivation, and from it the Thracians make garments very like linen, nor would any one who is not well skilled in such matters distinguish whether they are made of flax or hemp; but a person who has never seen this hemp, would think the garment was made of flax." Then follows a description of the use of the hemp as a narcotic: "The Scythians, transported with the vapour, shout aloud." Antiquity is in favour of this narcotic, and its use for that purpose before any other, except perhaps the poppy, was known, or at least of those now in use. The *nepenthes* of Homer has been supposed to have been this plant, or one of its products. The use of hemp had become so general amongst the Romans at the time of Pliny, that they commonly made ropes and cordage of it. The practice of chewing the leaves to produce intoxication existed in India in very early ages, whence it was carried to Persia, and before the middle of the thirteenth century, this custom was adopted in Egypt, but chiefly by persons of the lower orders.

What connection the narcotic hemp had with the famous oracle of Delphi is not altogether certain, but it has been supposed, and such supposition contains nothing of heresy in these days, that the ravings of the Pythia were the consequences of a good dose of haschish, or bang. The non-classical readers will allow us to inform them, and the classical permit us to remind them, that the oracle at Delphi was the most celebrated in all Greece. That it was related of old, that a certain shepherd, tending his flocks on Mount Parnassus, observed, that the steam issuing from a hole in the rock seemed to inspire his goats, and cause them to frisk about in a marvellous manner. That this same shepherd was tempted to peep into the hole himself, and the fumes rising therefrom filled him with such estacy, that he gave vent to wild and extravagant expressions, which were regarded as prophetical. This circumstance becoming known, the place was revered, and thereon a temple was afterwards erected to Apollo, and a priestess appointed to deliver the oracles. This priestess of Apollo, Pythia, was seated over the miraculous cavity upon a tripod, or three-legged stool, and the fumes arising were supposed to fill her with inspiration and she delivered, in bad verses, the oracles of the deity. During the inspiration, her eyes sparkled, her hair stood erect, and a shivering ran over the whole body. Under the convulsions thus produced, with loud howling cries, she delivered the messages, which were carefully noted down by an attendant priest. Plutarch states, that one of the priestesses was thrown into such an excessive fury, that not only those who came to consult the oracle, but the priests in attendance, were so terrified, that they forsook her and fled; and that the fit was so violent, that she continued several days in agony, and finally died. It has been believed that these fumes, instead of proceeding from the earth, were produced by the burning of some narcotic herb, probably hemp. Who shall decide?

In later times "bang" is referred to in the "Arabian Nights." In one of the tales, two ladies are in conversation, and one enquires of the other, "If the queen was not much in the wrong not to love so amiable a prince?" To which the other replied, "Certainly, I know not why she goes out every night and leaves him alone. Is it possible that he does not perceive it?" "Alas!" says the first, "how would you have him to preceive it? She mixes every evening with his drink the juice of a certain herb, which makes him sleep so sound all night, that, she has time to go where she pleases, and as day begins to appear, she comes to him again, and awakes him by the smell of something she puts under his nose."

The Caliph Haroun al Raschid indulged too in "bang," and although somewhere we have seen this word rendered "henbane," we still adhere to the "bang" of the text, and think the evidence is in favor of Indian hemp.

Persian and Arabic writers give, however, a fuller and more particular account of the early use of this substance. Makrisi treats of the hemp in his description of the ancient pleasure-grounds in the vicinity of Cairo. This quarter, after many vicissitudes, is now a mass of ruins. In it was situated a cultivated valley, named Djoneina, which was the theatre of all, for the sale of the *Hasheesha* or Haschisch, which is still consumed by certain of the populace, and from the consumption of which sprung those excesses which gave rise to the name of "assassin," in the time of the Crusades. This author states that the oldest work in which hemp is noticed is a treatise by Hassan, who states that in the year of the Hegira 658, the Sheikh Djafar Shirazi, a monk of the order of Haider, learned from his master, the

history of the discovery of hemp. Haider, the chief of acsetics and self-chasteners, lived in rigid privation on a mountain between Nishabor and Rama, where he established a monastery of Fakirs. Ten years he had spent in this retreat, without leaving it for a moment, till one burning summer's day, when he departed alone to the fields. On his return, an air of joy and gaiety was imprinted on his countenance; he received the visits of his brethren, and encouraged their conversation. On being questioned, he stated that, struck by the aspect of a plant which danced in the heat as if with joy, while all the rest of the vegetable creation was torpid, he had gathered and eaten of its leaves. He led his companions to the spot—all ate, and all were similarly excited. A tincture of the hemp-leaf in wine or spirits, seems to have been the favourite formula in which the Sheikh Haider indulged himself. An Arab poet sings of Haider's emerald cup—an evident allusion to the rich green colour of the tincture of the drug. The Sheikh survived the discovery ten years, and subsisted chiefly on this herb, and on his death his disciples, by his desire, planted an arbour in which it grew about his tomb. From this saintly sepulchre, the knowledge of the effects of hemp is stated to have spread into Khorasan. In Chaldea it was unknown until the Mahommedan year 728, during the reign of the Caliph Mostansir Billah. The kings of Ormus and Bahrein then introduced it into Chaldea, Syria, Egypt, and Turkey.

In Khorasan, it seems that the date of the use of hemp is considered, notwithstanding the foregoing, to be far prior to Haider's era. Biraslan, an Indian pilgrim, contemporary with Cosroes (whoever this same Cosroes may be, for it is a name often occurring, and applied as Caesar or Czar to more than one generation), is stated to have introduced and diffused the custom through Khorasan and Yemen.

In 780 M.E., very serious ordinances were passed in Egypt against this pracitce of indulging in hemp. The Djoneina garden was rooted up and all those convicted of the use of the drug were subjected to the extraction of their teeth. But in 792 M.E. the custom re-established itself with more than original vigour. A vivid picture is given by Makrisi of the vice and its victims:—"As a general consequence, great corruption of sentiments and manners ensued, modesty disappeared, every base and evil passion was openly indulged in, and nobility of external form alone remained to those infatuated beings."

It was for some time supposed that the Indian or narcotic hemp was a different species to that which is cultivated for textile purposes; and even now it is often characterized by a different specific name, which would seem to assume that the species are distinct. This, however, the most celebrated of our botanists deny. The difference is declared to be, not one of species, but of climate, and of climate only. The native home of the hemp plant is assigned by Dr. Lindley to Persia and the hills in the North of India, whence it has been introduced into other countries. Burnett says, "Hemp seed is nutritious and not narcotic; it has the very singular property of changing the plumage of bullfinches and goldfinches from red and yellow to black, if they are fed on it for too long a time or in too large a quantity." Never having tried the experiment, we have no ground for disputing or arthority for verifying these remarks. If such, however, is the case, hemp seed possesses some property, if not narcotic, which canary and poppy seeds, we should presume, do not.

The dried hemp plant which has flowered, and from which the resin has been removed, is called in India *gunjeh*. It sells at from twelve annas to a rupee the seer, or from ninepence to a shilling per pound, in the Calcutta bazaars. It is sold chiefly for smoking, in bundles two feet long and three inches in diameter, containing twenty-four plants. The colour is dusky green, the odour agreeably narcotic, the whole plant resinous and adhesive to the touch.

The larger leaves and capsules without the stalks, are called *Bang, Subjee,* or *Sidhee* in India, and have been brought into the London market under the name of *Guaza*. They are used for making an intoxicating drink, for smoking, and in the conserve called *Majoon*. Bang is cheaper than Gunjeh, and though less powerful, is sold at so low a price that for one halfpenny enough can be purchased to intoxicate an habituated person.

The Gunjeh consumed in Bengal comes chiefly from Mirzapore and Ghazeepur, being extensively cultivated near Gwalior and in Tirhoot. The natives cut the plant when in flower, allow it to dry for three days, and then lay it in bundles averaging two pounds each which are distributed to the licensed dealers. The best kinds are brought from Gwalior and Bhurtpore, and it is cultivated of good quality in gardens around Calcutta.

The *Majoon* or hemp confection, is a compound of sugar, butter, flour, milk, and bang. The mass is divided into small lozenge-shaped pieces; one dram will intoxicate a beginner, three drams one experienced in its use. The taste is sweet and odour agreeable. Most carnivorous animals will eat it greedily, and very soon become ludicrously drunk, but seldom suffering any worse consequences.

The confection called *el mogen* in use amongst the Moors appears to be similar to, if not identical with, the *majoon* of India.

The ancient Saracens and modern Arabs in some parts of Turkey and generally throughout Syria, use preparations of hemp still known by the name of *haschisch* or *Hashash*. M. Adolph Stuze, the court apothecary at Bucharest, thus describes the

haschisch, by which general name all intoxicating drugs whose chidf constituent is hemp, are well known all over the East. The tops and all the tender part of the hemp plant are collected after flowering, dried and kept for use. There are several methods of using it.

I. Boiled in fat, butter, or oil, with a little water; the filtered product is employed in all kinds of pastry.

II. Powdered for smoking. Five or ten grains of the powder are smoked from a common pipe with ordinary tobacco, probably the leaf of a species of Lobelia (Tombuki) possessing strong narcotic properties.

III. Formed with tragacanth mucilage into pastiles, which are placed upon a pipe and smoked in similar doses.

IV. Made into an electuary with dates or figs and honey. This preparation is of a dark brown or almost black colour.

V. Another electuary is prepared of the same ingredients, with the addition of spices, cloves, cinnamon, pepper, amber, and musk. This preparation is used as an aphrodisiac.

M. Rouyer, of the Egyptian Commission, says, with the leaves and tops, collected before ripening, the Egyptians prepare a conserve, which serves as the base of the *berch*, the *diasmouk*, and the *bernaouy*. Hemp leaves reduced to powder and incorporated with honey or stirred with water, constitute the *berch* of the poorer classes.

Dr. Livingstone found hemp in use among the natives of Southern Africa under the name of *mutokuane*.

With the Hottentots it is known as *Dacha*, and another plant used for similar purposes among them is called the *wild Dagga* or Dacha. The use of hemp as a narcotic appears to be very general in all parts of Africa.

The D'amba possesses numerous native titles, but it is only understood by those distinctive terms which the negros give it in their respective countries. By the people of Ambriz and Musula it is pronounced as D'yambah, while to the various races in Kaffraria, it is more generally known under the Hottentot name of Dakka or Dacha. This plant is extensively cultivated by the Dongos, Damaras, and other tribes to the southward of Benguela. Among the Ambundas or aborigines of Angola, the dried plant is duly appreciated, not only for its narcotic effects, but likewise on account of some medicinal virtues which it has been reputed to enjoy. The markets of St. Paul de Loanda are mostly supplied from the Dongos, and other adjacent tribes, and from St. Salvador, and the towns in the vicinity of Upper Kongo.

The mode in which it is prepared for sale, consists in carefully separating from the leaves and seeds, the larger stalks, retaining only the smaller stems, which are compressed into a conical mass, varying from two to four inches in diameter, and from one to two feet in length, the whole being covered by some dried vegetable, firmly secured by thin withes. The substance thus manufactured is ordinarily employed for the purpose of smoking, and is endowed with powerful stimulant and intoxicating principles, consequently it is proportionately prized by those nations who are familiar with those peculiar qualities, and is probably viewed more in the light of a luxury owing to the absence of all other sources of excitement, for which, perhaps, it was the only available substitute.

Hubble-Bubble

"This is a strange repose, to be asleep
With eyes wide open, standing, speaking, moving,
And yet so fast asleep."—The Tempest.

The *Hubble-bubble proper* is a smoking apparatus so contrived that the smoke, in its passage from the point of consumption to that of inhalation, shall pass through water, which performs the office of a cooler. The *Hubble-bubble common* consists of a cocoa-nut shell, with two holes perforated in one end, at about an inch apart, through the germinating eyes of the nut. Through these orifices the kernel is extracted, and a wooden or bamboo tube, about nine inches long, surmounted by a bowl, is passed in at one opening to the bottom of the shell, which is partly filled with water, and the smoke is either sucked from the other hole, or a tube is inserted into that opening also, as an improvement on the ruder practice, through which to inhale the smoke. The hubble-bubble is used generally for smoking hemp, but in Siam occasionally for opium.

Smoking the hemp is indulged in, with some variations, from the course usually pursued with tobacco. In Africa this mode of indulgence seems to be more universal than that of the Indian weed. The inhabitants of Ambriz seek with avidity the solace of this preparation; they, nevertheless, appear to employ it in moderation, and are not so passionately addicted to its influence as other native tribes—they therefore suffer less from these pernicious effects which result from intemperate indulgence in it. The Aboriginal method of smoking this narcotic consists in fixing the clay bowl of a native pipe into the centre of a large gourd, and passing it to each individual composing the community, who in succession take several inhalations of the smoke, which is succeeded by violent paroxysms of coughing, flushed face, suffused eyes, and spasmodic gestures, with other symptoms indicative of its dominant action on the system. Upon the subsidence of this excitement, the party experience all those soothing sensations of ease and comfort, with that pleasing languor stated to constitute the potent charm, that renders it in such universal request. If the inhaling process is carried

beyond this stage, inebriation shortly supervenes (Dr. Daniell in "Pharmaceutical Journal.").

The Hottentots and Bushmen smoke the leaves of this plant, either alone or mixed with tobacco; and as they generally indulge to excess, they invariably become intoxicated. When the Bushmen were in London exhibiting themselves, they smoked the hemp, from pipes made from the tusks of animals.

The Bechuanas have a curious method of smoking the *Dacha*. Two holes the size of the bowl of a tobacco-pipe are made in the gound about a foot apart; between these a small stick is placed, and clay moulded over it, the stick is then withdrawn, leaving a passage connecting the two holes, into one of which the requisite material and a light is introduced, and the smoking commenced by the members of the party, each in turn lying on his face on the ground, inhaling a deep whiff, and then drinking some water, apparently to drive the fumes downward. It is a singular circumstance, that a similar method of smoking is employed by certain of the tribes of India, as already described, on the authority of Dr. Forbes Royle.

Among the Zoolus the *dacha* is placed at the end of a reed introduced into the side of an oxhorn, which is filled with water, and the mouth applied to the upper part of the horn. The quantity of smoke which is inhaled through so large an opening, unconfined by a mouth-piece, often affects the breath, and produces much coughing, notwithstanding which the natives are very fond of it; this kind of pipe is called *Egoodu*. Tobacco composed of the dried leaf of the wild hemp is in general use, and has a very stupifying effect, fequently intoxicating, on which occasions they invariably commence long and loudly to praise the king.

Though some of the Zoolos indulge in smoking, all, without exception, are passionately fond of snuff, which is composed of dried "dacca" leaves mixed with burnt aloes, and powdered. No greater compliment can be offered than to share the contents of a snuff calabash with your neighbour. The snuff is shovelled into the palm of the hand, with a small ivory spoon, whence it is carefully sniffed up. Worse than a Goth would that barbarian be who would wantonly interrupt a social party thus engaged.

The Delagoans of the eastern coast, consider the smoking of the "hubble-bubble" one of the greatest luxuries of life. A long hollow reed or cane, with the lower end immersed in a horn of water, and the upper end capped with a piece of earthenware, shaped like a thimble, is held in the hand. They cover the top, with the exception of a small aperture, through which, by a peculiar action of the mouth, they draw the smoke from the pipe above by the water below; they fill the mouth, and after having kept it some time there, eject it with violence from the ears and nostrils. "I have often," says Mr. Owen, "known them giddy, and apparently half stifled from indulging in this facinating luxury—it produces a violent whooping and coughing, accompanied by a profuse perspiration, and great temporary debility, and yet it is considered by the natives highly strengthening, and is always resorted to by them previously to undertaking a long journey, or commencing work in the field. To the hut of an old man who was thus indulging himself, I was attracted by the loudness of the cough it had occasioned, and as I entered I observed that his feeble frame had almost fallen a victim to the violent effects of the bang or dakka he was smoking. He had thrown himself back on some faggots, and it was not until I had been some time there that he appeared at all conscious of my presence; yet, as soon as the half inebriated wretch had obtained sufficient strength, he commenced his devotions to the pipe again, and by the time I quitted the hut was reduced to the same state as that in which I had found him."

In India, *Gunjah* is used for smoking alone. About 180 grains and a little dried tobacco are rubbed together in the palm of the hand with a few drops of water. This suffices for three persons. A little tobacco is placed in the pipe first, then a layer of the prepared Gunjah, then more tobacco, and the fire above all. Four or five persons usually join in this debauch. The hookah is passed round, and each person takes a single draught. Intoxication ensues almost instantly; from one draught to the unaccustomed, within half an hour; and after four or five inspirations to those more practised in the vice. The effects differ from those occasioned by drinking the *Sidhee*. Heaviness, laziness, and agreeable reveries ensue, but the person can be readily roused, and is able to discharge routine occupations, such as pulling the punkah, waiting at table, and divers similar employments.

Young America is beginning to use the "Bang," so popular among the Hindoos, through in rather a different manner, for young Jonathan must in some sort be an original. It is not a "drink," but a mixture of bruised hemp tops and the powder of the betel, rolled up like a quid of tobacco. It turns the lips and gums of a deep red, and if indulged in largely, produces violent intoxication. Lager beer and schnaps will give way for "bang," and red lips, instead of red noses, become the "style."

Dr. Moreau, on one occasion believed that he was melting away by the heat of the sun, at another, that his whole body was inflated like a balloon, that he was enabled to elevate himself, and vanish in the air. The ideas that generally presented themselves to him of these illusions were, that objects wore the semblance of phantasmagoric figures, small at first, then gradually enlarging, then suddenly becoming enormous and vanishing. Sometimes these figures were subjects of alarm to him. A little hideous dwarf,

clothed in the dress of the thirteenth century, haunted him for some time. Aware of the delusion, he entreated that the object which kept up the illusion should be removed—these were a hat and coat upon a neighbouring table. An old servant of seventy-one, was, upon another occasion, represented by his eye to the brain as a young lady, adorned with all the grace of beauty, and his white hair and wrinkles transformed into irresistible attractions. A friend who presented him with a glass of lemonade was pictured to his disordered imagination as a furnace of hot charcoal. Sometimes the happiness was interrupted by delusions that affrighted him. Thus, having indulged himself with his accustomed dose, every object awoke his terror and alarm, which neither the conviction of his own mind nor the soothing explanations of his friends could diminish, and he was for a considerable length of time under the most fearful impressions.

> *"Through the darkness spread*
> *Around, the gaping earth then vomited*
> *Legions of foul and ghastly shapes, which*
> *Hung upon his flight."*

These are the immediate effects produced by this most extraordinary substance. There are others, however, still more singular, which have attracted the attention of travellers, and become the objects of intense curiosity. These are of a nature unknown in connection with any other substance, and have formed the basis of numerous marvellous narrations, that have astonished even the incredulous. Those who have seen the fearful symptoms betrayed during delirium tremens, and have heard the sufferers declare that they saw before them genii, fairies, devils, know how the senses may become the source of delusion, and hence may judge to *what* a disordered state of the intillect may lead. When the brain has once become disordered by the use of the narcotic hemp, it becomes ever afterwards liable to hallucinations and delusions, unlike those produced by anything else, save intoxicating liquours after an attack of delirium tremens, The mind then believes that it sees visions, and beholds beings with whom it can converse. The phenomena gradually develop themselves, until illusions take the place of realities, and hold firm possession of the mind, which would seem on all other points to be healthy and vigorous, but on this point, insane. So firm and so fixed becomes the belief, that neither argument convinces, nor ridicule shakes, the individual from his faith, in which a prejudiced or too credulous nature confirms him but the more.

Siva and Parvati straining bhang (marijuana) rajput style, Basholi school, ca. 1725, 9" x 6 3/8".

Map showing the putative original distribution of marijuana prior to its spread by humanity. The plants of India, Russia and Afghanistan show differences in appearance and potency, though their designation as different species is arbitrary.

Some of the leaf variations found in a field of marijuana.

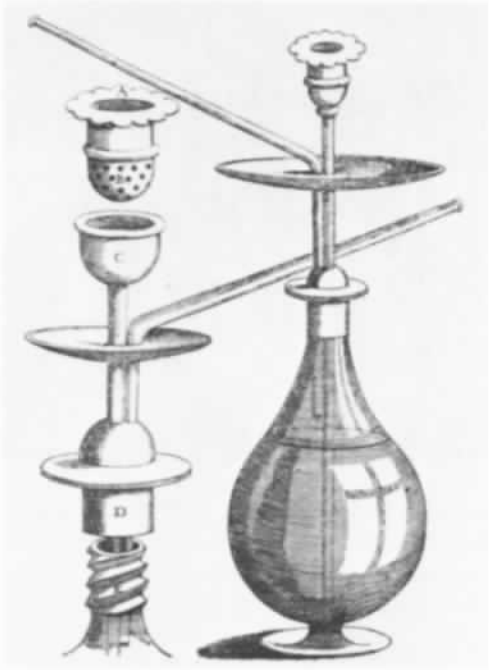
The oldest known picture of marijuana. From the illustrated Constantinopolitanus manuscript in the Vienna National Library.

***Cannabis sativa** L. A flowering female branch.*

"Hashish Smokers" - a classic 19th century painting by L. Taupin.

African waterpipes. 1. Horn pipe of the Bergdamara people. 2. Gourd pipe of the Sakalave. 3. Gourd pipe from the central steppe area of German East Africa. 4. Horn pipe of the Kaffir. 5. Gourd pipe of the Wanyamesi. 6a. Top of hashish pipe from Uganda made of black clay with white decoration. 6b. Top piece with removable perforated disc. 6c. Inner piece with central needle for holding 6b.

Very little is known of the history of marijuana in Africa, but these two pictures from the late 19th century show a Central African pigmy smoking marijuana in a bamboo pipe and a Congolese with a large pipe used for marijuana or tobacco.

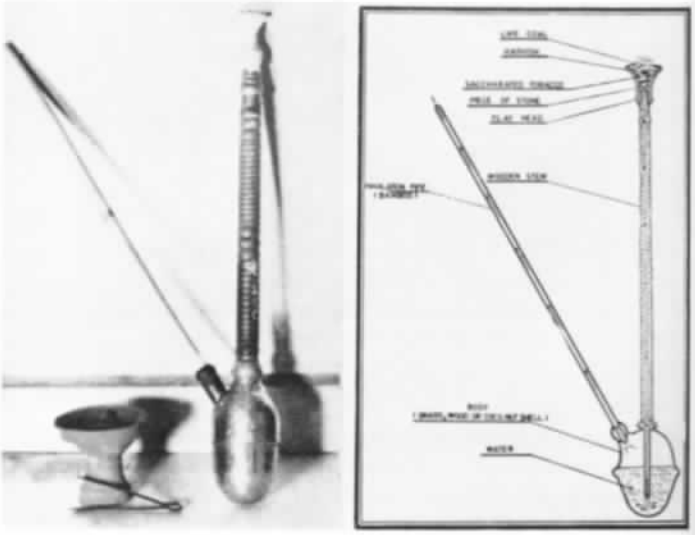


Sixteenth century Persian waterpipe with the perforated piece "B" between the top "A" and the bowl "C". The base "D" is threaded for screwing onto the top of the glass bottle. Although hashish has been eaten in the Arab world for hundreds of years, such pipes did not exist until smoking was introduced with tobacco. From Neander- "Tobacologia" (1626).

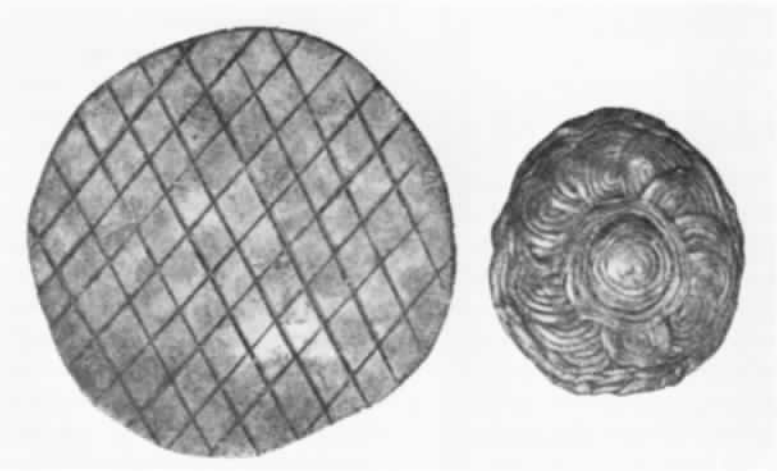
Marijuana smokers in 19th century Africa. Above: a priest of the Hill Angas. Below: Two Zulus, the left one smoking a waterpipe made from a buffalo horn.

Arabian coffeehouse in Algiers about 1900. Guests are supplied with waterpipes and hashish.

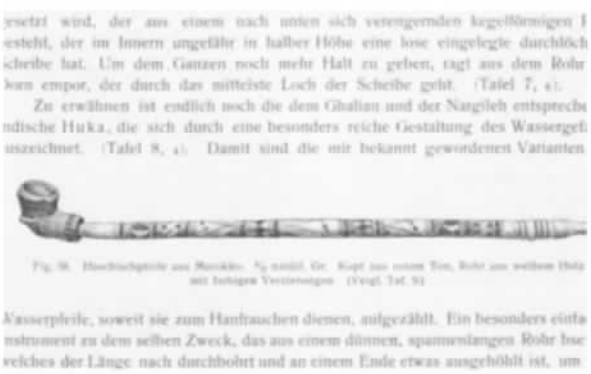
Asian waterpipes. 1. Pipe (schischah) from Mecca, 1 meter tall on brass stand (kurse) on which rests a coconut with a brass shell (djozah), which is connected to the brass covered barrel (qacabah). The tube (leij) is fitted with a mouthpiece (mamacc). The pipe bowl (ras) is enameled. 2, 3. Pipes from Annam. 2 has a wooden top and porcelain inlay with a metal handle. 3 is of ivory and gold. 4. Hookah from Pakistan. In the bowl is a perforated clay disc on which glowing coals are placed to ignite the contents. 5. Bamboo pipe from Assam with the side branch serving as a mouthpiece. 6. Cambodian pipe made from bamboo root about 50 cm high. 7. Bamboo pipe from Kanikar in Ceylon with an adjustable tube and a mouthpiece of rolled up leaf. 8. Bamboo pipe from Kanikar in Ceylon with clay bowl. 9. Woman's bamboo pipe of the Pankho of Bandschogi. 10. Woman's pipe of the Luschai of Assam. 11. Gourd for receiving the tobacco juice in 9 and 10. 12. Bamboo pipe of the Lawas of Indochina.



Hashish water pipe from modern Egypt with chafing dish and tongs which are used to add live coals to the hashish



Carefully molded hashish cakes from 19th century Cairo (left) and Southern Russia. About 1/2 natural size.



Moroccan hashish pipe with red bowl and colored designs on white wood stem. 1/3 natural size.

Henri de Monfried, shown at the tiller of his boat, created an international scandal in the 1920's when he tried to bring off his biggest hashish deal by legally importing 6 ***tons*** *of Indian charas into Ethiopia. The middle eastern equivalent of the mafia stole his load twice and it was never seen again. He later wrote many books about his adventures of which* ***Hashish: the memoirs of a Red Sea Smuggler*** *is the best known.*

TOBACCO—
Nicotiana tabacum

There is little reason to doubt that tobacco is a plant indigenous to the New World. With the era, therefore, of Columbus, our knowledge of it will necessarily commence. When the Spaniards landed with that navigator in Cuba in 1492, they found the Cubans doing the same kind of thing as the voyager would now find them occupied in, making and smoking cigars. In the latter act, these Spaniards soon followed the Cuban example, as did those also who landed in 1518, with Fernando Cortez, in the island of Tobago, to a still greater extent. The honour of introducing this, the fairest of "the Seven Sisters of Sleep," to European society and soil, is due, perhaps, to Hernandez, the naturalist, who brought the first seeds from Mexico (Humboldt states, from the Mexican province of Yucatan), in 1559, and conveyed them to Spain. About the same time some unknown Flamingo introduced the illustrious visitor to Portugal.

Of the introduction of tobacco into France, the more commonly-received opinion is, that the first seeds were sent to Catherine de Medici from Portugal in 1560, by Jean Nicot, the French ambassador to that country, and ever since it has borne as its generic name a memento of its patron. Other accounts attribute to Father Andre Thevet, or some friend of his, the honour of introducing the raw material to the most accomplished snuff-takers in Europe, and, perhaps, the first who ever indulged in it to any extent.

In Tuscany, tobacco was first cultivated under Cosmo de Medici, who died in 1574. It was originally raised by Bishop Alfonso Tournabuoni, from seeds received from his nephew, Nicolo Tournabuoni, then ambassador at Paris. After him it bore the name of Erba Tournabuoni, as in France it was called Herbe de la Reine. Very early, before1589, the Cardinal Santa Croce, returning from his nunciature in Spain and Portugal to Italy, carried with him thither tobacco; but he can scarce claim the honour of its introduction, although the exploit was commemorated by Castor Duranti in Latin verse. Thus it would appear that this plant was brought from Mexico to Spain, whence it passed into France, and thence into Italy, during the early part of the latter half of the sixteenth century.

The first introduction of tobacco into England has been claimed for a trinity of valiant knights—Sir Francis Drake, Sir John Hawkins, and Sir Walter Raleigh. In Bancroft's "History of the United States," it is said—"The exiles of a year had grown familiar with the favourite amusement of the lethargic Indians, and they introduced into England the general use of tobacco." These exiles were brought home by Drake before Raleigh visited the New World, and the period for the introduction of tobacco into this country by Sir Francis, claims the date of 1560. For Sir John Hawkins' introduction, the time has been fixed at 1565; whilst the earliest date assigned for its introduction by Sir Walter Raleigh is 1584, the same year in which a proclamation was issued in England against it. Humboldt states that the celebrated Raleigh contributed most to introduce the custom of smoking among the nations of the North. When Raleigh brought tobacco from Virginia to England, whole fields of it were already cultivated in Portugal. It was also previously known in France, where it was brought into fashion by Catherine de Medicis. As early as the end of the sixteenth century, bitter complaints were made in England of this imitation of the manners of a savage people. It was feared, that by the practice of smoking tobacco, Englishmen would degenerate into a barbarous state. The cultivation of this narcotic plant preceded that of the potato in Europe 120 or 140 years.

Camden, who informs us of these fears for the civilization of England, also states that Richard Fletcher, Bishop of London, a courtly prelate (who died in 1596), by the use of tobacco "smothered the cares he took by means of his unlucky marriage." According to Aubrey, the pipe was handed from man to man round the table; and this bears, certainly, a great resemblance to the custom of the North-American Indians—the chief smoking two or three whiffs, then passing it to his neighbour, until from one to another it passes round the circle, and comes back to the first smoker again.

M. Jorevin, a Frenchman, who visited England in Charles the Second's time, says that the women smoked tobacco as well as the men.

From England the practice of smoking was carried to the Continent. Dutch students were first taught the art of smoking at the University of Leyden by students from England; hence the greatest smokers in Europe derived their knowledge of the use of the pipe from the English.

In 1601, tobacco was carried to Java, whence it spread over the East. It was also conveyed to Turkey and Arabia in the beginning of this century. El-Ishakee states that the custom of smoking tobacco began to be common in Egypt between the years of the flight, 1010 and 1012 (A.D. 1601-1603). And from Persian writers on *Materia medica*, it appears to have been introduced into India in A.H. 1014 (A.D. 1605), towards the end of the reign of Jelaladeen Akbar Padshaw. From India, tobacco probably found its way to the Malayan Peninsula and China; although Pallas, Loureiro, and Rumphius think that tobacco was known in China before the discovery of the New World, and that the Chinese tobacco plant is indigenous to that country.

But tobacco did not come into general use in Europe without great and strenuous opposition. All kinds of weapons were called in requisition to stay its progress. Persuasion and force were alike essayed without effect. A German writer has collected the titles of a hundred different works condemning its use, which were published within half a century of its introduction into Europe. The pen was wielded by royal as well as plebeian fingers, and the famous diatribe of the British Solomon, King James I., of blessed memory, defender of the faith, and antagonist of tobacco, keeps his memory still *green* in the hearts of Englishmen. In Russia, the snuff-taker was ingeniously cured of the habit, by having his nose cut off, while smokers had a pipe bored through the same useful projection. Michael Feodorovitch Tourieff kindly offered a bastinado to the Muscovites for the first offence, cutting off the nose for the second, and the head for a third. In 1590, Pope Innocent XII, took the trouble to excommunicate all who used tobacco in any form in the church of St. Peter's in Rome. And in 1624, Pope Urban VII., the old woman, fulminated a bull against all persons found taking snuff during divine service; and old women, in the spirit of opposition, have been fond of snuff ever since. The sultans and priests of Persia and Turkey declared smoking a sin against their religion. Amurath IV. of Persia published an edict, making the smoking of tobacco a capital offense. Sha Abbas II. punished such delinquents equally severely. When leading an army against the Cham of Tartary, he proclaimed that every soldier in whose possession tobacco was found, would have his nose and lips cut off, and afterwards be burnt alive. El-Gabartee relates, that about a century ago, in the time of Mohammed Basha El-Yedekshee, who governed Egypt in the years of the flight, 1156-8, it frequently happened that, when a man was found with a pipe in his hand in Cairo, he was made to eat the bowl with its burning contents.

Forty varieties of tobacco have been described; but the differences are mainly the result of climate, and the mode of culture. It grows well in almost every part of the world. The northern limit in Scandinavia is 62°—63° N.L. The different parts of America in which it is grown include Canada, New Brunswick, United States, Mexico, the Western Coast, as far as 40° S.L. In Africa it is cultivated by the Red Sea and Mediterranean, in Egypt, Algeria, the Canaries, the Western Coast, the Cape, and numerous places in the interior. In Europe, it has been raised successfully in almost every country; in Hungary, Germany, Flanders, and France, it forms an important agricultural product. In Asia, it has spread over Turkey, Persia, India, Thibet, China, Japan, the Philippines, Java, and Ceylon. In parts of Australia and New Zealand. From the Equator to 50° N.L., it may be raised without difficulty. The finest qualities are raised between 15° and 35° N.L.

CHRONOLOGY OF TOBACCO

A.D.	
1496	Romanus Paine published the first account of tobacco, under the name of *cohoba*.
1519	Tobacco discovered by the Spaniards near Tabasco.
1535	Negroes cultivated it on the plantations of their masters.
1535	It was used at this time in Canada.
1559	Tobacco introduced into Europe by Hernandez de Toledo.
1565	Conrad Gesner became acquainted with tobacco.
1565	Sir John Hawkins brought tobacco from Florida.
1570	Tobacco smoked in Holland out of tubes of palm-leaves.
1574	Tobacco cultivated in Tuscany.
1575	First figure of plant in Andre Thevot's Cosmographic.
1585	Clay pipes noticed by the English in Virginia.
1585	First clay pipes made in Europe.
1590	Schah Abbas, of Persia, prohibited the use of tobacco in his empire.
1601	Tobacco introduced into Java. Smoking commenced in Egypt about this time.
1604	James I. laid heavy imposts on tobacco.
1610	Tobacco-smoking known at Constantinople.
1615	Tobacco first grown about Amersfort, in Holland.
1616	The colonists cultivated tobacco in Virginia.
1619	James I. wrote his "Counterblast."
1619	Sale of tobacco prohibited in England till the custom should be paid, and the royal seal affixed.
1620	Ninety young women sent from England to America, and sold to the planters for tobacco at 120 lbs. each.
1622	Annual import of tobacco into England from America, 142,085 lbs.
1624	The Pope excommunicated all who should take snuff in church. King James restricted the culture of tobacco to Virginia and the Somer Isles.
1631	Tobacco-smoking introduced into Misnia.
1634	A tribunal formed at Moscow to punish smoking.
1639	The Assembly of Virginia ordered that all tobacco planted in that and the succeeding two years should be destroyed.
1653	Smoking commenced at Apenzell (canton) in Switzerland.
1661	The police regulations of Berne made, and divided according to the ten commandments, in which tobacco was prohibited.
1669	Adultery and fornication punished in Virginia by a fine of 500 to 1000 lbs. of tobacco.
1670	Smoking tobacco punished in the canton of Glarus by fines.
1676	Customs on tobacco from Virginia collected in England, £120,000.
1676	Two Jews attempt the cultivation of tobacco in Brandenburg.
1689	Dr. J. F. Vicarius invented tubes containing pieces of sponge for smoking tobacco.
1691	Pope Innocent XII, excommunicated all who used tobacco in St. Peter's Church at Rome.
1697	Large quantities of tobacco produced in the palatinate of Hesse.
1709	Exports of tobacco from America, 28,858,666 lbs.
1719	Senate of Strasburg prohibited the culture of tobacco.
1724	Pope Benedict XIV. revoked Pope Innocent's Bull of excommunication.
1732	Tobacco made a legal tender in Maryland, at one penny per lb.
1747	Annual exports of tobacco to England from the American colonies, 40,000,000 lbs.
1753	The King of Portugal farmed out the tobacco trade for about £50,000.00.
1759	Duties on tobacco in Denmark amounted to £8,000.
1770	Empress of Austria derived an income of £160,000 from tobacco.
1773	Duties on tobacco in the two Sicilies, £80,000.
1775	Annual export of tobacco from the United States 1,000,000 lbs.
1780	King of France derived an income of £1,500,000 from tobacco.
1782	Annual export of tobacco during the seven years revolutionary war, 12,378,504 lbs.
1787	Tobacco imported into Ireland, 1,877,579 lbs.
1789	Exports of tobacco from the United States, 90,000,000 lbs.
1789	Tobacco first put under the excise in England.
1820	Quantity of tobacco grown in France, 32,887,500 lbs.
1828	Tobacco revenue in the State of Maryland, £5,400.
1830	Revenue from tobacco and snuff in Great Britain was 2¼ millions of pounds.
1834	Value of tobacco used in the United States estimated at £3,000,000.
1838	Annual consumption of tobacco in the United States estimated at 100,000,000 lbs.
1840	It was ascertained that 1,500,000 persons were engaged in the cultivation and manufacture of tobacco in the United States.

In Virginia's native country, the pipe sticks closer to a man than his boots. An American is no more furnished without his pipe or cigar, than a house is furnished without a looking glass. To the native Indian, it supplies an important place; it becomes his treaty of peace—his challenge of war. It is the instrument of a solemn ratification, and the subject of more than one semi-sacred legend, which has woven about the heart of the Red-man.

"At the Red-pipe Stone Quarry," say they, "happened the mysterious birth of the red-pipe, which has blown its fumes of peace or war to the remotest corners of the Continent, which has visited every warrior, and passed through its reddened stem, the irrevocable oath of war and desolation. And here, also, the peace breathing calumet was born, and fringed with the eagle's quills, which has shed its thrilling fumes over the land, and soothed the fury of the relentless savage. The Great Spirit, at an ancient period, here called together the !ndian warriors, and standing on the precipice of the red-pipe stone rock, broke from its wall a piece, and made a huge pipe, by turning it in his hand, which he smoked over them, and to the north, the south, the east, and the west; and told them that this stone was red—that it was their flesh—that they must use it for their pipes of peace, that it belonged to them all, and that the war club, and the scalping knife must not be raised on its ground. At the last whiff of his pipe, his head went into a great cloud, and the whole surface of the rock, for several miles, was melted and glazed. Two great ovens were opened beneath, and two women, guardian spirits of the place, entered them in a blaze of fire, and they are heard there yet, answering to the invocations of the priests or medicine men, who consult them when they are visitors to this sacred place." (Catlin's *North American Indians*, Vol 2, pg 160.)

> *"From the red stone of the quarry*
> *With his hand he broke a fragment,*
> *Moulded it into a pipe head,*
> *Shaped and fashioned it with figures.*
> *From the margin of the river*
> *Took a long reed for a pipe stem,*
> *With its dark green leaves upon it;*
> *Filled the pipe with bark of willow;*
> *With the bark of the red willow;*
> *Breathed upon the neighbouring forest,*
> *Made its great boughs chafe together,*
> *Till in flame they burst, and kindled;*
> *And erect upon the mountains,*
> *Gitche Manito, the mighty,*
> *Smoked the calumet, the Peace Pipe,*
> *As a signal to the nations," &c.*

The tribes of the Missouri make their pipes of a kind of stone called Catlinite, from the red pipe stone quarries upon the head waters of that river, the colour of which is brick red. These stones, when first taken out of the quarry are soft, and easily worked with a knife, but on exposure to the air become hard and take a good polish. The pipes of the Rocky Mountain Indians are some of them wrought with much labour and ingenuity of an argillaceous stone of a very fine texture, found at the north of Queen Charlotte's Island. This stone is of blue black colour, and in character similar to the red earth of the Missouri quarry.

Tobacco And Its Substitutes.

Vulgar Name	Botanical Name	Where Used Or cultivated	How Used
Virginian tobacco	Nicotiana tabacum	U. States	Smoked & chewed
Orinoko tobacco	Nicotiana macrophylla	U. States	Smoked & chewed
European tobacco	Nicotiana rustica	Europe	Smoked & chewed
Javanese tobacco	Nicotiana var.	Java	Smoked
Billah tobacco	Nicotiana var Asiatica	Malwa	Smoked
Guzerat tobacco	Nicotiana var.	Guzerat	Smoked
Chinese tobacco	Nicotiana var Chinensis	China	Smoked
Thibetian tobacco	Nicotiana var.	Thibet	Smoked
Persian tobacco	Nicotiana persica	Persia	Smoked
Latakia tobacco	Nicotiana var.	Syria	Smoked
Djiddar tobacco	Nicotiana crispa	Syria	Smoked
Indian tobacco	Nicotiana quadrivalvis	N. America	Smoked
Indian tobacco	Nicotiana multivalvis	N. America	Smoked
Indian tobacco	Nicotiana nana	Rocky Mts	Smoked
Cuban tobacco	Nicotiana repanda	Cuba	Smoked
Columbian tobacco	Nicotiana loxensis	America	Smoked
Brazilian tobacco	Nicotiana glauca	Brazil	Smoked
Peruvian tobacco	Nicotiana andicola	Andes	Smoked
Coltsfoot leaves	Tussilago farfar	Europe	Smoked for tobacco
Yarrow leaves	Achillea millefolium	Europe	Smoked for tobacco
Rhubarb leaves	Rheum emodi, &c.	Himalayas	Smoked for tobacco
Bogbean leaves	Menyanthes trifoliata	Britain	Smoked for tobacco
Sage leaves	Salvia officinalis	Europe	Smoked for tobacco
Mountain tobacco	Arnica montana	Switzerland	Smoked for tobacco
Black holly	Ilex vomitoria	N. America	Smoked for tobacco
Stag's horn sumach	Rhus typhina	Mississippi	Smoked for tobacco
Copal sumach	Rhus copallina	Mississippi	Smoked for tobacco
Water lilly leaves	Nelumbium speciosum	China	Mixed with tobacco
Pucha-pat	Marrubium odoratissimum	India	Mixed with tobacco
Tombeki	Lobelia sp.	E. Asia	Smoked as tobacco
Indian tobacco	Lobelia inflata	N. America	Smoked as tobacco
Maize husks	Zea mays	U. States	Patented for cigars
Birch bark	Betula excelsa	N. Brunswick	Mixed with tobacco
Willow leaves	Salix sp.	N. America	Smoked as tobacco
Bearberry leaves	Arctostaphylus uva-ursi	Chenook Ind.	Mixed with tobacco
Pimento berries	Eugenia pimento	W. Indies	Smoked
Cascarilla bark	Croton eleuteria	W. Indies	Mixed with tobacco
Polygonum leaves	Polygonum hispida	S. America	Smoked
Camphor leaves	Tarchonanthus camphoratus	Cape	Smoked
Wild dagga	Leonotis leonurus	Cape	Smoked
Wild dagga	Leonotis ovata	Cape	Smoked
Culen	Psoralea glandulosa	Mauritius	Smoked
Purphiok	Tupistra sp.	Sikkim	Mixed with tobacco
Camomile flowers	Anthemis nobilis	Britain	Mixed with tobacco
Beet leaves	Beta vulgaris	France	Substitute
Akel		Algeria	Mixed with tobacco
Trouma		Algeria	Mixed with tobacco
Kauw goed	Mesembryanthemum tortuosum	Cape	Chewed
Angelica root	Archangelica officinalis	Lapland	Chewed
Monkey bread leaves	Adansonia digitata	W. Africa	Snuffed
Rhododendron leaves	Rhododendron campanulatum	India	Snuffed
Brown dust of petioles of	Kalmia sp. Rhododendron sp.	N. America N. America	Snuffed Snuffed
Asarabaeca	Asarum uropeum	Europe	Snuffed
Grimstone's eye snuff	Various plants	Britain	Snuffed
Various indigenous plants		Erzegebirge	Snuffed
Woodruff	Asperula odorata	Britain	Mixed with snuff
Amadon ashes	Polyporus igniarius	Kmtschatka	Snuffed

The Calumet or "pipe of peace" of the Sioux Indians is thus described by Irving. "The bowl was of a species of red stone resembling porphyry, the stem was six feet in length, decorated with tufts of horse hair dyed red. The pipe bearer stepped within the circle, lighted the pipe, held it towards the sun, then towards the different points of the compass, after which he handed it to the principle chief. The latter smoked a few whiffs, then, holding the head of the pipe in his hand, offered the other end to their visitor, and to each one successively in the circle. When all had smoked, it was considered that an assurance of

good faith and amity had been interchanged." The use of the Uspogan or Calumet among the Eythinyuwak, appears not to have been an original practice of the Tinne, but was introduced with tobacco by Europeans; while among the Chippeways the plant has been grown from the most ancient times.

In South America, many of the tribes are free indulgers in tobacco; and this extends also to the female and juvenile sections of the community. A story, which Signor Calistro narrated to Mr. Wallace whilst travelling in the interior of Brazil, show that it was nothing but a common occurrence for little girls to smoke. This story is in itself interesting considered apart from all circumstances of veracity. "There was a negro who had a pretty wife, to whom another negro was rather attentive when he had the opportunity. One day the husband went out to hunt, and the other party thought it a good opportunity to pay a visit to the lady. The husband, however, returned rather unexpectedly, and the visitor climbed up on the rafters to be out of sight, among the old boards and baskets that were stowed away there. The husband put his gun by in a corner, and called to his wife to get his supper, and then sat down in his hammock. Casting his eyes up to the rafters, he saw a leg protruding from among the baskets, and thinking it something supernatural, crossed himself, and said, 'Lord deliver us from the legs appearing overhead!' The other, hearing this, attempted to draw up his legs out of sight; but, losing his balance, came down suddenly on the floor in front of the astonished husband, who, half-frightened, asked, 'Where do you come from?' 'I have just come from heaven,' said the other, 'and have brought you news of your little daughter Maria.' 'Oh, wife, wife! come and see a man who has brought us news of our little daughter Maria!' then turning to the visitor, continued, 'and what was my little daughter doing when you left?' 'Oh she was sitting at the feet of the Virgin with a golden crown on her head, and smoking a golden pipe a yard long.' 'And did she send any messages to us?' 'Oh, yes; she sent many remembrances, and begged you to send her two pounds of your tobacco from the little rhoosa; they have not got any half so good up there.' 'Oh, wife, wife, bring two pounds of our tobacco from the little rhoosa, for our daughter Maria is in heaven, and she says they have not any half so good up there.' So the tobacco was brought, and the visitor was departing, when he was asked, 'Are there many white men up there?' 'Very few,' he replied; 'they are all down below with the *diabo*.' 'I thought so,' the other replied, apparently quite satisfied; 'good night.'

On the Orinoco, tobacco has been cultivated by the native tribes from time immemorial. The Tamanacs and the Maypures of Guiana wrap maize leaves around their cigars as did the Mexicans at the time of the arrival of Cortes; and, as in Chili, is done at the present day. The Spaniards have substituted paper for the maize husks, in imitation of them. The little cigarettos of Chili are called *hojitas*. They are about two inches and a half long, filled with coarsely powdered tobacco. As their use is apt to stain the fingers of the smoker, the fashionable young gentlemen carry a pair of delicate gold tweezers for holding them. The cigar is so small that it requires not more than three or four minutes to smoke one. They serve to fill up the intervals in a conversation. At tertulias, the gentlemen sometimes retire to a balcony to smoke one or two cigars after a dance.

The poor Indians of the forests of the Orinoco know, as well as did the great nobles of the Court of Montezuma, that the smoke of tobacco is an excellent narcotic; and they use it not only to procure an afternoon nap, but also to induce a state of quiescence which they call dreaming with the eyes open. At the Court of Montezuma the pipe was held in one hand, while the nostrils were stopped with the other, in order that the smoke might be more easily swallowed. Bernal Diaz also informs us, that after Montezuma had dined, they presented to him three little canes, highly ornamented, containing liquid amber, mixed with a herb they call tobacco, and when he had sufficiently viewed and heard the singers, he took a little of the smoke of one of these canes, and then laid himself down to sleep. A tribe of Indians originally inhabiting Panama, improved upon this method, which occupied both hands, and involved considerable trouble; the method adopted by the chiefs and great men of this tribe, was to employ servants to blow tobacco smoke in their faces, which was convenient and encouraged their indolence; they indulged in the luxury of tobacco in no other way.

Pipeology

"It wa his constant companion and solace. Was he gay, he smoked—was he sad, he smoked—his pipe was never out of his mouth—it was a part of his physiognomy; without it his best friends would not know him. Take away his pipe—you might as well take away his nose."—Knickerbocker's New York.

Semele, in a death by fire, became a martyr to love. Thus Virginia suffers herself to be burnt for the good of the world. From the ashes of the old Phoenix the young Phoenix was born. From the smoke of the Havana spring new visions, and eloquent delights. As the altars of the gods received honour from men, and the censers from whence ascended the burning incense were sacred to the deities, wherefore should not the pipe receive honour, as well as the man who uses it, or the odorous weed consumed within it. An enthusiast writes of it thus—"Philosophers have drawn their best similes from their pipes. How could they have done so, had their pipes first been drawn from them? We see the smoke go upwards—we think of life; we see the smoke-wreath fade away—we remember the morning cloud. Our pipe breaks—we mourn the fragility of earthly pleasures. We smoke it to an end, and tapping out the ashes, remember that 'Dust we are, and unto dust we shall return.' If we are in love, we garnish a whole sonnet with images drawn

from smoking, and first fill our pipe, and then tune it. That spark kindles like her eye, is ruddy as her lip; this slender clay, as white as her hand, and slim as her waist; till her raven hair grows grey as these ashes, I will love her. This perfume is not sweeter than her breath, though sweeter than all else. The odour ascends me into the brain, fills it full of all fiery delectable shapes, which delivered over to the tongue, which is the birth become delectable wit."

The instruments by which the "universal weed" is consumed, are almost as variable in form and material as the nations indulging in their use. The pipe of Holland is of porcelain, and that of our own island of unglazed clay. These latter are made in large quantities, both at home and abroad (For the art of making tobacco pipes of clay, the Dutch are indebted to this country, in proof of which, Mr. Hollis, who passed through the Netherlands in 1748, states that the master of the Gouda Pipe Works informed him, that, to that day, the principal working tools bore English names.). One factory at St. Omer employs 450 work-people, and produces annually 100,000 gross, or nearly fifteen million pipes; and another factory at the same place cmploys 850 work-people, and produces 200,000 gross, or nearly thirty millions of pipes, consuming nearly eight thousand tons of clay in their manufacture. The quantity of pipes used annually in London is estimated at 364,000 gross, or 52,416,000 pipes; it requires 300 men, each man making 20 gross four dozen per week, for one year, to make them; the cost of which is £40,950. The average length of these pipes is twelve and a half inches; and if laid down in a horizontal position, end to end together, they would reach to the extent of 10,340 miles, 1,600 yards; if they were piled one above another perpendicularly, they would reach 135,138 times as high as St. Pauls; they would weigh 1,137 tons, 10 cwts., and it would require 104 tons, 9 cwts., 32 lbs. of tobacco to fill them. In 1857 we imported clay pipes to the value of £7,614, which cannot be short of 121,000 gross, or seventeen and a half millions. But even with us, pipes were not always of clay. The earliest pipes used in Britain are stated to have been made from a walnut-shell and a straw. Dr. Royle describes a very primitive kind of clay pipe used by some of the natives of India—it is presumed only in cases of necessity. "The amateur makes two holes, one longer than the other, with a piece of stick in a clay soil,inclining the stick so that they may meet; into the shorter hole he places the tobacco, and applies his mouth to the other, and thus, as he lies upon the ground, luxuriates in the fumes of the narcotic herb."

Turkish pipe-bowls, or Lules, are composed of the red clay of Nish, mixed with the white earth of the Roustchouck. They are very graceful in form, and are in some cases ornamented with gilding. The "regular Turk" prefers a fresh bowl daily; therefore the plain ones are resorted to on the score of economy. In Turkey and some other parts of the Orient, it is not unusual to compute distances, or rather the duration of a journey, by the numbers of pipes which might be smoked in the time necessary to accomplish it.

The pipe of German is, almost universally, the Meerschaum, that pipe of fame so coveted by the Northern smoker. These articles are composed of a kind of magnesian earth, known to the Tartars of the Crimea as *keff-til*. Pallas erroneously supposed that this kind of earth was so denominated from Caffa, and therefore the name signified "Caffa earth." From "Meninski's Oriental Dictionary" it would appear to be a derivation of two Turkish words which signify "foam" or "froth" or the "earth." The French name, *ecume de mer*, or "scum of the sea," and the Germans "sea foam," have doubtless an intimate relationship with this same "keff til" of the Crimean Tartars.

Meerschaum earth is met with in various localities in Spain, Greece, Crimea, and Moravia. The greatest quantity is derived from Asia Minor, it being dug principally in the peninsula of Natolia, near the town of Coniah. Before the capture of the Crimea, this earth is stated to have formed a considerable article of commerce with Constantinople, where it was used in the public baths to cleanse the hair of women. The first rude shape was formerly given to the pipe-bowls on the spot where the mineral was dug, by pressure in a mould; and these rude bowls were more elegantly carved and finished at Pesth and Vienna. At the present time, the greater part of the meerschaum is exported in the shape of irregular blocks; these undergo a careful manipulation, after having been soaked in a preparation of wax and oil. After being finished, and sold at the German fairs, some of them have acquired such an exquisite tint through smoking, in the estimation of connoisseurs, that they have realized from £40 to £50.

Attempts have not been wanting to imitate this material, hitherto not very successfully. The large quantity of parings that are left in trimming up the bowls, has been rendered available for the manufacture of what are called "massa bowls," but they do not enjoy the reputation of the genuine meerschaum bowls.

There is yet another mineral production, the use of which Turkish smokers, at any rate, know how to appreciate. This is amber. The Turk will expend an almost fabulous sum in an amber mouthpiece for his *narghileh*. Four valuable articles of this description were exhibited in the Turkish department of the Exhibition of 1851, which were worth together £1000, two of them being valued at £305 each. There is a current belief in Turkey that amber is incapable of transmitting infection; and as it is

considered a great mark of politeness to offer the pipe to a stranger, this presumed property of amber accounts in some measure for the estimation in which it is held.

For a knowledge of the pipes of modern Egypt, we must resort for information to Mr. Lane, from whom we gather the following notes. The pipe (which is called by many names, as "shibuk," "ood," &c.) is generally between four and five feet long. Some pipes are shorter, and some of greater length. The most common kind used in Egypt is made of a kind of wood called "garmashak." The greater part of the stick is covered with silk, which is confined at each extremity by gold thread, often intertwined with coloured silks, or by a tube of gilt silver; and at the lower extermity of the covering is a tassel of silk. The covering was originally designed to be moistened with water, in order to cool the pipe, and consequently the smoke, by evaporation; but this is only done when the pipe is old, or not handsome. Cherrystick pipes, which are never covered, are used by some persons, particularly in the winter. In summer, the smoke is not so cool from the cherrystick pipe as from the kind before mentioned. The bowl is of baked earth, coloured red or brown. The mouthpiece is composed of two or more pieces of opaque, light-coloured amber, interjoined by ornaments of enamelled gold, agate, jasper, carnelion, or some other precious substance. This is the most costly part of the pipe. Those in ordinary use by persons of the middle classes cost from £1 to £3 sterling. A wooden tube passes through it; this is often changed as it becomes foul from the oil of the tobacco. The pipe also requires to be cleaned very often, which is done with tow, by means of a long wire. Many poor men in Cairo gain a livelihood by cleaning pipes. Some of the Egyptians use the Persian pipe, in which the smoke passes through water. The pipe of this kind most commonly used by persons of the higher classes is called "nargeeleh," because the vessel that contains the water is the shell of a cocoa-nut, of which "nargeeleh" is an Arabic name. Another kind which has a glass vase, is called "sheesheh," from the Persian word signifying "glass." Each has a very long, flexible tube.

A kind of pipe commonly called "gozeh," which is similar to the nargeeleh, excepting that it has a short cane tube, instead of the snake, and no stand. This is used by men of the lowest class for smoking both the "tumbak" or Persian tobacco, and the narcotic hemp.

The Zoolus of Southern Africa have a kind of pipe or smoking horn called "Egoodu," which is constructed on a similar principle to the Persian pipe. The herb is placed at the end of a reed introduced into the side of an oxhorn, which is filled with water, and the mouth applies to the upper or wide part of the horn, the smoke passing down the reed and through the water.

The Delagoans of Eastern Africa smoke the "hubble-bubble," a similar instrument, having the upper part of the horn closed, excepting a small orifice in the centre of the covering through which the smoke is inhaled.

The Kaffirs form pipe bowls from a black, and also from a green stone; they are in shape similar to the Dutch pipes, and without ornament. The negroes of Western Africa have pipes of a reddish earth, some of them of very uncouth and singular forms, others close imitations of European pipe bowls. One kind of pipe consists of two bowls placed side by side upon a single stem. Old Indian pipes have been found in America, also fashioned out of green stone.

The natives of the South-West coast of Africa, near Elizabeth's Bay, use pipes in the shape of a cigar tube formed of a mottled green or white mineral of the magnesian family, externally carved or roughly ornamented.

In all parts of the Sultan's dominions, the pipe or narghile has a stem generally flexible, about six feet in length; and at this the owner will suck for hours. You may see a man travelling, mounted aloft on a tall camel, with his body oscillating to and fro like a sailor's when he rows, but still that man has his two yards of pipe before him. You may see two men caulking a ship's side as she lies careened near the shore. Up to their waists in water, they act up to the principle of division of labour; for one will smoke as the other plies the hammer, and then the worker takes his turn at the narghile. Arabs sitting at work, fix their pipes in the sand. In the potteries both hands must be employed—how, then, can the potter smoke? Necessity is the mother of invention. One end of the pipe is suspended by a cord from the ceiling, the other is in the potter's mouth.

In smoking, Lane informs us, the people of Egypt and other countries of the East draw in their breath freely, so that much of the smoke descends into the lungs; and the terms which they use to express "smoking tobacco," signify "*drinking* smoke," or "*drinking tobacco;*" for the same word signifies both smoke and tobacco. Few of them spit while smoking; he had seldom seen them do so. Isaac Browne thought, a century ago, that there was something in a pipe worth writing about, or he had never given us the following–

"ODE TO A TOBACCO PIPE"

"Little tube of might power,
Charmer of an idle hour,
Object of my warm desire,
Lip of wax, and eye of fire;
And thy snowy taper waist,
With thy finger gently braced;
And thy pretty swelling crest,
With thy little stopper prest;
And the sweetest bliss of blisses
Breathing from thy balmy kisses.
Happy thrice, and thrice again,
Happiest he of happy men;
Who, when again the night returns,
When again the taper burns,
When again the cricket's gay
(Little cricket full of play),
Can afford his tube to feed
With the fragrant Indian weed;
Pleasure for a nose divine,
Incense of the god of wine.
Happy thrice, and thrice again,
Happiest he of happy men."

Sniffing and Sneeshin

" 'Tis most excellent,' said the monk. 'Then do me the favour,' I replied, 'to accept of the box and all; and when you take a pinch out of it, sometimes recollect that it was the peace-offering of a man who once used you unkindly, but not from the heart.' "— Sterne's Sentimental Journey.

The word "snuff" is stated by competent authorities, to be an inflection of the old northern verb *sniff*, which latter word was in existence long before the invention or knowledge of the substance to which it now gives its name (Tooke says "Snuff is the past participle of the *sniff*, that which is *sniffed*."). In its earlier signification, it was expressive of strong inhalation through the nostrils, or descriptive of any impatience. Hence arose the expressions in use in the sixteenth and seventeenth centuries, the "snuff pepper"or "take in snuff." Shakespeare makes a similar use of the phrase in Henry IV., in connection with a small box of perfume displayed by a courtier to the annoyance of Hotspur.

"He was perfumed like a milliner;
And, 'twixt his finger and his thumb, he held
A pouncet box, which ever and anon
He gave his nose, and took't away again;
Who, therewith angry, when it next came there,
Took it in snuff."

In this quotation we also meet with the "pouncet box," which seems to have been a small box having a "pounced"or perforated cover, containing perfumes, the scent of which escaping from the open work at the top was regarded as a preservative against contagion. From the pouncet box the perfumes were inhaled. It was probably not till a century after the introduction of tobacco, that the triturated dust was commonly in use, and there became any occasion for the *snuff-box*.

The practice of using snuff is said to have come into England after the Restoration, and to have been brought from France; but it is well known that the habit of mere snuff-taking did not originate with the introduction of tobacco, since there are recipes for making snuff from herbs in the oldest medicinal works extant, The use of tobacco snuff has been referred to the age of Catherine de Medicis, and it was recommended to her son, Charles IX., for his chronic headaches. Snuff-taking was formerly characteristic of the medical profession; and the gold-headed cane and gold snuff-box came to be the peculiar emblems of those who were learned in the healing art.

As early as the beginning of the reign of James I., a "taker of tobacco" was furnished with an apparatus resembling that of a modern Scotch mull, when supplied with all the necessary implements. In 1609, Dekker, in his "Gull's Horn Book," says—"Before the meat come smoking to the board, our gallant must draw out his tobacco-box, the ladle for the cold snuff into the nostril, the tongs and priming iron; all which artillery may be of gold or silver, if he can reach the price of it." In 1646, Howell describes the apparatus and practice of snuff taking as quite common in other courntries; since, he says—"The Spaniards and Irish take tobacco most in powder or *smutchin*, and it mightily refreshes the brain; and I believe there's as much taken this way in Ireland, as there is in pipes in England. One shall commonly see the serving maid upon the washing block, and the swain upon the ploughshare, when they are tired of their labour, take out their boxes of smutchin, and draw it into their nostrils with a quill, and it will beget new spirits in them with a fresh vigour to fall to their work again."

The word printed "smutchin" by Howell, is stated to be more accurately "sneeshin," a vulgar name for snuff which causes sneezing; and hence "sneeshin mill" (sometimes corrupted into "mull") is the Scottish name for snuff-box. Dr. Jameson's Etymological Dictionary may be considered as an authority in these matters; and from it we learn that the word "mill" is the vulgar name for a snuff-box, especially one of a cylindrical form, or resembling an inverted cone. No other name was formerly in use in Scotland; and the reason assigned for it is, that when tobacco was first introduced into this country, those who wished to have snuff, were accustomed to toast the tobacco leaves before the fire, and then bruise them with a piece of wood in the box, which was thence called a "mill," because the snuff was ground in it. From all this, it is easy to perceive how a ram's horn, from its conical shape, became one of the primitive forms of the Scottish snuff-box, although latterly it is often one of the most costly and luxruious.

Down to the middle of the eighteenth century, the "sneeshin horn," with spoon and hare's foot attached to it by chains, appears to have been regarded as so completely a national characteristic, that when Baddeley played Gibby in "The Wonder," with Garrick, he came on the stage with such an apparatus.

The Mongrabins and other African races, according to Werne, are much addicted to snuff taking. The snuff they usually carry in small oval-shaped cases made out of the fruit of the Doum palm; these have a very small opening at one end, stopped up by a wooden peg; and the snuff is not taken in pinches, but shaken out on the back of the hand. Mr. Campbell, while traveling in South Africa, gave a Bushman a piece of tobacco. It was speedily converted into snuff. One of the daughters, after grinding it between two stones, mixed it with white ashes from the fire; the mother then took a large pinch of the composition, putting the remainder into a piece of goat's skin, among the hair, and folding it up for future use.

The snuff in use in Africa is not always made from tobacco. Mr. Hutchinson states that he saw at Panda, on the western coast, snuff made of the

powdered leaves of the monkey fruit tree (*Adansonia digitata*). That of the Zoolus is composed of the dried leaves of the dacca or narcotic hemp mixed with the powder of burnt aloes. Whether or not this was the kind of snuff which Mr. Richardson was knocked down with in his journey across the Great Desert, we are not in a position to determine; whatever it was, it appears to have been extremely powerful. "A merchant," he says, "offered me a pinch of snuff, and to please him I took a large pinch, pushing a portion of it up my nostrils. Immediately I felt dizzy and sick, and in a short time vomited violently. The people stared at me with astonishment, and were terrified out of their wits, and thought I was about to give up the ghost. They never saw snuff before produce such terrible effects. After some time I got a little better and returned home. This snuff was from Souf, and is called *war* (difficult). I had been warned of it, and therefore paid richly for my folly; indeed, the Souf snuff is extremely powerful." Some of the strict Mahometans of Ghadames consider snuffing, as well as smoking, prohibited by their religion, and therefore do not indulge in it. The South American traveler which Mr. Lizars, the tobacco antagonist, once fell in with, was evidently not a strict Mahometan, for he first filled his nostrils with snuff, which he prevented falling out by stuffing shag tobacco after it, and this he termed "plugging;" then put in each cheek a coil of pig-tail tobacco, which he named "quidding;" lastly, he lit a Havannah cigar, which he put into his mouth, and thus smoked and chewed—puffing at one time the smoke of the cigar, and at another time squirting the juice from his mouth. What a phenomenon! That gentleman should have politely thanked the South American for permitting him to view an exhibition, such as he may never have the pleasure of seeing again. And what a capital illustration ready made to his hands. It is almost equal to the amount of time consumed in taking so many pinches of snuff during the day, and so many of the operation of blowing the nose.

Lord Stanhope makes the following curious estimate: "Every professed, inveterate, and incurable snuff-taker, at a moderate computation, takes one pinch in ten minutes. Every pinch, with the agreeable ceremony of blowing and wiping the nose, and other incidental circumstances, consumes a minute and a half. One minute and a half out of every ten, allowing sixteen hours to a snuff-taking day, amounts to two hours and twenty minutes out of every natural day, or one day out of every ten. One day out of every ten amounts to thirty-six days and a half in the year; hence, if we suppose the practice to be persisted in for forty years, two entire years of the snuff-taker's life will be dedicated to tickling his nose, and two more to blowing it." The expense of snuff, snuff boxes, and handkerchiefs is also alluded to; and it is calculated that "by a proper application of the time and money thus lost to the public, a fund might be constituted for

A correspondent of the "Petersburg (Va) Express" says:—"There are, perhaps, in our state 125,000 women, leaving out of the account those who have not cut their teeth, and those who have lost them from age. Of this number, eighty per cent. may be safely set down as snuff-dippers. Every five of these will use a two-ounce paper of snuff per day—that is to the 100,000 dippers 2,500 lbs. a day, amounting to the enourmous quantity of 912,000 lbs. In this number of snuff-dippers are included all ages, colours, and conditions. This practice is generally prevalent in the pine districts of North Carolina, and in many parts of South Carolina, Georgia, Alabama, Florida, and Eastern Tennessee. It may be thus described;—A female snuff-dipper takes a short stick, and, wetting it, dips it into her snuff-box, and then rubs the gathered dust all bout her mouth, into the interstices of her teeth, &c., where she allows it to remain until its strength has been fully absorbed. Others hold the stick thus loaded with snuff in the cheek, *a la* quid of tobacco, and suck it with a decided relish, while engaged in their ordinary avocations; while others simply fill the mouth with the snuff, and thus imitate, to all intents and purposes, the chewing propensities of the men. In the absence of snuff, tobacco, in the plug or leaf, is invariably resorted to as a substitute. Oriental chewing is elegant, compared to "snuff-dipping."

The most uncomfortable reflection to the snuffer is that which concerns the probability of his consuming himself by a condition of slow poisoning, not the result of the pure tobacco, but its impure associates in the box. In boxes lined with very thin lead, but especially in cases where the leaden lining is thicker, and which are much used by the Paris retailers, a chemical action takes place, the result of which is to charge the snuff with subacetate of lead. This result was suspected by Chevalier, and has been confirmed by Boudet of Paris, and Mayer of Berlin, by careful experiments. Mayer traces several deaths and cases of saturnine paralysis to the patient's having taken snuff from packets, the inner envelope of which was thin sheet lead, in constant contact with the powdered weed. The cry once heard of "death in the pot," requires now to be exchanged for "death in the box," and Holbein to give us a new plate of the skeleton form emerging from a packet or snuff-box containing the scented rappee.

Late investigations have shown that no small amount of adulteration is practised with snuff, and this in some instances of a most dangerous kind. Out of forty-three samples of snuff examined by Dr. Hassell, the majority were adulterated considerably. Chromate of lead, oxide of lead, and bichromate of potash, all highly poisonous, were detected. Mr. Phillips also stated to the committee of adulteration, that he had found in different samples common peat, such as is obtained from the bogs of Ireland, starch, ground wood of various kinds, especially fustic,

extract of logwood, chromate of lead, bichromate of potash, and various ochreous earths. Samples of spurious snuff, it is presumed for the purpose of mixing, were found to be composed of sumach, umber, Spanish brown, and salt; another kind was made up of ground peat, yellow ochre, lime, and sand, all of these being more or less scented.

The numerous varieties of snuff owe their character principally to the peculiarity of scent and the method of preparation. The perfumes used are either the essential oil of bergamot or otto of roses, and in some cases powdered orris root or Tonquin beans. The powdered leaves of the sweet-scented woodruff and the fragrant melilot have been alluded to as used for the same purpose, also the dried leaves of some species of orchis (*Orchis fusca*, &c.).

In India, snuff-boxes are made of polished cocoanut shell, or of the seeds of *Entada gigalobium*, or *pursoetha*; or in Nepal, of a small kind of calabash or gourd, apparently resembling those used for the same purpose, at the distance of 5,000 miles in the South of Africa; excepting, that in some instances, the gourds of Nepal and of Scinde, are ornamented with mountings of gold or silver, a luxury in which the African does not indulge. In the same part of Africa, among the Zoolu Kaffirs, other kinds of snuff-boxes, of smaller size, are in common use. These are made of the seeds of a species of Zamia, ornamented with strings of small beads, and are worn suspended as earrings, from the ears of the natives.

In China, flasks are used, the form and size of a smelling bottle; these are of different kinds of material, some being cut out of rock crystal, and others made of porcelain and similar plastic substances. Snuff-takers are less numerous in China than smokers of tobacco; in powder, or as the Chinese say, "smoke for the nose," is little used, except by the Mantchoo Tartars and Mongols, and among the Mandarins and lettered classes. The Tartars are real amateurs, and snuff is with them an object of the most important consideration. For the Chinese aristocracy, on the contrary, it is a mere luxury—a habit that they try to acquire—a whim. The custom of taking snuff was introduced into China by the old missionaries who resided at the Court. They used to get the snuff from Europe for themselves, and some of the Mandarins tried it, and found it good. By degrees the custom spread; people who wished to appear fashionable, liked to be taking this "smoke for the nose;" and Pekin is still *par excellence*, the locality of snuff-takers. The first dealers in it made immense fortunes. The French tobacco was the most esteemed; and as it happened at this time, that it had for a stamp the ancient emblem of the three *fleur de lis*, the mark has never been forgotten, and the three *fleur de lis* are still in Pekin, the only sign of a dealer in tobacco. The Chinese have now, for a long time, manufactured their own snuff, but they do not subject it to any fermentation, and it is not worth much. They merely pulverize the leaves, sift the powder till it is as fine as flour, and afterwards perfume it with flowers and essences. A curious method of snuffing, requiring neither box nor flask, is noticed in the "Voyages and Researches of the *Adventure* and *Beagle*." At Otaheite, a substance, not unlike powdered rhubarb in appearance, but of a very pleasant fragrance, is rubbed on a piece of shark's skin stretched on wood; and an old man, who had one of these snuff sticks in his possession, valued it so hightly, that he could not be induced to part with it.

The method of taking snuff in Iceland is described by Made. Pfeiffer as differing from the methods above detailed, but equally singular. Most of the peasants, and many of the priests, have no proper snuff-box, but only a box made of bone, and shaped like a powder flask. When they take snuff, they throw back the head, insert the point of the flask in the nose, and shake a dose of snuff in it. They then offer it to their neighbour, who repeats the performance, passes it to his, and thus it goes the round until it reaches its owner again. Had this been the custom in the days of the "Rape of the Lock," Belinda had not so readily subdued the baron, as with one finger and a thumb—

> *"Just where the breath of life his nostrils drew,*
> *A charge of snuff the wily virgin threw;*
> *The gnomes direct, to every atom just,*
> *The pungent grains of titillating dust.*
> *Sudden, with starting tears each eye o'erflows,*
> *And the high dome re-echoes to his nose."*

The Zoolus of Southern Africa use a small gourd to carry their snuff, and a small ivory spoon with which to ladle out the dust. We remember many years ago an elderly gentleman who practised on the Zoolu plan, his snuff was carried loose in his waistcoat pocket, whence it was conveyed to his nose by means of a small silver spoon, which was always at hand for the purpose.

> "For I must, (nor let it grieve thee,
> Friendliest of plants, that I must) leave thee;
> For thy sake, Tobacco, I
> Would do anything but die;
> And but seek to extend my days
> Long enough to sing thy praise.
> But as she, who once hath been
> A king's consort, is a queen
> Ever after, nor will bate
> Any title of her state,
> Though a widow, or divorced,
> So I, from thy converse forced,
> The old name and style retain,
> A right Katherine of Spain;
> And a seat, too, 'mongst the joys
> Of the blest Tobacco boys;
> Where, though I, by sour physician,

Am debarred the full fruition
Of thy favours, I may catch
Some collateral sweets, and snatch
Sidelong odours, that give life,
Like glances from a neighbour's wife;
And still live in the by-places,
And the suburbs of thy graces;
And in thy borders take delight,
An unconquered Canaanite."

Charles Lamb

Yes! St. John (Percy, we mean— not "the Divine"), there must be "magic in the cigar." Then, to the sailor, on the wide and tossing ocean, what consolation is there, save in his old pipe? While smoking his inch and a half of clay, black and polished, his Susan or his Mary becomes manifest before him, he sees her, holds converse with her spirit—in the red glare from the ebony bowl, as he walks the deck at night, or squats on the windlass, are reflected the bright sparkling eyes of his sweetheart. The Irish fruit-woman, the Jarvie without a fare, the policeman on a quiet beat, the soldier at his ease, all bow to the mystic power of tobacco—all acknowledge the infatuations of CLOUDLAND.

CONSUMPTION OF TOBACCO IN 1860

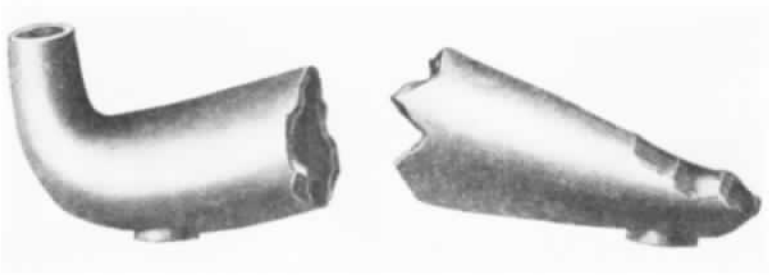
COUNTRIES	Average consumption of male population per head, over 18 years of age.	Net Revenue from Tobacco.
Austria	6.75 lbs.	£1,212,530
Zollverein	9.75 lbs.	296,560
Steurverein, including Hanover and Oldenburg	12.50 lbs.	12,420
France	5.50 lbs.	3,058,256
Russia	2.50 lbs.	284,280
Portugal	3.50 lbs.	304,140
Spain	4.75 lbs.	1,268,082
Sardinia	2.75 lbs.	246,192
Tuscany	2.50 lbs.	84,860
Papal States	2.00 lbs.	297,252
Two Sicilies		168,422
Britain	4.10 lbs.	5,272,471
Holland	8.25 lbs.	6,210
Belgium	9.00 lbs.	28,014
Denmark	8.00 lbs.	10,488
Sweden	4.07 lbs.	14,76
Norway	6.40 lbs.	23,322
United States	7.60 lbs.	

Flowering top of the commonest tobacco species ***Nicotiana tabacum.***

Surimono representing Daikoku, one of the seven gods of luck, smoking a tobacco pipe.

Flowering top of another tobacco species ***Nicotiana rustica.***

Bas-relief from an altar at Palanque, Mexico showing an Aztec smoking tobacco.

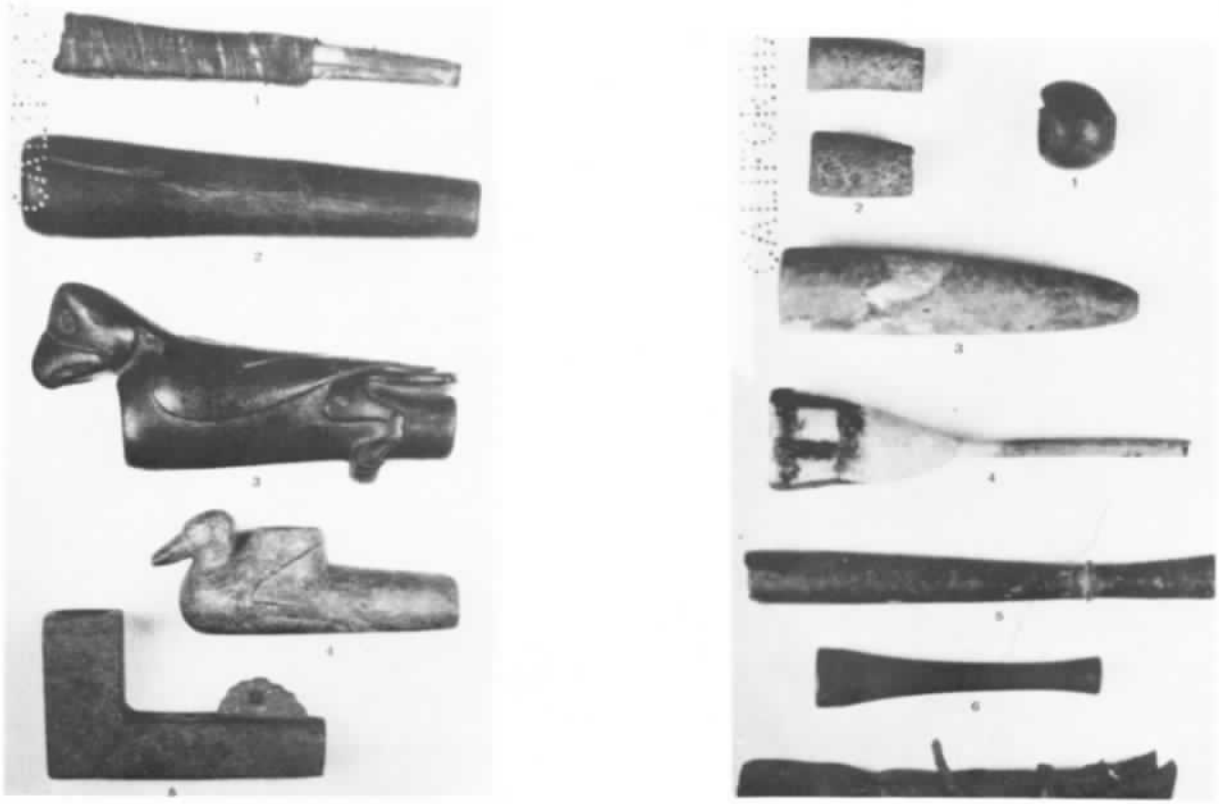


Prehistoric clay apparatus suggesting a pipe. From Germany.

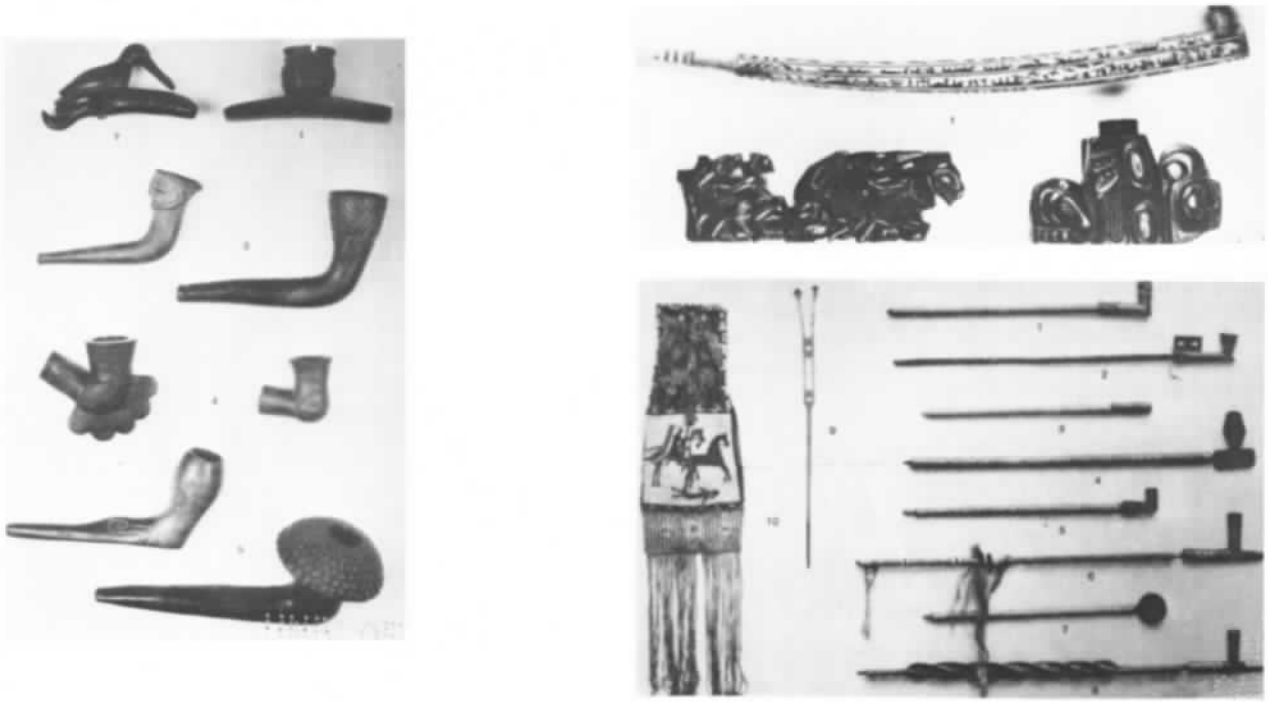
Precolumbian pipes from North America. 1, 2. Frog and head pipes from Ohio. 3. Georgia. 4. Raccoon pipe from Illinois. 5, 6. Kentucky. 7. Remarkable pipe from Iowa apparently representing an elephant (or mastadon). 8. Tennessee. 9. West Virginia. 10, 12. Arizona. 11. Pennsylvania. 13, 14, 15. Pipes from Georgia, two of which are very bizarre animal (bird?) designs.

North American Indian pipes. 1. From Kentucky, 2.5 cm long. 2. Oregon about 3 cm long, made from Mexican limestone. 3. Bird with man's head from Ohio. 4. Tennessee, 15 cm long. 5. Double headed pipe made of catlinite. 6. Dakota Sioux pipe with lead ornamentation. 7. Dakota catlinite pipe. 8. Maine. Totemic Micmac pipe. 9. Delaware pipe with turtle. 10. Horn pipe from Massachusetts. 11. Hupa pipe. 12. Serpentine pipe from Georgia adorned with turkey tracks. 13. Missouri sandstone pipe with hunter about 15 cm long. 14. Animal pipe with recumbent figure from California. About 12 cm long. 15. English Tomahawk pipe with inscription "H. Knox" on blade. About 20 cm long.

Precolumbian representation of an Aztec priest with a tobacco pouch on his back as a sign of rank.



American Indian tobacco pipes. Left: 1. Cheyenne antelope bone. 2, 3. Johnson County Illinois steatite pipes. 4, 5. Southeastern U.S. steatite pipes. Right: 1. Bowl of basketmaker pipe. 2. Bowl of southwestern tubular pipe. 3. Southwestern sandstone tubular pipe. 4. California clay pipe. 5. California steatite pipe. 6. California pipe with steatite bowl, wood stem and case.



American Indian tobacco pipes. Left: 1. Monitor pipe, Hopewell mounds, Ohio. 2. Bird and fish pipe, Hopewell mounds, Ohio. 3. Iriquois clay pipe. 4. Modern Catawba clay pipes. 5. Toltec clay pipes from Mexico. Bottom: 1, 2. Pawnee sacred pipes. 3. Cheyenne sun dance pipe. 4. Blackfoot pipe. 5-7. Cheyenne. 6-8. Sioux. 9. Sioux pipe bag. Top: 1. Eskimo pipe of walrus tusk. 2. Haida pipe of wood. 3. Haida pipe of black slate.

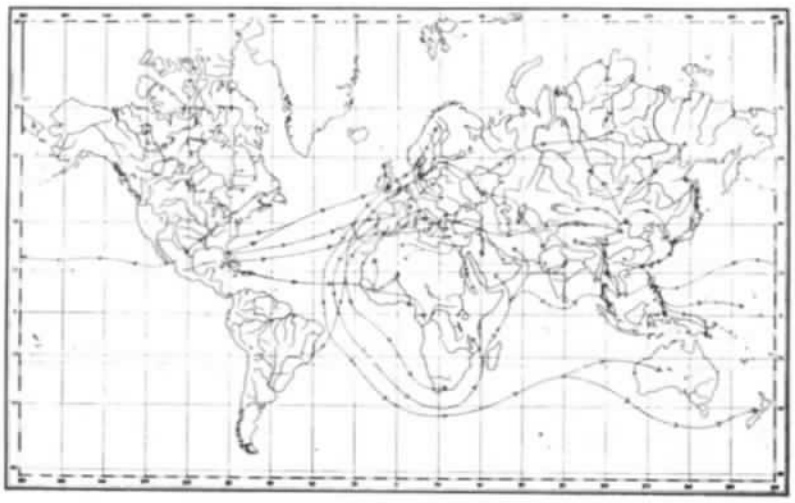
Feather decorated North American Indian calumet (ceremonial tobacco pipe).

Pawnee priests smoking tobacco about 1900.

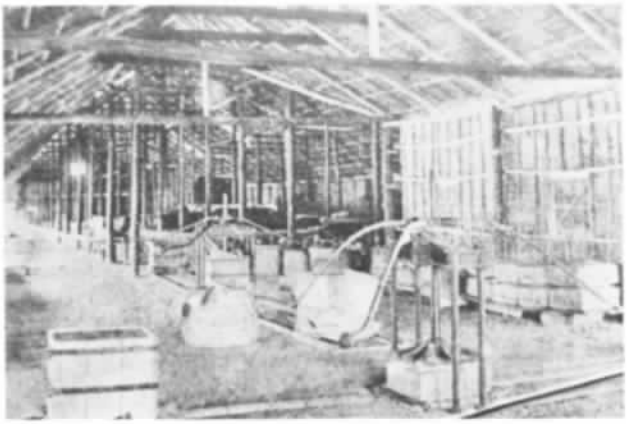
Black slate pipes of the Haidah Indians of Queen Charlotte Island, Canada.

South American Indian tobacco pipes. 1. Blackstone pipe with man's head of bone from Peru. 2. Brazilian stone pipe. 3, 4, 5. Papayna ceremonial pipes. 6. Chaco pipe. 7. Brazilian wooden pipe. 8, 9. Pipes from Gran-chaco. The eye is a glass bead. 10. A penis pipe from Matto Grosso with beads on neck and ankles. 11. Penis pipe of the Chaco Indians.

Central and South American tobacco pipes. Above left: From Paraguay and Tapajoz rivers in Paraguay and Brazil. The rest are from Mexico, those at the lower right having incised bird head designs.



Routes of the spread of tobacco over the earth after its discovery by Columbus.



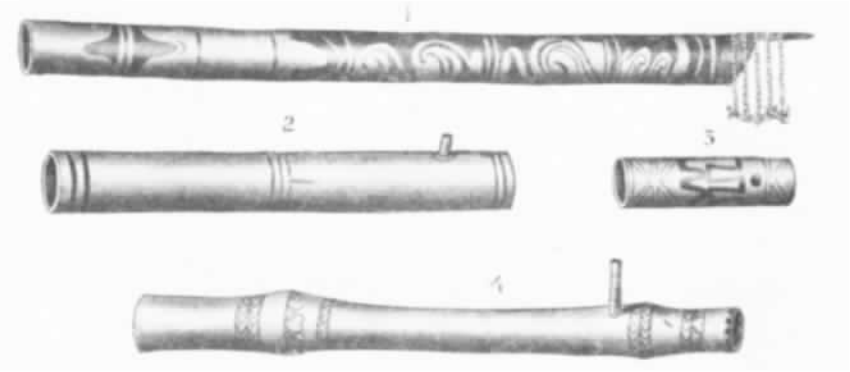
Tobacco cultivation. Above: Puerto Rican tobacco plantation around the turn of the century showing what was then a novel technique - covering the young plants with gauze to protect them from sun and insects and to maintain high temperature and humidity. Below: Sumatran plantation about 1890 showing drying sheds and young plants being shaded with pieces of wood.

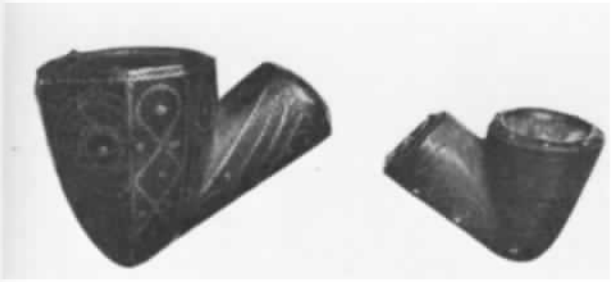
Tobacco production in Sumatra. Above: the interior of a fermentation shed. Below: another fermentation shed at a later stage showing the presses and the bales of pressed tobacco.

Tobacco plant collected in 1592. From the city herbarium Kassel, Germany.

African tobacco pipes. 1. Monbuttu wood pipe wrapped with copper, about 2 cm long. 2. Monbuttu pipe 2.2 cm long. 3. Baia pipe 50 cm long with clay head, copper wrapped stem and gourd mouthpiece. 4. Nilotic Negro pipe 55 cm long. 5. Ashanti double headed pipe. 6. Karagwe double headed pipe. Dagombo (Togo) pipehead. 8. Ovambo pipe head used with waterpipe for hashish. 9. Kaffir pipe from South America. 10, 11. Zulu stone head pipes. 12. Nilotic Negro tobacco container about 20 cm high. 13, 14. Stone pipes from Cape Town with openings for regulating air flow. 15. Antelope horn pipe from Upper Congo. 16. Bamboo pipe from Upper Congo. 17. Clay pipe from Central Africa with gourd mouthpiece.

Pipe heads of red clay made by Bali negroes. 1/2 natural size.





Algerian pipe heads made from the wood of ***Callitris quadrivalvis*** *and inlaid with brass and red beads. About 2/3 natural size.*

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*An Iranian waterpipe (**ghalian**) about 1/9 natural size.*

Arahuac pipes and tobacco pouch made from the neck skin of the rhea (South American ostrich). From the top left they are of wood, red clay, silver, stone, silver. 1/4 natural size.

Waterpipes made from coconuts, the longer from Cairo, the shorter from Oran. About 1/8 natural size.

Asiatic tobacco pipes. 1, 2. Pipe and tobacco box from Sumatra. 3, 4. Ainu box and pipe from Japan. 5. New Guinea wood pipe. 6. Bamboo stem pipe of the Lawa of southeast Asia. 7. Papuan pipe from New Guinea with special handgrip. 8. Shan pipe from Burma with bamboo stem and light red wooden bowl. 9, 10, 11. Philippine pipes of the Igorroten and Guianen people of Luzon. 13. Samojeden pipe of fossil ivory with metal inlay. 12. Pipe

Tobacco in Africa. Shown are a variety of 19th century pipes of wood, clay and brass, the more ornate ones probably being reserved for ceremonial use.

Turks smoking waterpipes in an Istanbul coffeehouse about 1900.

Iranians smoking tobacco about 1900. At the left is a ***tschibugh*** *and at the right a* ***ghalian*** *(waterpipe).*

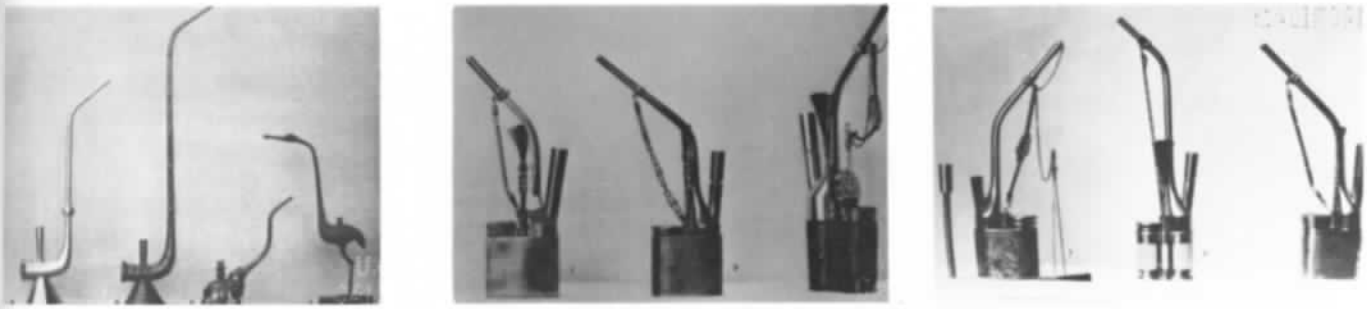
Japanese tobacco paraphernalia. The three bamboo pipe cases have attached tobacco containers, the upper two of bamboo, the lower right one of leather. At the lower left is a woman's pipe in a silk case and below it the usual type of man's leather tobacco pouch.

Japanese tobacco accessories box. The bamboo container on top is for pipe ashes. The porcelain dish is for coals with which to light the pipe.

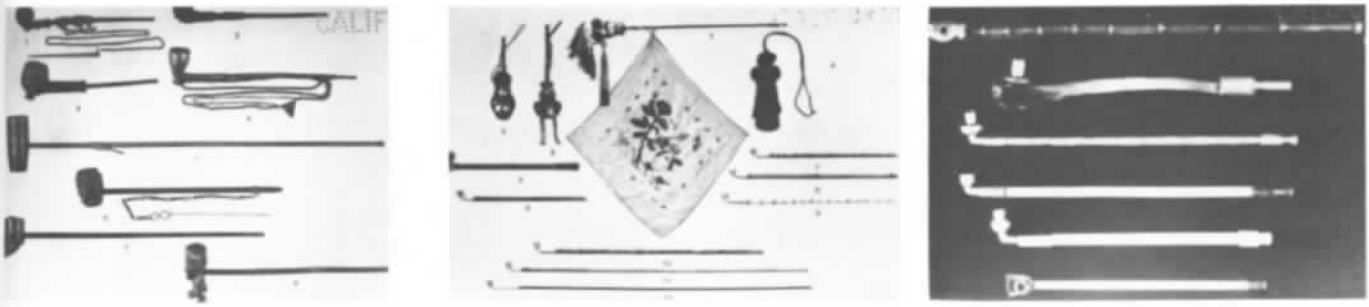
Japanese colored woodcut of women smoking tobacco. The woman at the right has a pipe in her hand and a pipe and tobacco pouch in her lap. The middle woman has a tobacco accessories box and a pipe.

Japanese tobacco pipes. The second is of silver, the fourth has a head and a mouthpiece of porcelain and the fifth is of clay.

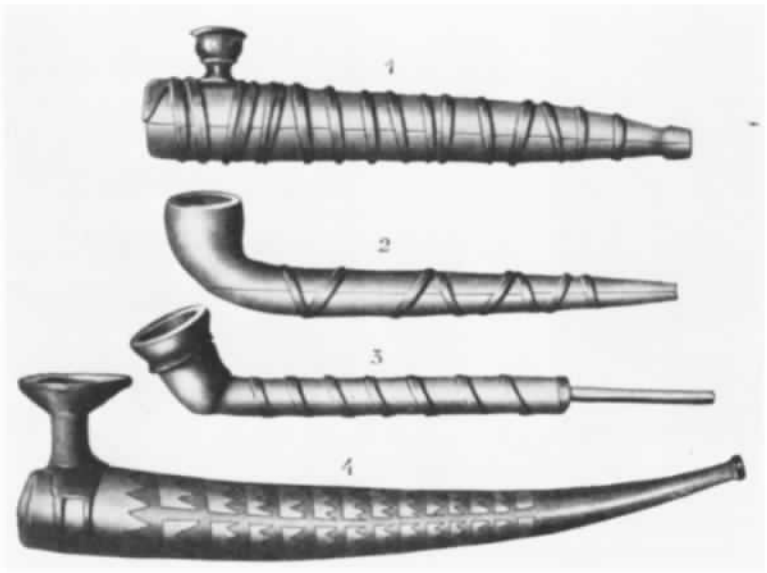
Smokers in 1890's China. The two lying down are smoking opium and the other two are smoking tobacco. The one at the left has a pipe over 1 m long while the one at the right has a water pipe of the type shown in the next figure.



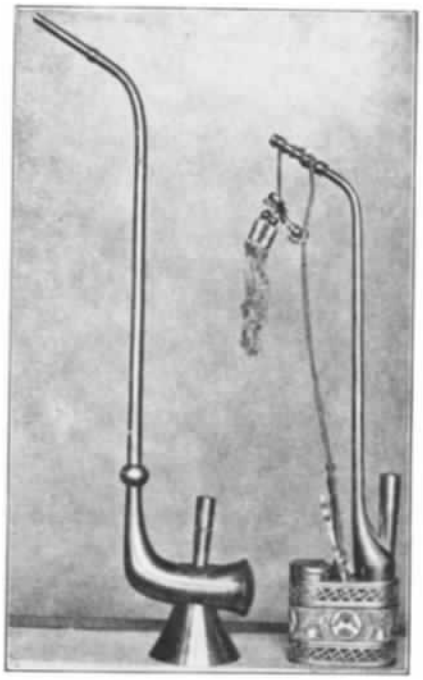
Chinese water pipes usually used for tobacco. 1-3 at left are from the 18th century.



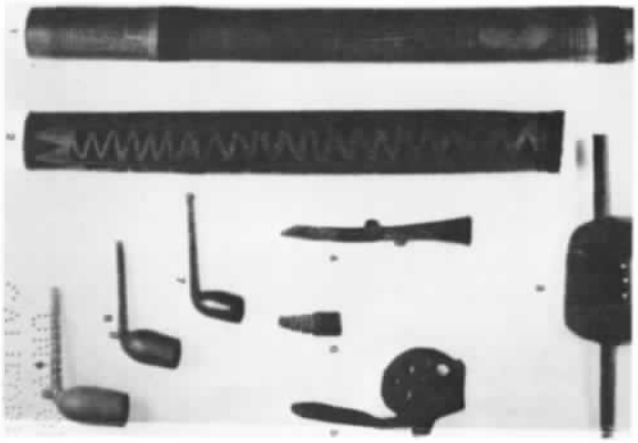
Asiatic tobacco pipes. Left: 1-4 from Philippines. 5-8 from Taiwan. Center: Chinese tobacco pipes and pouches except 5 which is an opium pipe. Right: Chinese pipes.



Siberian tobacco pipes. 1. From St. Gallen. 2, 3. from Burjaeten and 4 from the Eskimoes. About 1/3 natural size.



Chinese waterpipes. In contrast to the simple one at the left, the right hand specimen has elaborate metal work, a tobacco container and cleaning tools.

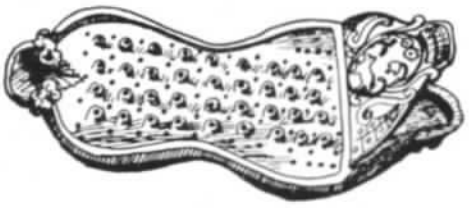


Burmese woman smoking cigar. Tobacco smoking became known in southeast asia in the second half of the 16th century. The women's chewots or cheroots differed from those of the men, being some 24 cm long, wrapped in flower parts of the betel nut palm or leaves of corn or bamboo and tied with cotton thread. In addition to the chopped roots, leaves and stems of tobacco they contained ***Euphorbia*** *roots,* ***Streblus*** *pith, coarse palm sugar and sometimes finely chopped banana leaves.*

Tobacco smoking in the South Pacific. Below: two groups of Papuans smoking cigarettes inserted in a hole in the end of the large bamboo pipe. Above are: 1, 2. bamboo pipes from Papua. 3-6. Wood pipes from Arfak Mtns. of Dutch New Guinea. 7-9. Clay pipes from Buka in the Solomon Islands.

One type of hallucinogenic snuff used by South American Indians is made from the resin of various species of the Genus ***Virola*** *of the family Myristicaceae. It contains compounds similar to dimethyltryptamine. The map shows the area of its use and a flowering branch of* ***Virola theiodora*** *is shown. A Waika Indian of the Rio Tototobi, Brazil is grinding the resin for the snuff (nyakwana) and his comrades are cleaning and drying leaves of* ***Justicia pectoralis*** *variety* ***stenophylla,*** *another component of the snuff. Other additives often contain monoamine oxidase inhibitors which potentiate the action of tryptamines. Also shown are snuffing tubes and related paraphernalia for preparing yopo snuff (****Anadenanthera peregrina****) of the Guahibo of Rio Orinoco, Columbia. Research and photos by R. E. Schultes, who has pioneered in this area.*

Apparatus for the use of tobacco snuff. 1. Walrus bone snuff box from Alaska, carved in the shape of a walrus. 2. Kaffir snuff container from South Africa. 3. Hottentot snuff spoon from South Africa. 4. Bone container for snuff made by the Betschuana. 5. Ovambo snuff container and spoon.

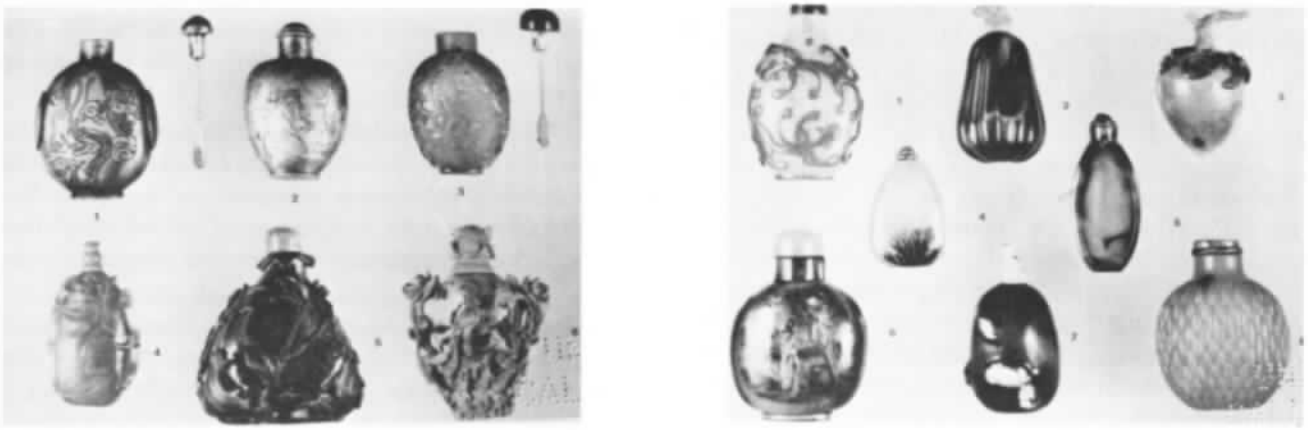


Rasp for pulverising snuff tobacco in 17th century Europe.

Two Chinese porcelain tobacco snuff containers and a Japanese snuff flask (below). The lid of the right hand container has been removed to show the snuff spoon attached. 1/2 natural size.

Hallucinogenic snuffs and drinks of varying composition are widely used by South American indians. One method of use is blowing a tube full of the powder into a friends nose as demonstrated by the Venezuelan Indians below. Above are Venezuelan snuff holders (1) and double tubes (2) for blowing into both nostrils simultaneously; (3) mortar and pestle for grinding snuff used by the Guahibo Indians of Columbia and a snuff taker used by the Tuyuka Indians of Columbia.

Siberian tobacco snuff containers. The middle one is of birchbark, the other two of bone.



Snuff containers from China (above) and Tibet (below).

COFFEE—

Coffea arabica

The name of coffee is given to a beverage prepared from the seeds of plants roasted, ground, and infused in boiling water. The seeds of the Arabian coffee-tree are most largely used for this purpose, but various other seeds are more or less extensively employed in a similar way.

Arabian Coffee.—The tree which produces this seed is said to be indigenous to the countries of Enarea and Caffa in southern Abyssinia. In these districts the coffee-tree grows like a wild weed over the rocky surface of the country. The roasted seed or bean has also been in use as a beverage in Abyssinia generally, from time immemorial and is at the present day extensively cultivated in that country. In Persia it is known to have been in use as early as the year 875. From Abyssinia it was introduced into Arabia in the beginning of the fifteenth century, when it partly superseded the older chaat, or Abyssinian tea. About the middle of the sixteenth century it began to be used in Constantinople, and in spite of the violent opposition of the priests, became an article of general consumption. In the middle of the seventeenth century (1652), the first coffee-house was opened in London by a Greek named Pasqua; and twenty years after, the first was established in Marseilles. Since that time both the culture and consumption of coffee have continually extended. It has become the staple produce of important colonies, and the daily and most cherished drink of probably more than a hundred millions of men!

The consumption in the United Kingdom in 1852 amounted to 35 millions of pounds, of which upwards of 20 millions were brought from Ceylon, 4 millions from Jamaica, and 8 millions from Costa Rica and Brazil. On the Continent it is much more generally used than among ourselves. The total European consumption was estimated a few years ago at 75 thousand tons, or 168 millions of pounds, valued at 4½ millions sterling. It probably approaches now to 200 millions of pounds. The entire weight of coffee raised over the whole world is guessed at about 600 millions of pounds (1855).

The quality of raw coffee does not appear to depend so much on the mode of collecting and drying it as that of tea does. Soil and climate are the circumstances which chiefly affect its commercial value. The flavour and quality of the beverage prepared from it depend very much, however, upon the manner of roasting the bean, and of subsequently preparing the infusion.

The Arabian or Mocha coffee is small, and of a dark yellow colour. The Javan and East Indian are larger, and of a paler yellow. The Ceylon, West Indian, and Brazilian have a bluish or greenish grey tint.

The coffee-tree when in good health, and full grown, attains a height in some countries not exceeding 8 or 10, but in others averaging from 15 to 20 feet, and is covered with a dark, smooth, and shining folliage. It is sown in nurseries—transplanted when about six months old—in three years comes into full bearing, and in favourable circumstances will continue to bear for twenty years. It delights in a dry soil and a warm situation. On dry and elevated spots the berries are smaller, and have a better flavour; but berries of all sizes improve in flavour or *ripen* by keeping. The small berries of Arabia will ripen in three years, but the worst coffee produced in America will, in from ten to fourteen years, become "as good, and acquire as high a flavour, as the best we now have from Turkey."—(Ellis.)

The sensible properties and effects of coffee, like those of tea, are too well known to require to be stated in detail. It exhilarates, arouses, and keeps awake; it allays hunger to a certain extent, gives to the weary increased strength and vigour, and imparts a feeling of comfort and repose. Its physiological effects upon the system, so far as they have been investigated, appear to be, that, while it makes the brain more active, it soothes the body generally, makes the change and waste of matter slower, and the demand for food in consequence less. All these effects it owes to the conjoined action of three ingredients, very similar to those contained in tea. These are a volatile oil produced during the roasting—a variety of tannic acid, which is also altered during the roasting—and the substance called theine or caffeine, which is common to both tea and coffee.

First, The Volitile Oil.—When the coffee-bean is gathered and dried in the air it has little smell, and only a slightly bitter and astringent taste. As with the tea-leaf, it is during the roasting of coffee that the much prized aroma and the greater part of the taste and flavour are brought out or produced. In tea, as we have seen, the proportion of volatile oil amounts about one pound in a hundred of the dried leaf, but in roasted coffee it rarely amounts to more than one in fifty thousand! And yet on the different proportions of this oil which they severally contain, the aroma and the consequent estimation in the market of the different varieties of coffee in a great measure depend. A higher aroma would make the inferior Ceylon, Jamaica, and East Indian coffees nearly equal in value to the finest Mocha; and if the oil could be bought for the purpose of imparting this flavour, it would be worth in the market as much as £100 sterling an ounce!—(Payen). How it comes—by what slow chemical change within the bean, that is, that coffee of the most inferior quality so ripens by keeping as at length to yield, on roasting, a coffee equal to the finest Mocha, we do not as yet know. The oil is formed during the roasting by the action of the heat on some substance present in the natural bean, probably in small quantity only. It is possible

formed in the inferior qualities of coffee; so that when roasted after the keeping a larger quantity of the valuable aromatic oil is formed in the bean.

Second, The Astringent Acid.—The raw coffee contains about 5 per cent. of an astringent acid—the caffeine or caffee-tonic—which does not blacken a solution of iron, as the infusion of tea does, but renders it green, and does not precipitate solutions of gelatine. This acid is changed to some extent during the roasting, but still retains a portion of its astringent properties, and contributes in some degree to the effects which the infusion of coffee produces upon the system.

It will be observed that the proportion of this astringent principle contained in coffee is much less than is contained in tea. Hence it is not sufficient to retard the action of the bowels as tea does, especially when associated with the empyreumatic volatile oil, which, as we have seen, has a positive tendency to move them. To the same result the large percentage of fat contained in coffee may also contribute.

Third, The Theine, or Caffeine as it is also called, exists in different proportions in different varieties of coffee. It varies in the coffee usually employed in this country from three quarters of a pound to one pound in the hundred—(Stenhouse),—though according to some experimenters, three or four pounds in the hundred occur in certain varieties of coffee. By rubbing common roasted coffee in a mortar with a fifth of its weight of slaked lime, and then boiling the mixture in alcohol, about half a per-cent. of theine may be readily extracted. Weight for weight, therefore, tea yields about twice as much theine as roasted coffee does to the water in which it is infused. But as we generally use a greater weight of coffee than we do of tea in preparing our beverages, a cup of coffee of ordinary strength will probably contain as much theine as a cup of ordinary tea.

But the coffee-bean contains also about thirteen per cent. of nutritious gluten, which, as in the case of tea, is very sparingly dissolved by boiling water, and is usually thrown away in the insoluble dregs of the coffee. Among some of the Eastern nations, the custom prevails of drinking the *grounds* along with the infusion of the coffee: in these cases the full benefit is obtained from all the positively nutritive matter which the roasted coffee contains.

The composition of unroasted coffee, compared with the average composition of the tea-leaf as it comes to Europe, is nearly as follows:—

	TEA (Mulder)	COFFEE (Payen)
Water	5	12
Gum and sugar	21	15½
Gluten	25	13
Theine	½	¾
Fat and volatile oil	4	13
Tannic acid	15	5
Woody fibre	24	34
Ash	5½	6¾
	100	100

The proportion of theine in both tea and coffee, it will be recollected, is somewhat varible.

Coffee swells by roasting, but loses in weight, and asumes a brown colour more or less dark. These changes vary, however, with the degree of roasting. Thus—

Roasted to a	It loses in weight	And gains in bulk
Reddish brown	15 per cent	80 per cent
Chestnut brown	20 per cent	50 per cent
Dark brown	25 per cent	50 per cent

The aroma is most agreeable when the heat is not greater than is sufficient to impart a light brown colour to the bean. When the roasting is carried too far a disagreeable smell gradually mingles with the esteemed aroma, and lessens the value of the product.

The quality of the coffee-bean which is taken up by water is nearly the same before and after roasting. It is nearly the same also in some samples, whether they be much or little roasted. It differs, however, very much in different samples. Thus three experimenters found that water extracted from the samples of roasted coffee they examined, the following proportions per cent.:—

	Payen.	Cadet.	Lehman.
Reddish brown,	37.0	12½	21½
Chestnut brown,	37.1	18½	—
Dark brown,	37.2	23½	—

Some infusions of coffee, therefore, even when roasted to the same extent, contain three times as much of the solid substance of the coffee as others do. But we have no experiments upon the comparative effects which infusions so differing have upon the constitution of the drinkers. It is observed that some natural waters give a stronger and better flavoured coffee than others; and this has been traced, as in Prague, to the presence of alkaline matter in those which give the most agreeable infusion. Hence, to obtain a more uniformly strong and well-flavoured coffee, it is recommended to add a little soda to the water with which the infusion is made. About forty grains of dry, or twice as much of crystallized carbonate of soda, are sufficient for a pound of coffee.

The chemical changes caused by the roasting, are the production of the active empyreumatic oil, and of a brown, bitter substance, the chemical properties of which, and its action upon the system, still remain to be investigated. They are produced from the soluble part of the raw bean, but by what chemical changes is not yet known. In conclusion, it is proper to state that coffee is reputed to possess important medicinal virtues. The great use of coffee in France is supposed to have abated the prevalence of the gravel. In the French colonies, where coffee is more used than in the

English, as well as in Turkey, where it is the principal beverage, not only the gravel, but the gout, is scarcely known. Among others, also, a case is mentioned of a gentleman who was attacked with gout at twenty-five years of age, and had it severely till he was upwards of fifty, with chalk stones in the joints of his hands and feet; but the use of coffee then recommended to him completely removed the complaint.

It has not been determined to which of the constituents of coffee this curative action is due, or whether it is the same in all constitutions. These points are worthy of careful experimental investigation.

Other Coffees.—Besides the real *Coffea arabica*, other species of the coffee-plant are grown in various countries, and yield a useful marketable bean. Thus, in Silhet and Nepaul, the *Coffea benghalensis* is cultivated; on the coast of Mosambique, the *Coffea mosambicana;* on the coast of Zanguebar, the *C. zanguebaria*; and in the Mauritius, the *C. mauritiana.* The seed of the last of these tastes disagreeably sharp and bitter, and sometimes causes vomiting, yet it is in some places cultivated instead of the *Coffea arabica.* It is possible that these so-called different species may, like the varieties of the tea-plant, be only differently modified forms of the same original species.

But, besides the fruit of the different coffee-plants, numerous other vegetables have, in different countries, been proposed or used as substitutes for Arabian coffee. A successful substitute must contain, like coffee, a fragrant aromatic principle, a bitter principle, and an astringent principle. These properties are found more or less satisfactorily—

a. In the roasted seeds of *Iris pseudacoris* (yellow water-iris), which are said to approach very near to coffee in quality.

b. In the seeds of a Goumelia, called in Turkey Kenguel, which were shown at the Great Exhibition as extensively cultivated in the Kair-ar-eh and Komah, where they are roasted, ground, and used as coffee.

c. In the roasted acorn, which is said to be much used on the Continent under the name of acorn coffee.

d. In the cicer or chick-pea roasted; in beans rye, and other grains; in nuts, almonds, and even in wheaten bread, when roasted carefully.

e. In the seeds of Broom(*Spartium scoparium*), and in the dried and roasted berries of the *Triosteum perfoliatum* (Caprifoliaceae). In the West Indies, the seeds of several species of Psychotria (Cinchonaceae); in Soudan, those of Dura and Nitta (*Inga bigtobosa*); among the African negroes, those of *Parkia (Africana)*; and among the Tonguses, those of a species of Hyoscyamus—are all employed as substitutes for coffee.

f. In the dried and roasted roots also of many plants. The carrot and turnip are used for this purpose, but more commonly the roots of the common goose-grass (*Galium aparine*), especially in Ireland; while those of the dandelion *(Leontodon taraxacum*) and of chicory are extensively employed both in this country and on the Continent. In none of these roots, however, has the characteristic principle, theine, been discovered, and none of them, therefore, can serve physiological purposes as the seeds of our common coffee.

Yet one of these roots (chicory) has already, in other countries, crept into extensive use, and among outselves is at present rapidly rising in public estimation. At first it was only mixed with pure coffee as an adulteration by frandulent dealers. But this practice extended itself so widely, that, for the defence both of the honest dealer and of the public, the sale has been legalised, and much chicory in the unmixed state is now bought and used instead of or along with genuine coffee. As one of the recognised beverages we *now* infuse, therefore, the plant deserves a brief notice in this place.

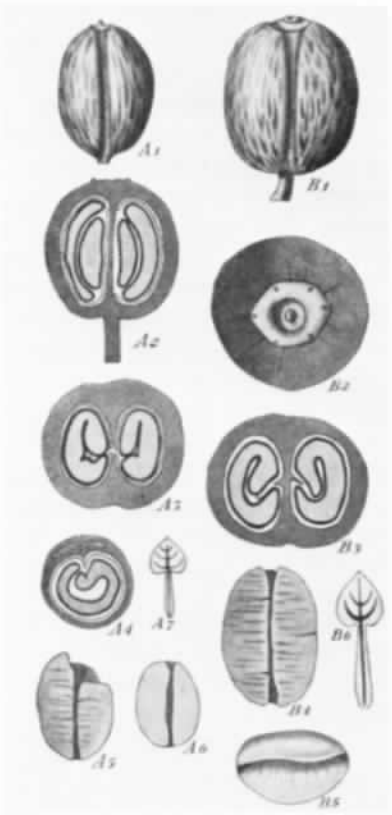
Succori, chicory or wild endive *(Cichorium intybus)*, is a native weed, which, with its large pale-blue flowers, is seen scattered about in numerous places. It has a large white parsnip-like tap-root, which increases in size when the plant is subjected to cultivation. This root abounds in bitter juice, which has led to its use as a substitute for coffee. The plant is now extensively cultivated for the sake of its root. In this country the culture is chiefly confined to the counties of Surrey, Bedford, and York. On the Continent it is largely grown in Prussia, Belgium, and France. The foreign is considered greatly superior to that of English growth, and is largely imported into this country, chiefly through Hamburg and Antwerp.

The root is taken up before the plant shoots into flower, is washed, sliced, and dried; it is then roasted till it is of a chocolate colour. Two pounds of lard are roasted with each hundredweight, and the root loses in roasting from 25 to 30 per cent. When ground and exposed to the air, it becomes moist and clammy, increases in weight, and acquires a distinct smell of liquorice, and a sensibily sweet *first* taste. It possesses in no degree the pleasant aroma which recommends the genuine roasted coffee. When infused, even in cold water, it imparts to it a dark colour, and a sweetish bitter taste. To many the addition of a little of this bitter liquid to the infusion of genuine coffee appears an improvement—a remarkable illustration of the creation of a corrupt taste by an adulteration, which taste demands afterwards the continuance of the adulteration to satisfy its own craving. The bitter substance however, is not considered unwholesome. Very many bitter substances of this kind possess a tonic property, and it is not unlikely that the bitter of chicory may be among the number.

Branch of Egyptian coffee tree drawn by Prospero Alpini in the 16th century. From "De Plantis Aegypti Liber," Venice (1592).

Fruiting tree of ***Coffea arabica.***

Flowering and fruiting branch of ***Coffea arabica,*** *the most commonly used type of coffee.*



Fruits and seeds of ***Coffea arabica*** *(A) and* ***Coffea liberica*** *(B). 1. Side view of fruits. 2A. Longitudinal Section showing the two seeds with a single endosperm each, which appears double because it is curved back on itself. 2B. Fruit from the top. 3. Cross section showing the curved endosperm (the stored food for the growing embryo). 4A. Cross section of a fruit with only one embryo. 4B, 5A. Seeds in their shells. 5B, 6A. Seeds removed from shells. 6B, 7A. Embryos removed from seeds. About natural size except 6B, 7A which are greatly enlarged.*

Flowering and fruiting branch of ***Coffea liberica.***

Coffee cultivating areas of the world in 1900.

Coffee production in 19th century Java. A tree of ***Coffea liberica*** *laden with fruit and workers boating the sacks of dried beans to market.*

Harvesting the fruits of ***Coffea liberica*** *in Java ca. 1900.*

Nineteenth century Mexican coffee plantation. Harvesting below and drying the fruits (coffee beans) above.

Forest clearing in Ceylon showing sugar cane, banana, coffee and coconut palm.

Turn of the century coffee plantation in the hills of Ceylon. A coffee pulping mill is in the center and a dwelling for the workers at the upper right.

Close up of a coffee pulping mill in the middle of a Ceylonese plantation. The coffee fruits are being spread out to dry on the mats in the background. Heaps of discarded hulls are visible in the foreground.

Eine Ausnahme bilden die orientalischen V-
von denen wir den Kaffee erhalten haben und
man nachrühmt, daß sie ihn am besten zu be-
verstehen und zwar mit ganz einfachen Hilfsmi
Die Tassen, aus denen man ihn trinkt, sind k
henkellose, tiefe Näpfchen, die etwa 30 cm³ fa
aus Porzellan oder Ton, selten aus Serpentin
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Metallbecher, um sie, wenn sie mit dem he
Getränk angefüllt sind, anfassen zu können. Ein
pentingefäß aus Persien in meiner Sammlung hat s

Antique Egyptian coffee service with metal coffee mill, boiling water pot and holders for porcelain cups.

Iranian coffee cups collected about 1890. The first is serpentine, the second and third of serpentine in brass cups and the fourth of porcelain with blue and gold designs (of European manufacture).

The oldest coffee house in Leipzig, Germany. A boy is giving a cup of coffee to a Turk, lying under a coffee tree, in the relief, presented (according to tradition) to the owner by August The Strong.

COCOA—

Theobroma cocao

The Cocoas are more properly soups or gruels than simple infusions. They are prepared from certain oily seeds, which are first ground to a pulp by passing them between hot rollers, and are then diffused through boiling water for immediate use.

The Mexican cocoa is the seed of the *Theobroma cacao*. This is a small but beautiful tree, with bright dark-green leaves, which is a native of the West Indies and of the central regions of America. It grows spontaneously in Mexico, and on the coast of Caraccas and forms whole forests in Demerara.

When the Spaniards first establish themselves in Mexico they found a beverage prepared from this seed in common use among the native inhabitants. It was known by the Mexican name of Chocollatl, and was said to have been in use from time immemorial. It was brought thence to Europe by the Spaniards in 1520, and has since been introduced more or less extensively as a beverage into every civilised country. Linnaeus was so fond of it that he gave to the tree the generic name of Theobroma—Food of the Gods.

The fruit of the tree, which, like the fig, grows directly from the stem and principle branches, is of the form and size of a small oblong melon or thick cucumber. It contains from six to thirty beans or seeds, imbedded in rows in a spongy substance, like that of the water-melon. When ripe, the fruit is plucked, opened, the seeds cleaned from the marrowy substance, and dried. In the West Indies they are immediately picked for market; but in the Caraccas they are put in heaps, and covered over, or sometimes buried in the earth till they undergo a slight fermentation, before they are finally dried and picked for market. By this treatment they lose a portion of their natural betterness and aerimony of taste, which is greater in the beans of the mainland than in those of the American islands. The cocoa of Central America is, however, of superior quality, or at least is more generally esteemed in the European markets than that which is grown in the West Indies. It still retains a greater degree of bitterness, and this may be one reason for the preference given to it.

The cocoa of Trinidad is the variety chiefly consumed in this country. The quality of the mainland cocoas which come to the English market from Bahia and Guayaquil for example, has hitherto been always inferior. The reason of this has been that, until the recent alteration of the tariff, the duty on British province cocoa was 1 d. a-pound, and five per cent. additional; while on foreign cocoa it was 2d. a-pound, and five per cent. This difference was equal to one-fourth or one-fifth of the whole price of the cocoa; and, therefore, while it brought to our markets the best qualities produced in Trinidad and in our other colonies, it excluded all foreign cocoas but those which were of such inferior quality that, after paying this heavy duty, they could still be sold as low as the produce of our own plantations. The more choice varieties were sent to the markets of Mexico, Spain, France, and Italy, in which countries the beverages prepared from the cocoa-bean are more popular and in more general use than among ourselves. Indeed, they have never been favourites among us, nor has the consumption of cocoa kept pace even with the increase of our population. Thus the importation in—

1840 was	.....	3,499,746 lbs.
1842 was	.....	3,172,255 lbs.
1852 was	.....	3,400,000 lbs.

so that for twenty years the quantity imported yearly into the United Kingdom has been nearly stationary. By the recent alteration of the tariff, however, the duty on foreign cocoa has been reduced to a penny a-pound, the same as on British plantation cocoa. All qualities, therefore, will now come to us under equal advantages, and we may expect both that the article will be cheapened in the market, and that the consumption of it will largely increase.

The cocoa-bean of commerce is brittle, of a dark brown colour internally, eats like a rich nut, and has a slightly astringent but decidedly bitter taste. This bitterness is more decided in the South American or mainland varieties. In preparing it for use, it is gently roasted in an iron cylinder, in the same way as coffee is roasted, till the aroma appears to be fully developed, when it is allowed to cool. The bean is now more brittle, lighter brown in colour, and both the natural astringency and the bitterness are less perceptible than before. It is manufactured for the market in one or other of three principle ways. *First*, The whole bean after roasting is beat into a paste in a hot mortar, or is ground between hot rollers adjusted for the purpose. This paste, mixed with starch , sugar, and other similar ingredients in various proportions, forms the common cocoa, rock cocoa, soluble cocoa, &c., of the shops. These are often gritty from the admixture of earthy and other matters which adhere to the husk of the beans. *Second*, The bean is deprived of its husk, which forms about 11 per cent. of its weight, and is then crushed into fragments. These form the cocoa nibs of the shops, and are the purest state in which cocoa can usually be obtained from the retail dealer. *Third*, The bean, when shelled, is ground at once into a paste, by means of hot rollers, mixed with sugar, and seasoned with vanilla, and sometimes with cinnamon and cloves: this paste forms the long-known chocolate.

When prepared, it is also used in three different ways. *First*, The chocolate is made up into sweet cakes and bonbons, and is eaten in the solid state as a nutritious article of diet, containing in a small compass much strength-sustaining capability. *Second*, The chocolate or cocoa is scraped into powder, and mixed with boiling water or boiling milk, when it makes a beverage, somewhat thick, but agreeable to

the palate, refreshing to the spirits, and highly nutritious. *Third*, The nibs are boiled in water, with which they form a dark-brown decoction, which, like coffee, is poured off the insoluble part of the bean. With sugar and milk this forms an agreeable drink, better adapted for persons of weak digestion than the consumption of the entire bean. Another variety of the cocoa beverages, and which may be called cocoa-tea, is prepared by boiling the husks of the bean in water, with which they form a brown decoction. This husk is usually ground up with the ordinary cocoas, but it is always separated in the manufacture of the purer chocolates. Hence in the chocolate manufactories it accumulates in large quantities, which are imported into this country from Trieste and other Italian ports, under the name of "miserable." Here the husk is partly ground up in the inferior cocoas, and is partly despatched to Ireland, where it is said to yield a wholesome and agreeable beverage to the poorer classes.

Besides the exhilarating and sustaining properties which it possesses in common with tea and coffee, cocoa, in its more common forms, is eminently nutritious. Its active or useful ingredients are the following:

First, The volitle oil, to which its aroma is due, and which is produced during the roasting. The proportion of this oil which is contained in the roasted bean has not yet been determined, but it is no doubt very small. Its action on the system is probably similar to that of the odoriferous oils produced by the same process in tea and coffee.

Second, A peculiar principle, resembling the theine of tea and coffee, though not identical with it. Like theine, it is a white crystalline substance, which has a slightly bitter taste, and contains a large per-centage of nitrogen. It is called by chemists *theobromine*, from the generic name of the cocoa tree; and its composition, compared with that of theine, is as follows:—

	Theine.	Theobromine.
Carbon,	49.30	46.43
Hydrogen,	5.03	4.20
Nitrogen,	28.83	35.85
Oxygen,	16.20	13.52
	100	100

It is richer in nitrogen, therefore, even than theine; and as nearly all vegetable principles, rich in nitrogen, of which the influence upon the system has been examined, are found to be very active, the same is inferred in regard to theobromine. And further, its analogy in chemical properties to theine leads to the belief that it exercises a similar exhilarating and soothing, hunger-stilling and waste-retarding effect with the latter substance. The benefits experienced from the use of cocoa are due, in part at least, therefore, to the theobromine it contains. The proportion of this substance in the cocoa-bean is small, but it has not yet, I believe, been rigorously determined. It exists, also, in sensible quantity in the husk of the bean. The decoction obtained by boiling the husk in water, will not, therefore, be wholly devoid of useful ingredients, or of good effect.

Third, The predominating ingredient in cocoa, and the one by which it is most remarkably distinguished from tea and coffee, however, is the large proportion of fatty matter known as cocoa-butter which it contains. This amounts to upwards of one-half the weight of the shelled or husked bean. Consumed in either of its more usual forms, therefore, cocoa is a very rich article of food, and for this reason it not unfrequently disagrees with delicate stomachs. It is in some measure to lessen the sense of this richness, that sugar, starch, and fragrant seasonings are so generally ground up with the roasted bean in the manufacture of cocoa and chocolate.

Fourth, It contains also a large proportion both of starch and gluten,—substances which, as we have elsewhere seen, form the staple constituents of all our more valuable varieties of vegetable food. The average composition of the entire bean, when deprived of its husk, is nearly as follows:—

Water,	5
Starch, gum,&c.,	22
Gluten, &c.,	17
Oil (cocoa-butter), with a little theobromine,	56
	100

This composition reminds us of the richest and most nutritive forms of vegetable food; and especially of the oily seeds and nuts with which cattle are fed and fattened. Of all the varieties of human food, however, it has the closest resemblance to milk. Thus, dried milk (milk evaporated to dryness), and the dry cocoa-bean, consist respectively of—

	Milk.	Cocoa-bean.
Casein or gluten,	35	18
Fat,	24	55
Sugar or starch, &c.,	37	23
Ash, or mineral matter,	4	4
	100	100

It is rich, therefore, in all the important nutritious principles which are found to co-exist in our most valued forms of ordinary food. It differs from milk chiefly by the greater proportion of fat which it contains, and hence it cannot be used so largely without admixture as the more familiar milk. When mixed with water, however, as it is usually drank, it is more properly compared with milk than with infusions of little direct nutritive value, like those of tea and coffee. And, on the other hand, it has the great advantage over milk, over beef-tea and other similar

beverages, that it contains the substance theobromine, and the volatile empyreumatic oil. Thus it unites in itself the exhilarating properties of tea with the strengthening and ordinary body-supporting qualities of milk. The cocoa, as shown in the above table, is richer in fat, the milk in casein. Hence probably has arisen the practice of making milk-cocoa, in which the constituents of the one ingredient dovetail into and assuage the influence of those of the other. The large proportion of oil it contains justifies also, as fitting it better for most stomachs, the practice of mixing or grinding up the cocoa with sugar, flour, or starch, in the preparation of cocoa-paste or chocolate. Both practices are indeed skilful chemical adjustments, made without chemical knowledge, as the results of long and wide experience. And, lastly, the general composition of the bean shows that, in chocolate cakes and comfits, when faithfully prepared, there should reside, as experience has also shown to be the case, much nutritive virtue, and the means, both of supporting the bodily strength, and of sustaining the nervous energy reduced into comparatively small compass.

Brazilian cocoa, or Guarana.—In Brazil the seeds of the *Paullinia sorbilis* are collected, prepared, and used in the same way as those of the *Theobroma cacao*. They are usually described by travellers as a variety of coffee—but the seeds, like the cocoa-bean, are pounded and made into cakes, which are known as Guarana bread. When used, these cakes are mixed with water, as we do with the cakes of cocoa or chocolate, and the mixture is sweetened and drank. To what extent this article is prepared and consumed in Brazil, I have not been able to ascertain. It is a fact of great interest in regard to this substance, and one which shows it to have a true place among the beverages of which we are now treating, that like tea and coffee it has been found to contain theine, and is, therefore, capable of exercising upon the system an influence similar to that which is experienced by those who use these two favourite beverages.

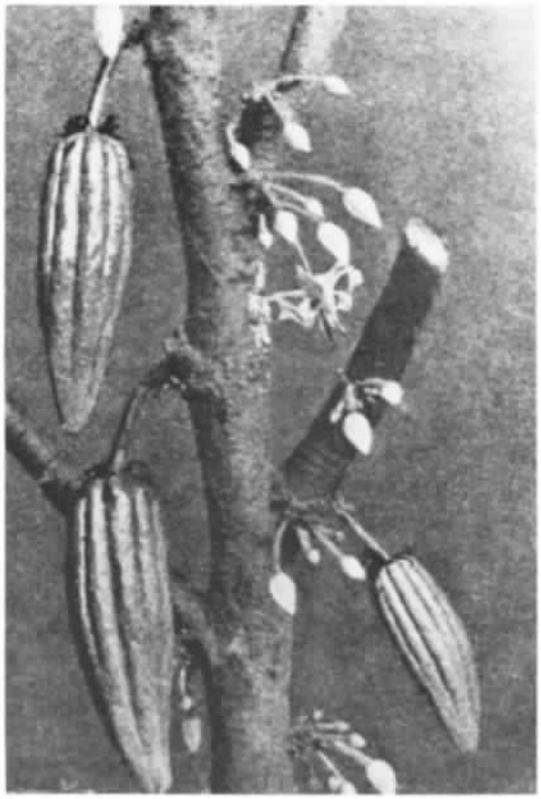
Other cocoas.—The substances, as yet known, which can be employed in the place of, or as substitutes for, Mexican cocoa, are comparatively few in number. To fit them for this purpose, they must contain an odoriferous principle of some degree of fragrance, abundance of fat, and a considerable amount of ordinary nutriment. Oily seeds and nuts are almost the only vegetable productions from which beverages resembling cocoa have anywhere been manufactured. Among these the earth-nut (*Arachis hypogoea*), a kind of oily underground pea, is roasted in South Carolina, and then prepared and used in the same way as chocolate. In Spain, the root of the *Cyperus esculentus*, or earth chestnut, is roasted and used as a substitute for both coffee and chocolate, but especially for the latter, which is much consumed in Spain. These are all the professed substitutes for the cocoa bean with which I am acquainted. Neither of the two last-mentioned, however, contains a bitter principle rich in nitrogen, of the nature of the theobromine of the true cocoa, or of the theine contained in guarana. They can never, therefore, be employed effectively to replace the Mexican cocoa.

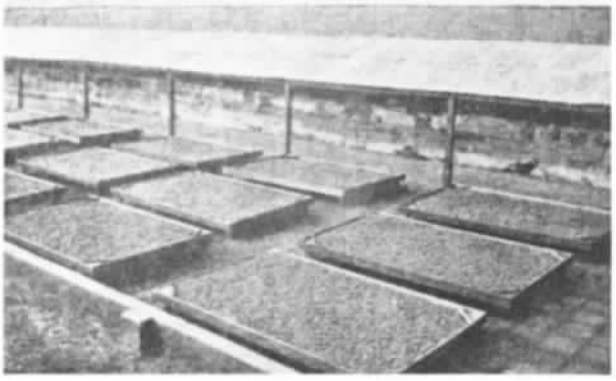
As adulterating materials, the substances chiefly employed by fradulent manufacturers of cocoa and chocolate are the husks of the bean, starch, sugar, fat, ground roots and red ochre.

Cocoa fruits and seeds. In the upper row from left to right are examples of ***Theobroma cocoa*** *as cultivated in Ecuador, Nicaragua and Venezuela. In the lower row from the left are shown the fruits and seeds (in longitudinal or cross section) of the three other species,* ***T. pentagonum, T. angustifolium*** *and* ***T. bicolor.*** *All about 1/4 natural size.*

Cocoa production in Samoa about 1890. Workers are shown breaking the pods to obtain the beans.

Cocoa in Java. Above a young cocoa plant and below a worker knocking down the cocoa pods.





Cocoa production in 19th century Ceylon. Pods shown on the tree and the cocoa beans being removed from the pods and dried in large trays.

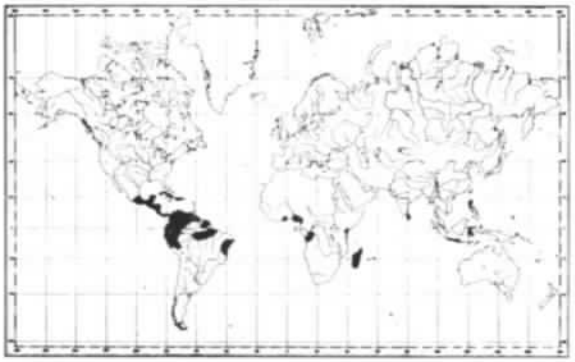
Map showing cocoa producing areas around the turn of the century and a picture of the washing of fermented cocoa in Ceylon.

Antique Spanish copper pot for the preparation of chocolate. This specimen is from Granada and is provided with a wooden stirrer. The Spanish dominated the chocolate trade for centuries. About 1/3 natural size.

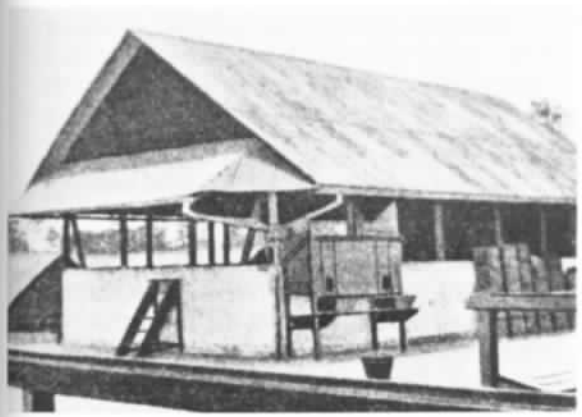
Cocoa branch in bloom.

Title page from what is probably the first book on chocolate - "De Chocolatis Potione" by Nicephorus Sebastus Melissenus, published in Naples in 1671. A native is shown grinding cocoa beans on a flat stone with a piece of wood. Behind him is a bundle of vanilla fruits.

Cocoa tree with numerous pods.



Cocoa growing regions of the world in 1900. Exporting areas are dotted.



Cocoa production in Trinidad about 1890. Top: inside of the shed showing the sweatboxes and a worker turning the cocoa beans. Bottom: Fermentation shed containing 16 wood covered sweat boxes 1.5 by 2 by 1.5 meters; a 20 cm thickness of sod serves as insulation.

A very early depiction of chocolate from Dufour - "Traites Noveaux et Curieux du Cafe du The et du Chocolate" published in Lyon in 1688. At the left foot of the Indian is a pot and whip for preparing chocolate. The vessel at the right foot is for preparing mate. The lower figure shows a branch of the cocoa tree with three fruits, below which is a bundle of vanilla and two cocoa pods.

Woven baskets used by the central American peoples for paying tribute to the Aztec King in cocoa. The left one has a flag and a cocoa fruit, the right one has cocoa fruit and powdered cocoa. From the Codex Mendoza, an early 16th century copy of ancient indian documents, made shortly before the Spanish barbarians burned them all.

TEA—

Thea sinensis

Of teas there are many varieties in use in different parts of the world; but China tea, Paraguay tea or mate, and perhaps coffee-tea, are the most extensively consumed as national beverages. There are some others in constant though less general employment, to which it will be necessary somwhat briefly to advert.

China tea is not only the most important of these beverages to the British and other English-speaking peoples but it forms the daily drink of a larger number of men than all the others put together. Among the three hundred millions of China, and among the inhabitants of Japan, Thibet, and Nepaul, it is an article of consumption with all classes three or four times a-day. In Asiatic Russia also, in a large portion of Europe, in North America, and in Australasia, it is in, or is coming into, almost equally extensive use. It is consumed at the present moment by probably not less that five hundred millions of men, or one-half of the whole human race.

The tea-plant (*Thea sinensis*) has much resemblance to the Camellia japonica. There are several varieties of it, distinguished by some botanists as the *Thea viridis*, *T. bohea*, and *T. Strieta*, but all are now recognised as belonging to one single species, somewhat altered in habit and appearance by cultivation, climate, and soil. The two most marked varieties are represented by the annexed woodcuts. The smaller is the *Thea bohea*, which produces the inferiour green and black teas which are made about Canton. The larger is the *Thea viridis*, the more northern variety, from which are made all the fine green teas in the great Hwuy-chow and the adjoining provinces. The plant is believed to be a native of China, and grows wild still among the hills both of that country and of Japan. It thrives best in the cooler parts of the tropical zone, but grows in the temperate zone even as far north as the 40th degree of north latitude. The districts of China which supply the greater portion of the teas exported to Europe and America lie between the 25th and the 31st degrees of north latitude, and the best districts are those between 27° and 31°.—(Fortune.)

The tea-plants are raised from seed which, to secure germination, is kept over winter in moist earth, and sown in March. When a year old,, the young bushes are planted out, and then by cropping the main shoot for the first year they are kept down to a height of about 3 feet, and made to grow bushy. Being placed in rows three or four feet apart, they have some resemblance to a garden of gooseberry bushes. The cropping of the leaves begins in the fourth and fifth years, and is seldom continued beyond the tenth or twelfth, when the bushes are dug up and renewed. The plant thrives best on dry sunny slopes, where occasional showers fall and springs appear, and where an open, somewhat stony but rich soil prevents the water from lingering about its roots. The season for gathering varies in different districts, but the principle leaf-harvest ends in May or June. The leaves are plucked by the hand, and chiefly by women. They are generally gathered at three successive seasons. The youngest and earliest leaves are the most tender and delicate, and give the highest flavoured tea. The second and third gatherings are more bitter and woody, and yield less soluble matter to water. The refuse and decayed leaves and twigs are pressed into moulds and sold under the name of brick tea. These bricks are often made harder by mixing the leaves with the serum of sheep and ox blood. This inferior variety is chiefly consumed in northern China and Thibet.

The first in order, and not the least interesting point, in the chemical history of the tea we use, is the mode in which it is prepared for the market. The leaves when freshly plucked have neither a decidedly astringent, and aromatic, nor a bitter taste. They possess nothing, in fact, either of the odour or flavour of the dried leaves. The pleasant taste and delightful natural scent for which they are afterwards so highly prized, are all developed by the roasting which they undergo in the process of drying. The details of this process have lately been made known to us through the investigations of Mr. Fortune.

Another interesting chiemical fact is, that different qualities of tea are prepared from the same leaves, according to the way in which they are treated in the drying. This we should to a certain extent expect; but the inquiries of Mr. Fortune have shown that samples so very unlike as the green and black teas usually are may be prepared at will from the same leaves, gathered at the same time and under the same circumstance. The mode of drying and roasting the leaves generally, and the specific processes by which the green and the black teas are severally obtained, have been minutely described by Mr. Fortune; and from his discription we learn—

For Green Tea.—When the leaves are brought in from the plantations they are spread out thinly on flat bamboo trays, in order to dry off any superfluous moisture. They remain for a very short time exposed in this manner, generally from one to two hours; this however, depends much upon the state of the weather.

In the mean time the roasting-pans have been heated with a brisk wood-fire. A portion of leaves is now thrown into each pan, and rapidly moved about and shaken up with both hands. They are immediately affected by the heat, begin to make a crackling noise, and become quite moist and flaccid, while at the same time they give out a consederable portion of vapour. They remain in this state for four or five minutes, and are then drawn quickly out and placed upon the rolling-table, and rolled with the hands.

Having been thrown again into the pan, a slow and steady charcoal fire is kept up and the leaves are kept in rapid motion by the hands of workmen. Sometimes they are thrown upon the rattan-table, and rolled a second time. In about an hour, or an hour and a half, the leaves are well dried, and their colour has

become *fixed*,—that is, there is no longer any danger of their becoming black. They are of a dullish green colour, but become brighter afterwards.

The most particular part of the operation has now been finished, and the tea may be put aside until a larger quantity has been made. The second part of the process consists in winnowing and passing the tea through sieves of different sizes, in order to get rid of the dust and other impurities, and to divide the tea into the different kinds known as twankay, hyson-skin, hyson, young hyson, gunpowder, &c. During this process it is re-fired—the coarse kinds once, and the finer sorts three or four times. By this time the colour has come out more fully, and the leaves of the finer kinds are of a dull bluish green.

For Black Tea.—When the leaves are brought in from the plantations they are spread out upon large bamboo mats or trays, *and are allowed to lie in this state for a considerable time.* If they are brought in at night they lie until next morning.

The leaves are next gathered up by the workmen with both hands, thrown into the air, and allowed to separate and fall down again. They are tossed about in this manner, and slightly beat or patted with the hands, for a considerable space of time. At length, when they become soft and flaccid, they are thrown in heaps, and *allowed to lie in this state for about an hour, or perhaps a little longer.* When examined at the end of this time, they appear to have undergone a slight change in colour, are soft and moist, and emit a fragrant smell.

The rolling process now commences. Several men take their stations at the rolling table, and divide the leaves amongst them. Each takes as many as he can press with his hands, and makes them up in the form of a ball. This is rolled upon the rattan-worked table, and greatly compressed, the object being to get rid of a portion of the sap and moisture, and at the same time to twist the leaves. These balls of leaves are frequently shaken out, and passed from hand to hand until they reach the head workman, who examines them carefully to see if they have taken the requisite twist. When he is satisfied of this, the leaves are removed from the rolling-table and shaken out upon flat trays, until the remaining portions have undergone the same process. In no case are they allowed to lie long in this state, and sometimes they are taken at once to the roasting pan.

The next part of the process is exactly the same as in the manipulation of green tea. The leaves are thrown into an iron pan, where they are roasted for about five minutes, and then rolled upon the rattan-table.

After being rolled, the leaves are shaken out, thinly, on sieves, and exposed to the air out of doors. A framework for this purpose, made of bamboo, is generally seen in front of all the cottages among the tea hills. The leaves are allowed to remain in this condition for about three hours: during this time the workmen are employed in going over the sieves in rotation, turning the leaves and separating them from each other. A fine dry day, when the sun in not too bright, seems to be preferred for this part of the operation.

The leaves having now lost a large portion of their moisture, and having become considerably reduced in size, are removed into the factory. They are put a second time into the roasting-pan for three or four minutes, and taken out and rolled as before.

The charcoal fires are now got ready. A tubular basket, narrow at the middle and wide at both ends, is placed over the fire. A sieve is dropped into the tube, and covered with leaves, which are shaken on it to about an inch in thickness. After five or six minutes, during which time they are carefully watched, they are removed from the fire and rolled a third time. As the balls of leaves comes from the hands of the rollers, they are placed in a heap until the whole have been rolled. They are again shaken on the sieves as before, and set over the fire for a little while longer. Sometimes the last operation—namely, heating and rolling—is repeated a fourth time; the leaves have now assumed a dark colour.

When the whole have been gone over in this manner, they are placed thickly in the baskets, which are again set over the charcoal fire. The workman now makes a hole with his hand through the centre of the leaves, to allow vent to any smoke or vapour which may rise from the charcoal, as well as to let up the heat, which has been greatly reduced by covering up the fires. The tea now remains over the slow charcoal fire, covered with a flat basket, until it is perfectly dry,—carefully watched, however, by the manufacturer, who every now and then stirs it up with his hands, so that the whole may be equally heated. The black colour is now fairly brought out, but afterwards improves in appearance. the after processes, such as sifting, picking, and refining, are carried on at the convenience of the workmen.

First, That, in the process of drying, the leaves are roasted and scorched in such a way as necessarily to bring about many chemical changes within the substance of the leaves themselves. The result of these changes is to produce the varied flavours, odours, and tastes by which different varieties of tea are more or less distinguished.

Second, That the treatment or mode of handling by which the leaves are converted respectively into green and black teas, is the cause of the different colours of these two main varieties. Thus for,

Green Teas	***Black Tea***
1. The leaves are roasted almost immediately after they are gathered.	1. They are allowed to be spread out in the air for some time after they are gathered.
2. They are dried off quickly after the rolling process. The whole operation is speedy and simple.	2. They are then further tossed about till they become soft and flaccid.
	3. They are now roasted for a few minutes, and rolled; after which, they are exposed to the air for a few hours in a soft and moist state.
	4. Lastly, they are dried slowly over charcoal fires.

It is by lenghthened exposed to the air, therefore, in the process of drying, accompanied, perhaps, by a slight heating and fermentation, that the dark colour and distinguishing flavour are given to the black teas of commerce. The oxygen of the atmosphere acts rapidly upon the juices of the leaf during this exposure, and changes chemically the peculiar substances they contain, so as to impart to the entire leaf the dark hue it finally acquires. The precise nature however, of these changes has not as yet been chemically investigated.

This action of the air does not appear sensibly to affect the weight of the tea obtained, as three pounds of the fresh leaves produce on an average about one pound of marketable tea of either kind. The teas intended for home consumption are not so highly dried as those which are prepared for exportation—(Dr. Bowring)—a circumstance which must affect the quality of the beverage they yield.

The produce of different districts varies in quality and flavour with the climate, the soil, and the variety of plant cultivated, as well as with the period at which the leaves are gathered, and with the mode of drying

them. The finest tea of China grows between the 27th and 31st parallels of north latitude, on a low range of hills, which is an offshoot of the great chain of Peling. The principle varieties of *black* tea are known by the names of Bohea, Congou, Campoi, Souchong, Caper, and Pekoe. Of these the bohea grows in the province of Fu-kian (Fokien). Pekoe, or pakho, means "white down" in Chinese, and consists of the first downy sprouts of leaf-buds of three-year-old plants. A very costly tea of this kind, known as the "Tea of the wells of the Dragon," is used only by persons of the highest rank in China, and is never brought to Europe. Caper is in hard grains, made up of the dust of the other varieties cemented together by means of gum. The *green* teas are known as Twankay, Hyson-skin, Hyson, Imperial, and Gunpowder. The hyson is grown in the province of Songho. The true imperial, known also, because of its excellence, as the flot-theac, seldom comes to Europe,—that which is usually sold under this name being really Chusan tea flavoured with the cowslip-coloured blossoms of the sweet-scented olive (*Olca fragrans*). The practice of scenting teas is very common, and various odoriferous plants are employed for the purpose in different parts of China (Among these are mentioned the Olea fragrans, Chloranthus inconspicuus, Gardenia florida, Aglaia odorate, Mogorium sambac, Vitex spicata, Camellia sasanqua, Camellia odorifera, Illicium anisatum, Magnolia yulan, Rosa indica odoratissima, Murraya exotica, turmeric, oil of Bixa orellana and the root of the Florentine Iris. With such a list before us, we cannot wonder that teas should exhibit great diversity in fragrance and flavour.). It is remarked, however, by the dealers in tea, that the plantations which naturally yield a produce of a particularly-esteemed flavour are as limited in extent as the vineyards in Europe which are celebrated for particular kinds of wine. The price of tea varies, of course, with the variations in natural quality, being for some samples double or treble what is asked for others. But the average price at Canton is about 8½d. a-pound, so that the grower must sell it a 5d. or 6d. (Meyen.).

Tea-leaves prepared as above-described have been in use as a beverage in China from very remote periods. Tradition speaks of it as early as the third century. The legend relates, "that a pious hermit, who, in his watchings and prayers, had often been overtaken by sleep, so that his eyelids closed, in holy wrath against the weakness of the flesh, cut them off and threw them on the ground. But a god caused a tea-shrub to spring out of them, the leaves of which exhibit the form of an eyelid bordered with lashes, and possess the gift of hindering sleep. A similar story is related concerning the introduction of coffee into Arabia. Both legends were probably invented long after the qualities of tea and coffee were known.

It was after the year 600 that the use of tea became general in China, and early in the ninth century (810) it was introduced into Japan. To Europe it was not brought till about the beginning of the seventeenth century. Hot infusions of leaves had been already long familiar as drinks in European countries. Dried sage-leaves were much in use in England, and are even said to have been carried as an article of trade to China by the Dutch, to be there exchanged for the Chinese leaf, which has since almost entirely superseded them. A Russian embassy to China also brought back to Moscow some carefully-packaged green tea, which was received with great acceptance. And in the same century (1664) the English East India Company considered it as a rare gift to present the Queen of England with two pounds of tea!"

The growth and consumption of tea are now really enormous. Mr. Ingham Travers estimates the total produce of the dried leaf in China alone at a million of tons, or 2240 millions of pounds! To this is to be added the tea of Japan, Corea, Assam, and Java. The produce of this latter island already goes far to supply the markets of Holland; and the introduction of the tea-plant into the hill-country of India promises to add largely to its future growth. The quantity of tea yielded by an acre of land is not stated in any book to which I have access; but if we take it at 600 lbs., which is probably a full estimate, the extent of land devoted to this branch of rural industry in China alone must be nearly 3½ millions of acres!

The consumption of tea in the United Kingdom in 1352 amounted to 55 millions of pounds (24,000 tons)—about one forty-fifth part of the estimated produce of China. This is at the rate of 1 lb. 9 oz. per head of the population, and the consumption is rapidly on the increase. Among European nations tea is pre-eminently a British, Dutch, and Russian drink. Among the other nations of Europe, coffee and dodo are more usual beverages than tea. This is strikingly illustrated by the fact, that while in 1835 about 36 millions of pounds of tea were consumed in the United Kingdom, only 200,000 lbs. were consumed in the kingdom of Prussia! The population of Prussia was then upwards of thirteen millions.

The effects of tea, as it is used in China, are thus described by Chinese writers: "Tea is of a cooling nature, and, if drunk too freely, will produce exhaustion and lassitude. Country people, before drinking it, add ginger and salt to counteract this cooling property. It is an exceedingly useful plant. Drink it, and the animal spirits will be lively and clear. The chief rulers and nobility esteem it; the lower people, the poor, and beggarly will not be destitute of it. All use it daily, and like it." Another writer says, "Drinking it tends to clear away all impurities, drives off drowsiness, removes or prevents headache, and it is universally in high esteem."

The mode of using it in China is to put the tea into a cup, to pour hot water upon it, and then to drink the

infusion off the leaves, and without admixture. While wandering over the tea districts of China, Mr. Fortune only once met with sugar and a tea-spoon.

The mode of making and drinking the infusion of tea probably does not alter its general effects upon the system. In China cold water is disliked, and considered as unwholesome, and therefore tea is taken to quench the thirst, which it probably does best when drunk unmixed. The universal use, on the other hand, of sugar and cream or milk among us, probably arose from its being introduced here as a beverage among grown-up people whose tastes were already formed, and who required something to make the bitter infusion palatable. The practice thus begun has ever since continued, and, physiologically considered, is on the whole, I believe, an improvement upon the Eastern fashion.

The effects of tea as obtained and thus used among us are too familiarly known to require any detailed explanation. It exhilarates without sensibly intoxicating. It excites the brain to increased activity and produces wakefulness; thence its usefulness to hard students, to those who have vigils to keep, and to persons who labour much with the head. It soothes, on the contrary, and stills the vascular system, and hence its use in inflammatory diseases and as a cure for headache. Green tea, when taken strong, acts very powerfully upon some constitutions, producing nervous tremblings and other distressing symptoms, acting as a narcotic, and in inferiour animals even producing paralysis (New tea in China is said to exhibit this narcotic quality in a high degree, and hence the Chinese rarely use tea before it is a year old.). Its exciting effect upon the nerves makes it useful in counteracting the effects of opium and of fermented liquors, and the stupor sometimes induced by fever.

In manufactured tea there are at least three active chemical substances, by the conjoined influence of which these effects are produced.

The volatile oil.—When commercial tea is distilled with water there passes over a small quantity of a volatile oil, which possesses the aroma and flavour of the tea in a high degree. A hundred pounds of tea yield about one pound of this oil, and to this minute quantity of its volatile ingredient the value of tea in general estimation is in a great measure due. Its special action upon the system has not yet, we believe, been scientifically investigated. But that it does exercise a powerful, and most likely a narcotic influence, is rendered probable by many known facts. Among these I mention the headaches and giddiness to which tea-tasters are subject; the attacks of paralysis to which, after years, those who are employed in packing and unpacking chests of tea are found to be liable; and the circumstances already alluded to, that in China tea is rarely used till it is a year old, because of the peculiar intoxicating property which new tea possesses. The effect of this keeping upon tea must be chiefly to allow a portion of the volatile ingredients of the leaf to escape. And lastly, that there is a powerful virtue in this oil is rendered probable by the fact, that the similar oil of coffee has been found by experiment to possess narcotic properties.

This volatile ingredient does not exist in the natural leat, but is produced during the process of drying and roasting already described.

The Theine.—When dry finely-powdered tea-leaves are put upon a watch-glass, covered over with a conical cap of paper, and then placed upon a hot plate, a white vapour gradually rises from the leaves, and condenses on the inner side of the paper in the form of minute colourless crystals. If, instead of the leaves, a dried watery extract of the leaves be employed, the crystals will be obtained in greater abundance. These crystals consist of the substance known to chemists by the name of Theine or Caffeine. The teas of commerce contain, on an average, about two per cent. of this theine.—(Stenhouse.) In some it is a little more. Certain green teas, according to Peligot, contain as much as six pounds in every hundred pounds of the dried tea; but so large a proportion as this is very rare. Theine has no smell and only a slightly bitter taste.

It has little to do, therefore, either with the taste or flavour of the tea from which it is extracted. It is remarkable, however,

First, in containing a very large per centage of nitrogen, an element I have already spoken of as forming a large proportion of our common atmospheric air, and as distinguishing the gluten of wheat from the starch with which it is associated in the grain. The composition of the dried theine is represented by the following numbers—

Carbon,	49.80
Hydrogen,	5.08
Nitrogen,	28.83
Oxygen,	16.29
	100

It contains, therefore, nearly three-tenths of its weight of nitrogen; a proportion which exists in only a very small number of other known substances.

Second,—Theine is remarkable as being present not only in Chinese tea, but also in Mate or Paraguay tea, in coffee, and in guarana—a substance prepared and used in Brazil in the same way as coffee. It is a very curious fact that, in countries so remote from each other, plants so very unlike as all these are should have been, by a kind of instinct as it were, selected for the same purpose of yielding a sightly exciting, exhilarating, and refreshing beverage; and that these plants, when now examined by chemists, should all be found to contain the same remarkable compound body which we call theine or caffeine. The

selection must have been made by the independent discovery, in each country and by each people, that these several plants were capable of gratifying a natural consitutional craving, or of supplying a want equally felt by all.

The quantity of three or four grains of theine, mentioned above, is contained in less that half an ounce of good tea, and may be taken in a day by most full-grown persons, without unpleasant effects. But if twice this quantity, or eight grains a-day, be taken, the pulse becomes more frequent, the heart beats stronger, termbling comes on, and a perpetual desire to void urine. At the same time the imagination is excited, and, after a while, the thoughts wander, visions begin to be seen, and a peculiar state of intoxication comes on; all these symptoms are followed by, and pass off in, a deep sleep. The effects of strong tea, therefore,—and especially of old teas, and such as are peculiarly rich in theine—are to be ascribed in great part to the overdose of this substance which has been introduced into the stomach.

The Tannin or tannic acid.—If tea be infused in hot water in the usual manner, and the infusion be poured into a solution of common green copperas (sulphate of iron), the mixture will become black. Or if it be poured into a solution of glue or isinglass (gelatine), it will render the solution turbid or muddy, and cause a greyish precipitate to fall. These appearances show that the tea contains an astringent substance, known to chemists by the name of tannin or tannic acid. This substance is so called, because it is the ingredient which, in oak bark, is so generally employed for the tanning of leather.

To this tannic acid tea owes its astringent taste, its constipating effect upon the bowels, and its property of giving an *inky* infusion with water which contains iron. It forms from 13 to 18 per cent. of the whole weight of the dried tea-leaf, and is the more completely extracted the longer the tea is infused. The tannic acids, of which many varieties are known to chemists, though naturally colourless, have all a tendency to become dark-coloured when exposed to the air. This is one reason why the same leaves, when dried quickly, will give a *green*, and when dried more slowly, a *black* tea, as has been described by Mr. Fortune.

What is the full and precise action of this tannin upon the system as we drink it in our tea, or whether it contributes in any degree to the exhilarating, satisfying, or narcotic action of tea, is not yet known. That it does aid even in the exhilarating effect which tea produces, is rendered very probable by the fact, that a species of tannin is the principal ingredient in the Indian betel-nut, which is so much chewed and prized in the East, and which is said to produce a kind of mild and agreeable intoxication.

The Gluten.—The three substances already described may be considered as the really active constituents of the tea-leaf as it is usually employed. But it is an interesting fact, that the leaf contains a large proportion of that nutritive ingredient of plants to which the name of gluten is given. This substance forms as much as one-fourth of the weight of the dry leaves; so that if we chose to eat them in mass, they would prove as nutritious as beans or peas. This is seen by the following table, which exhibits the composition of beans and of tea-leaves as they are severally brought to market:-

	Tea leaves	*Beans*
Water	5	14
Starch, gum, &c.	27	48
Gluten	20 to 25	24
Fat	3	2
Tannic acid	15	—
Husk or woody fibre	20	10
Ash	5	2
	100	100

Of this large per-centage of gluten, the water in which we usually infuse our tea, extracts very little; and hence we throw away in the waste leaves a large proportion of the common nutririon they contain. It has been recommended, therefore, as an improved method of infusing tea, that a pinch of soda should be put into the water along with it. The effect of this would be, that a portion at least of the gluten would be dissolved, and the beverage in consequence made more nutritious. The method of preparing the brick tea adopted among the Mongols and other Tartar tribes, is believed to extract the greater part of the nutriment from the leaf. They rub the tea to a fine powder, boil it with the alkaline steppe-water, to which salt and fat have been added, and pour off the decoction from the sediment. Of this liquid they drink from 20 to 40 cups a-day, mixing it first with milk, butter, and a little roasted meal. But even without meal, and mixed only with a little milk, they can subsist upon it for weeks in succession.

The effect of the tea in this way of using it seems to be twofold. *First*, it directly nourishes by the gluten and milk or meal it contains; and, *second*, it makes this food go farther, through the waste-retarding influence of the theine, which the boiling thoroughly extracts.

But the most perfect way of using tea is that described, I think, by Captain Basil Hall, as practised on the coast of South America, where tea-leaves, after being exhausted by infusion, are handed round the company upon a silver salver, and partaken of by each guest in succession. The exhilarating effects of the hot liquid are in this practice followed by the nutritive effects of the solid leaf. It is possible that this practice may refer to the Paraguay tea, so extensively used in South America; but in either case the merit of it is the same.

The four substances above mentioned are the most important ingredients of the tea-leaf. It contains

besides, as is shown by the table given above, a large proportion of starch and gum, some of which will, of course, be extracted by boiling water, and will give a certain nutritive value to the infusion. Tea, however, varies in composition with the mode of drying, with the age of the plant and of the leaf, with the season in which it is gathered, and even with the variety of shrub on which it has grown. Hence the proportion of the whole leaf which is extracted by boiling water varies much both in kind and quantity. The genuine green teas, which are usually prepared from the young leaves, yield more of the lighter coloured—the black teas more of the darker coloured, ingredients. And even of teas of the same colour and name in the market, different samples yield to boiling water very different proportions of soluble matter. Two samples of souchong, for example, examined by Davy and Lehmann, respectively gave, to boiling water, from a hundred parts—

82½ parts to Davy,
15½ parts to Lehmann.

It is obvious, therefore, that the value of tea as a beverage, in so far as this depends on the proportion of soluble matter it contains, differs very much. We usually judge of the quality of a tea by its aroma, and by the flavour and colour of the infusion it yields; and these, in the main, are good guides: but chemistry indicates that, as in the case of opium, some weight ought also to be attached to the proportion of soluble ingredients it contains and readily yields to boiling water.

It is necessary to mention, before concluding by remarks upon tea, that, in addition to the substances which it naturally contains, others are sometimes added by way of adulteration to the teas of commerce. This is especially the case with the green teas, which are not all prepared by simply drying quickly the natural leaf as already described, but are often artificially coloured by the addition of blue, white and yellow colouring substances. Mr. Fortune, who saw the colouring performed in China, thus describes the process:—"The superintendent having taken a portion of Prussian blue, threw it into a porcelain bowl not unlike a mortar, and crushed it into a very fine powder. At the same time a quantity of gypsum was burned in the charcoal fire which was then roasting the tea. This gypsum having been taken out of the fire after a short time, readily crumbled down, and was reduced to powder in the mortar. The two substances thus prepared were then mixed together, in the proportion of four of gypsum to three of Prussian blue, and formed a light blue powder, which was then ready for use.

"This colouring matter was applied to the teas during the last process of roasting. About five minutes before the tea was removed from the pans, the superintendent took a small porcelain spoon, and with it he scattered a portion of the colouring matter over the leaves in each pan. The workmen then turned the leaves rapidly round with both hands, in order that the colour might be equally diffused. To 14 lbs. of tea about 1 oz. of colouring matter was applied.

"During this part of the operation the hands of the workmen were quite blue. I could not help thinking that if any green-tea drinkers had been present during the operation, their taste would have been corrected and improved.

"One day an English gentleman in Shanghae, being in conversation with some Chinese from the green-tea country, asked them what reasons they had for dyeing the tea, and whether it would not be better without undergoing this process. They acknowledged that tea was much better when prepared without having any such ingredients mixed with it, and that they never drank dyed teas themselves; but remarked that, as foreigners seemed to prefer having a mixture of Prussian blue and gypsum with their tea, to make it look uniform and pretty, and as these ingredients were cheap enough, the Chinese had no objections to supply them, especially as such teas always fetched a higher price!"

Mr. Fortune describes the blue substance employed as Prussian blue; and Mr. Warrington's experiments show that, until the last few years, this substance was very generally in use in China for giving an artificial colour to teas. More recently, however, it appears that indigo has been substituted, in consequence, probably, of the injurious effects which European writers have described the Prussian blue as likely to produce on the constitution of green-tea drinkers. The quantity of either substance employed, however, is so minute that, without justifying the adulteration, I think it unlikely that any serious consequences can have followed from it. The indigo is probably harmless; but supposing it to be Prussian blue, the quantity added to the green tea is about one grain to the ounce; and this is already diluted to a pale tint with white clay, so as not to contain more than a third, or probably a fourth, of a grain of pure Prussian blue. This quantity in an ounce of tea is, I think, but little to be dreaded; nevertheless the practice ought to be discouraged and abandoned.

Less doubt exists as to the pernicious qualities of an adulterated tea largely manufactured by the Chinese under the name of Lie tea. This consists of the sweepings and dust of the tea-warehouses cemented together with ricewater and rolled into grains. It is made either of black to imitate caper, or green to resemble gunpowder, and is manufactured professedly for the purpose of adulterating the better kinds of tea.

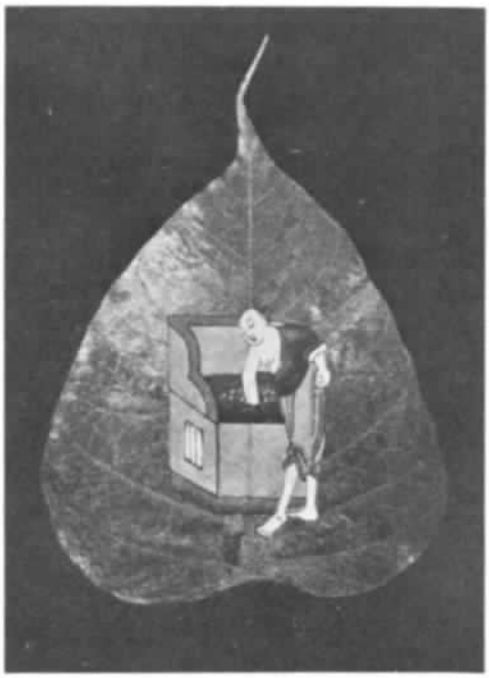
Genuine tea yields only 5 or 6 per cent. of ash when burned, being the proportion of mineral matter naturally contained in the leaf. The lie teas leave from 37 to 45 per cent. of ash, consisting chiefly of sand

and other impurities. These adulterated teas are imported into this country to the extent of half a million pounds' weight every year! In this, as in similar cases, the poorest classes, who can least afford it, are the greatest sufferers from the fraudulent practice.

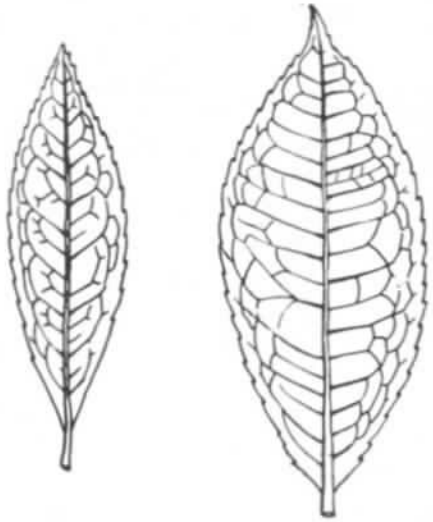
Thea sinensis *in flower.*

Darma, the legendary discoverer of tea. Woodcut 1/2 natural size from Kaempfer's "Amoenitates Exoticae" (1712).

Picking tea leaves in ancient China. The painting is on paper made of thin slices of the core of ***Aralia papyrifera,*** *a plant related to ginseng and English ivy.*



*Roasting tea in ancient China. The fuel chamber is visible on the side of the oven. The dishes on top contain small balls of tea which the man is rolling with his right hand. The painting was done on a skeletonized fig leaf (****Ficus religiosa****) covered with a layer of gelatin. About 1/2 natural size. Collection of the Polytechnical Institute of Zurich.*



Two species of tea leaves. Left, ***Thea sinensis*** *and right,* ***Thea assamica.***

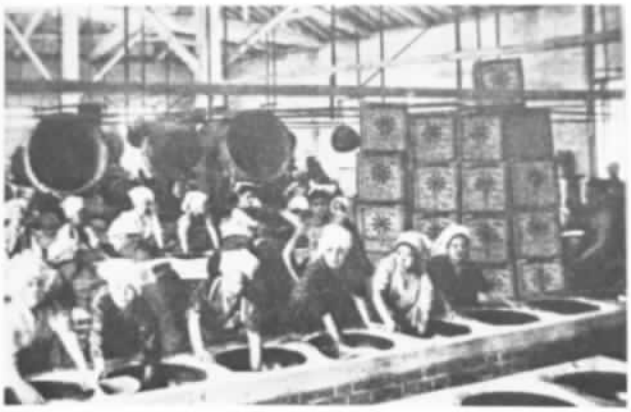
Living on the land. A late 19th century tea plantation in the highlands of Ceylon.

Method of pruning tea plants and gathering leaves. The stump was pruned back and the bud gave rise to a new branch. This has been picked twice at a' and a", and can be picked again at a, after which the bud B will produce new growth as has already occurred at a' and a".

Destroying the primeval forest to plant tea. Above: a Ceylonese nursery with thousands of tea plants. Below: setting the young plants in the recently cleared ground of a low-lying forest in Ceylon.

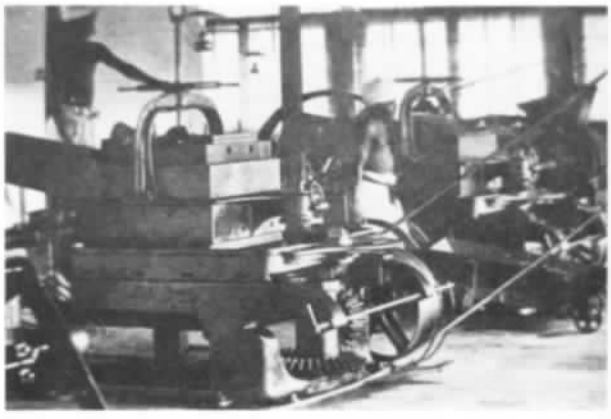
Singalese picking tea in turn-of-the-century Ceylon.

Ancient Chinese drawings depict stages in tea manufacture. Above: fermenting the freshly picked leaves. The inscription reads "Purifying the Tea." Below: roasting the leaves over fire. The inscription reads "The Tea is being roasted."



Roasting and fermentation steps in tea manufacture. Above: a late 19th century scene in a Japanese tea factory. The women are turning over the leaves as they roast in their metal pans. In the background are the large baskets for leaves and the chests for the final product.

Tea production in China. Above: picking tea in southern China about 1890. Below: Chinese women sorting tea leaves. The pointed feet of the woman on the right show that by this time the custom of foot binding had spread to the poorer classes.



Tea processing in old Ceylon. Pickers bring in the baskets of leaves for weighing. It is taken to the factory (above right) where it is dried on shelves and rolled with the machine shown. The processing is largely the same 100 years later.

Tea manufacture in 19th century Japan. Picking the leaves.

Tea manufacture in Japan. Weighing freshly picked leaves.

Tea tasters at work on the Tjikadjang estate in the late 19th century Java. Tea leaves are drying on large bamboo platters in the foreground.

Japanese tea plantation and workers sorting the leaves.

Rolling tea leaves with the feet in 19th century China.

Packing tea in square chests in late 19th century China.

Tea manufacture in Japan. Turning the leaves for drying.

Tea manufacture in Japan. Right - a woman fuels the oven used to steam tne leaves. Left - cooling the steamed leaves.

Tea manufacture in Japan. Grading of the tea in flat bamboo baskets (left) and by hand (right).

Tea manufacture in Japan. Weighing the finished tea chest with a single arm balance. The recorder sits at the right with his abacus.

Area of tea cultivation in 1900. Dotted line in east asia shows the northern limit of occurrences of the plant.

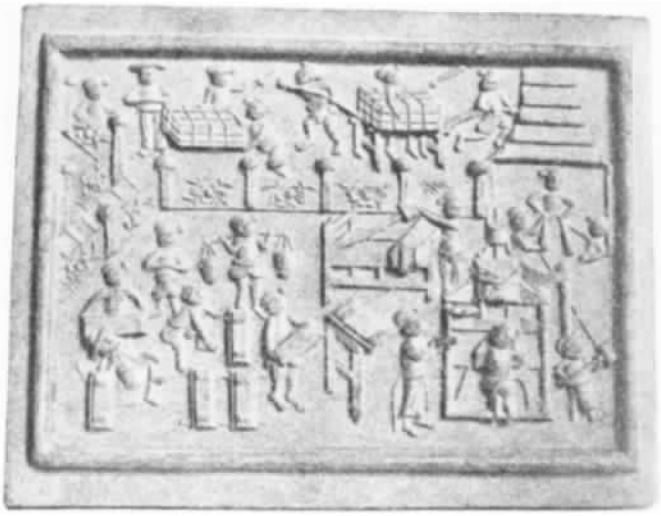
Russian tea caravan in Siberia about 1890.

Drying tea leaves in Java. From a picture in the colonial museum in Haarlem.

Method of picking tea leaves in Java. The end of the branch with the two youngest leaves is picked.

Carved Japanese tea boxes (chaire) for the leaf tea, made of bamboo. The first shows a monstrous citrus fruit (Citrus chirocarpa). The second is engraved with leaves and fruits of ***Diospyros kaki.*** *The third has a scene with rocks and trees while the fourth has a frog lying in wait for an insect. The last one has a beetle and a dragonfly. All about 1/5 natural size.*

Japanese tea service for leaf tea (sencha). The gray glazed clay surface has many small cracks. The teapot (chabin, dobin, kiusu) sits on a woven mat while the five cups (chawan) have red lacquered saucers (chataku or chadai). The serving tray is in the form of a lotus leaf. About 1/5 natural size.

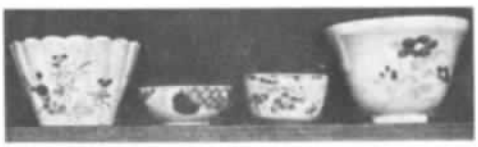


Bricks of powdered tea manufactured in the 19th century. The lower brick is from Nischny-novgorod, Russia, and is 21 x 14 x 1.7 cm. The uppper brick was presented to visitors to the factory of Tatakoff, Molotkoff and Co. in Hankow. It depicts the various steps in the manufacture of brick tea. The tea is being carried in round baskets at mid left, while at the mid right the leaves are packed in cloth bags for steaming. The press is below. At the left the pressed bricks are drying in their forms while in the middle the dried bricks are removed from their forms by hitting with a fixed hammer. Above, the bricks are tied in bails with rattan strips. This brick is 22 x 17.3 x 2 cm.

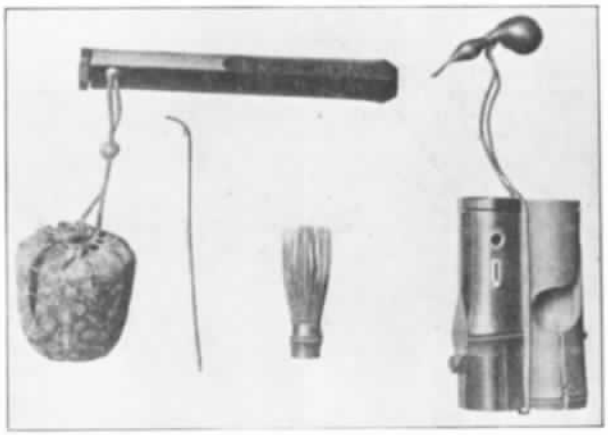
Flat bamboo scoops (sempai or chasukui) from Japan for scooping leaf tea. On the first are carved leaves and fruits, on the second a rocky landscape and on the third a sitting figure. The first four are shown from the outer surface and the fifth from the inside. About 1/3 natural size.

Japanese tea pots made of bamboo trunk and nodes. The first one shows the knobs remaining from the roots, while the second is carved with lotus leaves.

Teas from southeast Asia. Left is a Burmese tea wrapped in bamboo. Right is Vietnamese pressed tea. From the colonial exposition in Marseille about 1900.



Japanese tea and sake cups. At the left and right are porcelain cups for powdered tea (macha). The second cup is for sake and the third has double walls for use with leaf tea (sencha) - the five petals of the flower on it are holes into the space between the two walls.



Japanese apparatus for the preparation of ***macha*** *(powdered tea). Above is a case for the bamboo tea spoon, tied to the cloth covered tea box. At the right are two boxes, one for the bamboo tea whip (center) and the other for tea. The small gourd tied to the boxes is for hanging them from the belt. About 1/3 natural size.*

Below from the left: the iron water pot (kama) with two rings (kwan) for handles which sits on a charcoal stove (furo) supported by a wooden block (robuchi); two porcelain macha cups, the bamboo tea whip, the dipper and its clay cylinder for catching any water that drips from it. Behind the cylinder is a wooden box for the tea whip, next to which is a vessel for holding the tea residue (mizu kobushi) and the ancient form of tea cup of brown glazed clay (cha no yu no chawan). In front of these is the lacquered tea box (natsume) and the silk holder (go-motsu) for the tea box. In front is the bamboo spoon (cha saji) for the tea. About 1/6 natural size.

Colored Japanese woodcut showing tea serving (cha no yu) for three female guests. The hostess in the background is dipping boiling water from a sunken kettle (kama) with a ladle (cha saku). To her left on the bamboo mat lies the agitator (cha sen) for mixing the tea and the scoop (cha saji) for transferring tea from the box into the cups.

Colored Japanese woodcut showing preparation of tea. The women are unpacking and setting up the necessary apparatus. The woman at the right is cleaning a tea box (natsume) with a brush. The woman at left is fetching the tea cups (cha no yu chawan), next to which are the bamboo whip (chasen), the glazed clay cylinder (cha shaku tate) for holding the ladle (cha saku or hishaku) one of which is found on each side of her. On the middle shelf is a tea box (natsume) in its covering (gomotsu), next to a small bamboo spoon (cha saji) for removing tea from the box.

Title page (1/3 original size) of a 17th century book in praise of ***Veronica theezans*** *as a tea substitute. Published by Johannes Frank in Lubeck in 1696 it was titled "Veronica, der preiswurdige oder Europaische tee, wie selbige anstalt des indischen tee gebraucht werden kann" (Veronica, the praiseworthy or European tea, which can be used by itself to prepare the indian tea).*

MATÉ—

Ilex paraguariensis

Mate, or Paraguay tea, though not used over so large an area as the Chinese tea, is as much the passion of the Brazilians and their neighbours, in Southern America, as the latter is of the nations of north-eastern Asia. It is prepared from the dried leaves of Brazilian holly *(Ilex paraguariensis)*,—is said to have been in use among the Indians from time immemorial,—has been drunk by all classes in Paraguay since the beginning of the seventeenth century, and is now consumed by "almost the whole population of South America." The leaf of this tree is four or five inches long, and after being dried it is rubbed to powder before it is infused. The dried leaf has much of the aroma of some varieties of Chinese tea, and the infusion has a a pleasant odour, and an agreeable bitter taste. In the state in which it is commonly used in South America, it is more exciting than China tea, producing a kind of intoxication, and by excessive use leading even to *delirium tremens*.

The tree which yields the Yerba (or plant *par excellence*), as this tea is called, does not appear to be an object of culture. It grows spontaneously, in extensive natural plantations, amid the forests of Paraguay. The principle Yerbals or woods of this tree, are situated in the neighbourhood of a small town called Villa-Real, about fifteen hundred miles above Assumption, on the Paraguay river. They are scattered about, however, in various other localities upon the rich tract of country which extends between the rivers Parana and Uruguay. Permission to gather the leaves is granted by the government to certain merchants, in return for a considerable money payment. These merchants fit out parties of men, chiefly Indians, for the purpose of collecting the Yerba, and at the proper season proceed to the forests. When in the course of their journey they come to a Yerbal, or growth of mate trees, sufficiently extensive to make it worth while to halt and collect the leaves, they begin by constructing a long line of wigwams, which they cover with the broad leaves of the banana and palm. Under these they expect to pass nearly six months. An open space is then prepared, of which the soil is beaten with heavy mallets until it becomes hard and smooth. Over this is erected a kind of arch, made of hurdles, called a *Barbagua*, upon which the Yerba branches are placed. Beneath these a large fire is kept up till the foliage is thoroughly dried and roasted, without being scorched or suffered to ignite. The hard floor is then swept clean, the dried branches are laid upon it, and the now brittle leaves beaten off with sticks, which partly reduce them to powder. They are then crammed and beaten into sacks made of damp hides, which, when sewed up and left to dry, become in a few days as hard as stone. In these sacks, weighing about 200 lb., the mate is well preserved. The labour of collecting the Yerba, in the midst of these tropical forests, is very severe, and it is said to have been very fatal to Indian life. Many of the Creoles and Mestizos even assert that the Paraguyans have exterminated the poor Indians by compelling them to the labour of collecting this plant.

From the smallest shrubs the finest tea is obtained; but from the same kind of leaves different qualities are procured, according to the mode of preparation, and the kind of weather which prevails. Three principal kinds, however, are prepared and sold in South America under the names of caa-cuys, caa-miri, and caa-guaza—the prefix caa signifying the leaf itself. The *first* is prepared from the half-expanded buds: it will not keep, and its consumption is entirely confined to Paraguay. The *second*, from the leaf carefully picked and stripped from the nerves before roasting, as was done by the Jesuits. And the *third*, from the entire foliage, roasted as above described, without any preparation. The two latter varieties are not only used largely in the country of Paraguay, but are exported as far as Lima and Quito.

We have no data from which to calculate the total amount of mate consumed either in the whole of South America or in Paraguay alone. But it must be very large, since the quantity exported from the latter country is about 50,000 quintals, or 5,600,000 lb. a-year. It loses in virtue and flavour, however, and its aromatic bitterness diminishes by exportation and keeping, so that the infusion is drunk in perfection only on the spot where the leaves are gathered and newly dried.

In Brazil, a variety of mate called Gongonha is in use. It is prepared from the leaves of two other species of holly, the *Ilex gongonha* and the *Ilex theezans;* but I do not know to what extent. In Chili also, a tea called Paraguay tea, but different from the mate, is prepared from the leaves of the *Psoralea glandulosa*, and in Central America another variety from those of the *Capraria biflora*.

The use of the mate is very frequent, as well as very universal in South America. At every meal, and at every hour of the day, it is drunk. It has acquired the name of Mate from that of the vessel or cup in which it is infused, and from which it is drunk. Hot water is poured upon the powdered leaf, then a lump of burned sugar, and sometimes a few drops of lemon juice are added. The infusion is sucked through a tube, *bombilla*, often made of silver, which is open at one end, and has a perforated bulb or strainer at the other.

The cup is passed from hand to hand, the same cup, and often the same tube, serving a whole party. The leaves will bear to be steeped or watered three times, and the infusion is drunk off quickly, as it soon becomes black if allowed to stand.

Persons who are fond of mate consume about an ounce a-day. In the mining districts it is most universally taken, experience having shown that fermented liquors are there prejudicial to health. The Creoles in South America are passionately fond of the beverage, and never travel without a supply of the leaf, which they infuse before every meal, and sometimes much oftener, never tasting food unless they have first drunk their mate.

Numerous virtues are ascribed to this favourite beverage. It possesses many of the good qualities of our Chinese tea, while, like opium, it is said to calm the restless, and to arouse the torpid. As is the case with opium also, the habit of using it becomes a kind of second nature, so that to give it up, or even to diminish the customary quantity, is almost impossible. On the other hand, long indulgence, or an immoderate consumption of it, is apt to induce diseases similar to those which follow the excessive use of ardent spirits. It differs both from Chinese tea and from opium in acting upon the kidneys and moving the bowels.

The chemistry of the mate leaf is but imperfectly understood. From being rarely met with in Europe, it has not been much examined by chemists, yet we are sufficiently acquainted with the nature of its constituents to be able to account for its most striking effects. Thus—

First,—Like Chinese tea, it contains a volatile oil, which is produced during the roasting of the leaf, gives it a peculiar, agreeable aroma, gradually escapes from it by keeping, and upon which a portion of its narcotic virtue depends. This is shown by the facts already stated, that the tea becomes less valuable when long kept, or carried to great distances, and that it is only drunk in perfection near the Yerbal, where it is collected and prepared.

Second,—Dr. Stenhouse has shown that this leaf also contains theine, the vegetable principle which we have described as existing in Chinese tea, and as produced into the stomach. The proportion, however, is somewhat less than in Chinese tea, amounting in the varieties hitherto examined in Europe, to about 1¼ per cent.

Third,—Paraguay tea contains a large proportion of a peculiar, astringent acid, analogous to the tannin or tannic acid. For this reason, the fresh leaves are used in Brazil by the dryers. It is probably the presence of this substance in the infusion which causes it to blacken so rapidly when exposed to the air, and makes it necessary to drink it off as soon as it is made. Were it poured out into cups, as is done with Chinese tea, the liquid would become black and repulsive before the eyes of the drinker. Hence the reason for the peculiar mode of sucking it through a tube, which is practised in South America, and which at first seems so peculiar to Europeans. And,—

Lastly,—Like the Chinese leaf, it contains also nutritious gluten. Of this substance about 10 per cent. is present in the dried mate, of which only a small proportion dissolves when the tea is infused. The benefit of this ingredient, therefore, is experienced only where the infused leaf is subsequently eaten, as is the case, it is said, in some parts of South America.

An exact analysis of Paraguay tea has not yet been made, so that we are still in the dark as to its precise composition; but it is both interesting and remarkable to find, so far, a great similarity between the Chinese and the South American leaf. Both contain the same active ingredients, and both, though belonging to very different tribes of plants, have been selected to serve the same remarkable physiological purposes. How came tribes so remote, and so little civilized, to stumble upon this happy selection?

Coffee-tea.—Attention has lately been drawn to the use of the leaf of the coffee-tree as a substitute for that of the tea-tree. In 1845 Professor Blume of Leyden, who had travelled much in Java, made known in Holland that this leaf was so used in the Eastern Archipelago, and recommended it for use in Europe. Subsequently it was made known in this country by Professor Brand; and at the Great Exhibition in 1851, Dr. Gardner showed specimens of prepared coffee-leaves, announced at the same time that they contained *theine*, and suggested that they should be substituted for our ordinary tea.

These, along with other circumstances, have drawn the attention of Eastern merchants to the subject, and it appears from various communications which have recently been made public, that the use of coffee-leaves in this way is an old practice in the Eastern Archipelago. In the Dutch island of Sumatra especially, prepared coffee-leaves form "the only beverage of the whole population, and, from their nutritive qualities, have become an important necessary of life."

The leaves are roasted over a clear, smokeless, bamboo fire, till they become of a brownish-buff colour. They are then separated from the twigs, the bark of which, after a second roasting, is rubbed off and used along with the leaves. In this state they have an extremely fragrant odour, resembling that of a mixture of tea and coffee. When immersed in boiling water, they give a clear brown infusion, which, with sugar and cream, forms an agreeable beverage. Mr. Ward, who has been many years settled at Pedang in Sumatra, thus narrates his experience in regard to the use of the coffee-leaf in that island:—

"The natives have a prejudice against the use of water as a beverage, asserting that it does not quench thirst, or afford the strength and support the coffee-leaf does. With a little boiled rice and infusion of the coffee-leaf, a man will support the labours of the field in rice-planting for days and weeks successively, up

to the knees in mud, under a burning sun or drenching rain, which he could not do by the use of simple water, or by the aid of spirituous or fermented liquors. I have had the opportunity of observing for twenty years the comparative use of the coffee-leaf in one class of natives, and of spiritous liquors in another—the native Sumatrans using the former, and the natives of British India settled here, the latter; and I find that, while the former expose themselves with impunity to every degree of heat, cold, and wet, the latter can endure neither wet nor cold for even a short period, without danger to their health.

"Engaged myself in agriculture, and being in consequence much exposed to the weather, I was induced several years ago, from an occational use of the coffee-leaf, to adopt it as a daily beverage, and my constant practice has been to take two cups of a strong infusion, with milk, in the evening, as a restorative after the business of the day. I find from it immediate relief from hunger and fatigue. The bodily strength is increased, and the mind left for the evening clear and in full possession of its faculties. On its first use, and when the leaf has not been sufficiently roasted, it is said to produce *vigilance*; but I am inclined to think that, where this is the case, it is rather by adding strength and activity to the mental faculties, than by inducing nervous excitment. I do not recollect this effect on myself except once, and that was when the leaf was insufficiently roasted.

"As a beverage the natives universally prefer the leaf to the berry, giving as a reason that it contains more of the bitter principle, and is more nutritious. In the lowlands, coffee is not planted for the berry, not being sufficiently productive; but, for the leaf, the people plant it round their houses for their own use. It is an undoubted fact that everywhere they prefer the leaf to the berry."

He adds further, that while the culture of the coffee plant, for its fruit, is limited to particular soils and more elevated climates, *it may be grown for the leaf wherever, within the tropics, the soil is sufficiently fertile.* This is a very important fact, and, should the leaf come into general use, will no doubt lead to the introduction of new forms of husbandry in many tropical regions, from which the coffee-tree, as profitable article of culture, has been hitherto excluded. The Brazilian government is said to be directing its attention to the subject, and shipments of prepared coffee-leaves are announced to have been already made from that country to Europe. At present the price of prepared leaves in Sumatra is about 1½d. a pound; and they may be packed of good quality, for the European market, for 2d. a-pound.

In regard to the constituents of the dried coffee-leaf, the agreeable aroma emitted shows that, like Chinese tea, it contains a volatile oil, which will probably act upon the system like the similar oils of tea and coffee. It has been proved also to contain theine to the extent of 1½ per cent.—(Stenhouse)—and an astringent acid closely resembling that which is found in Paraguay tea. Both of these are present in it in larger proportion than in the coffee-bean; and hence, probably, the reason why the leaf is preferred to the bean by the natives of Sumatra. These, with about 13 per cent. of gluten and some gum, are all the ingredients yet found in the leaf. But the presence of these substances proves it to be so similar to the tea-leaf in composition, as to lead to the belief that it may be successfully substituted in common use for the Chinese tea. And this conclusion is supported by the wakefulness which is said to be produced by the infusion of coffee-leaves, and by the bodily refreshment it is found to yield, by the directly nutritive power which the leaves possess, and by the general favour they have found in the estimation of the people of Sumatra.

To boiling water the dried coffee-leaves yield about 39 per cent. of their weight—as much as is taken up by water from the most soluble varieties of the coffee-bean, and more than is yielded by Chinese tea. In this property, therefore, the leaf of the coffee-tree is also equal to the bean.

Labrador tea is the name given in North America to the dried leaves of the *Ledum palustre* and the *Ledum latifolium*. The plants grow on the borders of the swamps, and along the heathy shores of the mountain lakes in the colder regions of that continent. The leaves are gathered and used in the stead of Chinese tea—the narrower leaved plant *(L. palustre)*, according to Dr. Richardson, giving tea of the better quality. Both varieties are very astringent, and possess a narcotic, soothing, and exhilarating quality. This latter is so strong that in the north of Europe (Sweden and Germany) these plants are secretly employed by fraudulent brewers to give headiness to beer. They have not been examined chemically; but from the above facts we may infer that, besides a variety of tannin, to which they owe their astringency, they contain an active narcotic principle, more powerful, probably, than the theine of the tea-leaf, to which their peculiar, exhilarating, and stupefying effects are due. It is possible also, that, in the cold northern climates of Sweden and Labrador the effects of such a narcotic substance may be less sensibly felt than under our milder skies.

Abyssinian tea, called in its native country Khat or Chaat, is very extensively cultivated in Shoa and the adjoining regions, and is in general use among the inhabitants, just as tea is in China. It consists of the dried leaves of the *Catha edulis*, a species of small tree which is allied to the *Sageretia theezans*, from which the poorer classes of Chinese prepare an inferior kind of tea. In a light gravelly soil the plant attains a height of 12 feet. The leaves are plucked in the dry season, and well dried in the sun. In Abyssinia they sell at 1d. or 2d. a pound. They are gathered

chewed, boiled in milk, or infused in boiling water, and, by the addition of honey, yield a pleasant beverage. They have much resemblance to Chinese tea, both in their qualities and their effects. They are bitter to the taste, possess exhilarating properties, and dispel sleep if used to excess.

The leaves of this plant are also used green. Forskall states that the Arabs eat them green because of their property of preventing sleep. To such a degree do they exhibit this influence, that a man who chews them may stand sentry all night without feeling drowsiness. They are also regarded as an antidote to the plague; and the Arabs believe that the plague cannot appear in places where the tree is cultivated. Botta adds to these qualities that, when fresh, the leaves are very intoxicating.

This North African tea appears to be extensively cultivated and used, though less so now than in ancient times; but we have no means of estimating the absolute quantity which is grown and consumed. We are entirely ignorant, also, I believe, of its exact chemical history, and do not yet know whether it belongs to the class of plants in which theine exists. Its relation to the *Sageretia theezans* of China renders this not unlikely.

Many other plants, of which the chemistry is unknown, are used in various countries as more or less perfect substitutes for Chinese tea. Thus, the name *Tasmanian tea* is given to the dried leaves of various species of Melaleuca and Leptospermum, belonging to the order of the Myrtaceae, which are collected in Australia, and used by the colonists instead of Chinese tea. These trees are commonly called tea-trees, and the large tracts of country which are covered with them, *tea-tree flats*. The leaves of various species of Correa also, which belong to the Rutaceae, and especially of the *Correa alba*, are collected and used for the same purpose. The leaves of *Acaena sanguisorba*, a plant allied to the Rosaceae, and which abounds everywhere in Tasmania, are said to be an excellent substitute for tea. In the same eastern region the leaves of the *Glaphyria nitida*, another of the Myrtaceae—called by the Malays the Tree of Long Life, affords at Bencoolen, in Sumatra, a substitute for tea.

Faham tea, is the name given in Mauritius to the dried leaves of the *Angroecum fragrans*—a fragrant orchid. The infusion of these leaves is exceedingly pleasant to the smell, and is drunk to promote digestion, and in certain diseases of the lungs. Its fragrance is owing to the presence of *coumarin*, the odoriferous principle of the Tonka bean and of mellilot, described in a subsequent chapter. The leaf does not contain theine, and it is not therefore to be classed in its virtues and uses with the Chinese and Paraguay teas.

Besides all these we have North American substitutes for the China leaf, distinguished by the names of Appalachian tea, Oswego tea, Mountain tea, and New Jersey tea. We have a Mexican tea, a Brazilian tea,—the aromatic *Capitao da matto*,—a Santa Fe tea, and Indian, Toolsie tea and many others. Of the chemistry of all these substitutes we know next to nothing. I have therefore embodied in the following table nearly all the information we possess regarding them:—

Name of Plant	Natural Order	Where collected & used.	Name Given
Hydrangea thunbergii	Hydrangencea	Japan	Ama tsja or tea of Heaven
Sageretia theezans	Rhamnaceae	China	?
Ocymum album	Labiata	India	Toolsie tea
Catha edulis	Celastraceae	Abyssinia	Khat or Chaat
Glaphyria nitida	Myrtaceae	Bencoolen (flowers used)	Tea plant and tree of Long Life
Correa alba	Rutaceae	New Holland	
Acaena sanguisorba	Sanguisorbiaceae	Do	
Leptospermum scoparium & L. thea	Myrtaceae	Do	Tea plants and Tasmanian tea
Melaleuca scoparia & M. genistifolia	Myrtaceae	Do	
Myrtus ugni	Myrtaceae	Chili	Substitutes for
Psoralea glandulosa	Leguminosae	DO	Paraguay tea
Alstonia theaformis	Styracaceae	New Granada	Santa Fe tea
Capraria biflora	Scrophulariaceae	Central America	
Lantana pseudothea	Verbenaceae	Brazil	Capitao da matto
Chenopodium ambrosioides	Chenopodiaceae	Mexico & Columbia	Mexican tea
Viburnum cassinoides	Caprifoliaceae	North America	Appalachian tea
Prinos glaber	Aquifoliaceae	Do	New Jersey tea
Ceanothus americanus	Rhamnaceae	Do	(medicinal)
Gaultheria procumbens	Ericaceae	Do	Mountain tea
Ledum palustre	Ericaceae	Do	Labrador tea or James' tea
Ledum latifolium			
Monarda didyma			
M. purpurea	Labiatae	Do	Oswego tea
Angraecum fragrans	Orchidiaceae	Mauritius	Bourbon or Faham tea
Micromeria theasinensis	Labiatae	France	?
Stachytarpheta jamaicensis	Verbenaceae	(Austria)	Brazilian tea
Prunus spinosa mixed with ⅓	Drupaceae	(Northern Europe)	Sloe and Strawberry tea, one of our best substitutes for Chinese tea.
Fragaria collina, ⅔ or F. vesea	Rosaceae		
Salvia officinalis	Labiatre	Do	Sage tea

Before I leave this subject, it may interest the reader if I briefly sum up what appears to be the actual state of our knowledge regarding the chemistry and physiology of the beverages we infuse.

First, As to the chemistry of the various leaves and seeds we have mentioned, it appears that, when roasted and ready for use, they all contain,—

a. A volatile, odoriferous, aromatic oil, which does not exist in the fresh leaf or seed, but is produced or developed during the roasting. In tea this oil is most abundant, in coffee probably next, and in cocoa least in quantity. In the teas (Chinese and Paraguay), and in roasted coffee, the quantity and activity of this oil appear to diminish by keeping. In raw coffee, on the other hand, the power of developing this oil by roasting is greater the longer the bean is kept or allowed to ripen.

b. A peculiar, bitter, crystallisable principle, containing much nitrogen, and exerting a specific action on the system. In the teas, in coffee, and in guarana, this principle is theine, which contains 29 per cent. of nitrogen; in cocoa it is theobromine, which contains 36 per cent. of nitrogen. Weight for weight, the average qualities of tea contain about twice as much

theine as the average qualities of coffee, but in both it varies between 1 and 5 per cent. as extremes. In cocoa the proportion of theobromine has not been determined. In well-roasted coffee, and in chicory, another bitter principle, which is soluble, uncrystallisable, and free from nitrogen, is produced during the roasting. The quantity and properties of this substance have not been determined.

c. A variety of tannin or tannic acid, which gives their astringency to the infusions prepared from all these substances. Of this ingredient the teas contain most, coffee next, and cocoa the least. The tannin of Chinese tea gives a black, that of mate and of coffee a green with solutions containing iron.

d. A nutritious substance resembling the gluten of wheat or the fibrin of beef. In the tea-leaf this ingredient is most abundant, in cocoa next, while coffee contains the least. It dissolves but sparingly in water, and is therefore generally lost to the consumer when only the infusion is drank. The full benefit of this ingredient is obtained only when the tea-leaves are eaten, when the coffee grounds are taken along with infusion, or when the whole material is made into a beverage, as in the usual modes of preparing cocoa and chocolate.

e. A quantity of fat, which in cocoa forms more than half the whole weight of the bean, in coffee one-eighth, and in tea only three or four per cent. The presence of so large a proportion of fat gives a peculiar character to cocoa, rendering it most nutritious, especially when made with milk, to those whose stomachs will bear it, but making it less suitable at the same time to persons of weak digestive powers.

Of the infusions themselves which are yielded by the different varieties of tea, mate and coffee, it is to be observed that they vary in strength with the sample employed. Of some teas and coffees, boiling water will extract and dissolve as much as one-third of the whole substance; of others, not more than one-sixth. The proportions of the several ingredients above-mentioned which the infusions we prepare are likely to contain, must therefore by very variable and uncertain.

Second, As to the physiology of these beverages, or their action on the system, it appears—

a. Generally, that they all exert a remarkable influence on the activity of the brain—exalting, so to speak, the nervous life; and yet they do so in a way different from opium or ardent spirits, since they act as antidotes to the narcotic influence of the one, and relieve the intoxication produced by the other.

b. They all soothe the vascular or corporeal system, allay hunger, retard the change of matter, and diminish the amount of bodily waste in a given time; and if this waste must, in the healthy body, be constantly restored in the form of ordinary food, this diminution of the waste is equivalent to a lessening of the amount of food which is necessary to sustain the body—hence their value to the poor. They are *indirectly* nutritious.

c. Specially, they diminish the quantity of carbonic acid given off from the lungs in a given time—(Prout)—and that also of urea, phosphoric acid, and common salt in the urine (Julius Lehmann.) These are the chemical forms in which the lessening of the change of matter manifests itself. In the case of coffee it has been ascertained by experiment, that this lessening of the waste is due more to the empyreumatic oil than to the caffeine. The same is probably true also of tea.

d. The increased action of the heart, the trembling, the headache, and the peculiar intoxication and delirium which extreme indulgence in coffee sometimes produces, are mostly caused by caffeine. On the other hand, the increased action of the kidneys, of the bowels, and of the perspiring vessels, and generally the increased activity of the whole system, are ascribed to the action of the oil. That Chinese tea has an astringent or costive effect upon the bowels, may arise either from the empyreumatic oil of tea not acting in the same way as that of coffee, or from the larger proportion of the astringent tannic acid which tea contains being able to counteract the effect of the oil. That there is a specific difference in the action of the empyreumatic oils of tea and mate, compared with that of coffee, is further probable from the remarkably intoxicating effect which both the Chinese and the Paraguay leaves possess when newly gathered and roasted for use.

Of course the general effect of these beverages upon the system is the combined result of the simultaneous action of all their constituent ingredients. But possessing the two characteristic influences of retarding the change of matter, and of increasing at the same time the activity of the nervous life, they cannot, according to our present knowledge, be replaced by the strongest soups or flesh teas, or by any other infusions or decoctions which merely supply the ordinary kinds of nourishment in more or less diluted and digestible forms.

In some countries it is the custom to heighten the natural flavour of roasted coffee by the addition of spices. Thus M. de Sauley, in his recent tour round the Dead Sea, found the Bedouins in the country of ancient Moab drinking coffee, of which he says that it was "an absolute decoction of cloves." On the Continent, and in North and South America, vanilla is said to be employed largely for flavouring coffee as well as chocolate. To the other more natural influences of coffee these spices add a stimulating effect, which appears to expend itself chiefly upon the animal propensities.

A perusal of the history of these beverages leaves lingering in our minds some interesting general facts, which are suggestive of many thoughts.

The first is, the vast extent to which the materials for these beverages are cultivated and used, and the important place they occupy among what may be called the artificial necessities of life. Our data for forming correct calculations as to the quantity of each beverage which is grown and consumed are very defective, but we may guess them at about—

Chinese Tea	2240 millions of pounds.
Mate	20 millions of pounds.
Coffee	600 millions of pounds.
Chicory	30 millions of pounds.
Cocoa	100 millions of pounds.

forming an aggregate of nearly 3000 millions of pounds of the raw materials consumed annually in the preparation of the beverages we infuse.

Nor is the number of people to whom these warm beverages have become necessaries of life less surprising. Thus—

	Is Consumed in	By about
Chinese tea	China, Russia, Tartary, England, Holland, and North America.	500 millions of men.
Mate or Paraguay tea	Peru, Paraguay, Brazil, &c.	10 millions of men.
Coffee-tea	Sumatra, &C.	2 millions of men.
Coffee-bean	Arabia, Ceylon, Jamaica, Germany, France	100 millions of men.
Chicory	Germany, Belgium, France, England	40 millions of men.
Cocoa	Spain, Italy, France, Central America	50 millions of men.

So that upon these four plants about three-fifths of the whole human race are dependent for one of their most useful and harmless forms of indulgence.

A second point which strikes us in the history of these beverages—at least of the teas and coffees—is, that they have come more and more into use in Europe and America, as the intellectual activity which distinguishes the leading nations of modern times has developed itself. The kind of ordinary food upon which the consumers of these beverages usually live no doubt modifies the influence they exercise upon the system. It is even probable that the nature of this food is one of the causes which determine the preference given to tea or to coffee by the different European nations. And, reasoning from this probability, we might say that there is too much of mere vulgar nutrition in cocoa to allow it to influence the nervous or intellectual life to an equal degree with tea and coffee; and in this we might find a reason for the less prominent intellectual position which has been occupied by Spain and Italy, since cocoa has become an article of such universal consumption amongst them.

A third striking fact is, that the poorest and humblest among us, who has his own little earnings to spend, devotes a small part of it to the purchase of tea or coffee. He can barely buy bread and milk, or potatoes and salt, yet the cup of tea or coffee is preferred to the extra potato or the somewhat larger loaf. And if thereby his stomach is less filled, his hunger is equally stayed, and his comfort, both bodily and mental, wonderfully increased. He will probably live as long under the one regimen as the other; and while he does live, he will both be less miserable in mind, and will show more blood and spirit in the face of difficulties, than if he had denied himself his trifling indulgence. Besides the mere brickwork and marble, so to speak, by which the human body is built up and sustained, there are rarer forms of matter, as these chapters have shown, upon which the life of the body and the comfort of animal existence most essentially depend. This truth is not unworthy the consideration of those to whom the arrangement of the dietaries of our prisons, and other public institutions, has been intrusted.

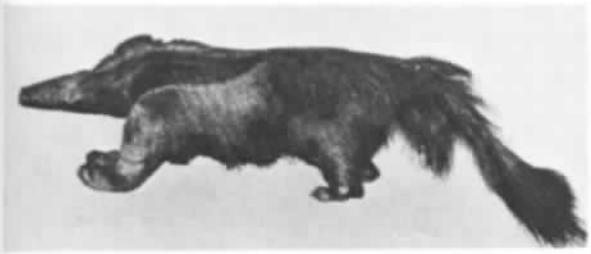
If there be in the human constitution this innocent craving, it cannot be misplaced humanity to minister to it, even in the case of the depraved and convicted. Where reformation is aimed at, the moral sense will be found most accessible where the mind is maintained in most healthy activity, and where the general comfort of the whole system is most effectually promoted.

Blooming and fruiting branches of ***Ilex paraguariensis*** *- the source of mate.*

Paraguayans drying yerba mate over a fire in a special shed (carijo, above) and cutting the mate branches (below).

Area of growth and greatest use of mate.

Final steps in bringing verba mate to the consumer in Paraguay about 80 years ago. People are shown stuffing leaves into sacks and transporting them downriver. From



Two 19th century methods of packing a mate: ***the skin of a giant anteater*** *and* ***a leather bag.*** *From Tschirch.*

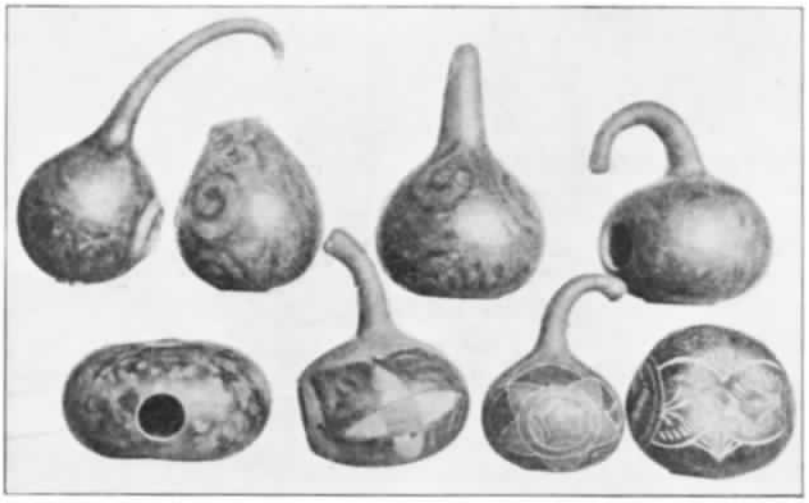
Packages of Paraguay tea (mate), the left one of leather, the right one an early 20th century paper package.

Modern porcelain mate pitcher made in Europe. 1/2 natural size.

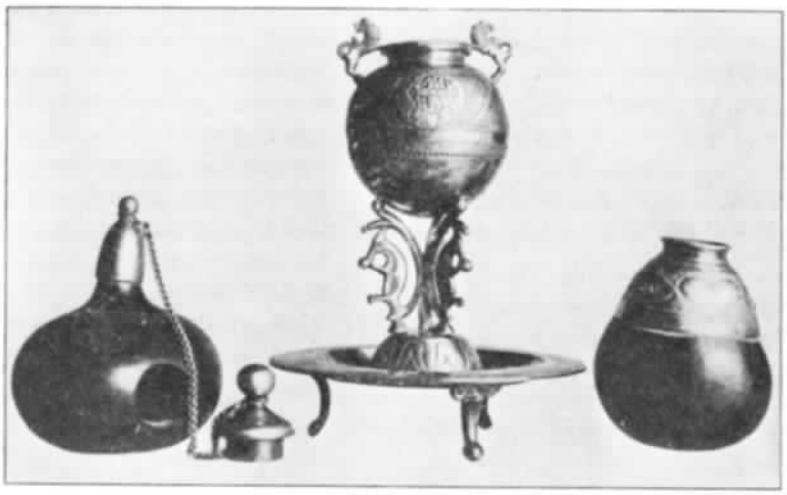
Straws for sipping mate. From the left they are: partially rewoven stem with woven head, silver, silver and the last two are of German silver, made in Europe. About 1/2 natural size.

Mate trees in Uruguay. From Moreau de Tours, "Le Mate."

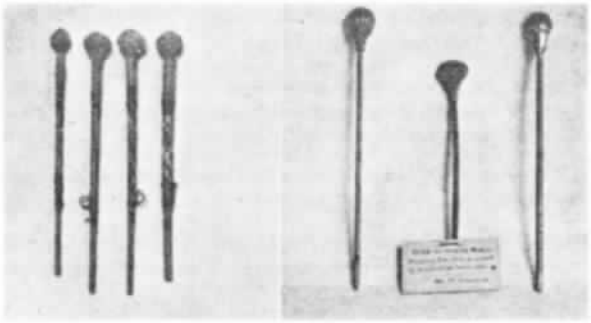
Nineteenth century mates (mate cups) from Argentina, made from black gourds, carved and the carving filled with white dye. From the top left they show a person sipping mate through a tube, escutcheons of Argentinian states, a castle and mountain by the sea, a ship, a flower, a coat of arms and a flower. About 1/3 natural size.



Mates made from gourds, the first five with woodburned ornamentation are from Argentina, while the lower right three with carving are from Chile. About 1/3 natural size.



Mate containers. Two are gourds with silver caps, the right hand one from Argentina. The middle one is of silver, engraved with flowers and leaves and having two lions as handles and three animals eating fruits in the base.



Cups and straws (bombillas) used with mate (Paraguay tea). Originals in the museum of Kew Gardens collected in the 19th century.

Paullinia cupana *the source of guarana, another caffeine containing beverage. Its cultivation by the Indians of the upper Amazon, formerly very common, is now rare.*

COCA—
Erythroxylon coca

OUR LADY OF YONGAS

And all my days are trances;
And all my nightly dreams
Are where thy dark eye glances,
And where thy footstep gleams:
In what etherial dances,
By what eternal streams.

E.A. Poe

To the Peruvian the province of Yungas de la Paz in the North—East of Bolivia is an El Dorado, because *there* grows in the greatest profusion and luxuriance his favorite Coca. We may look with delight towards the island of Ceylon, and, in imagination, snuff the fragrant breezes that have passed over the cinnamon groves and coffee plantations; or direct the gaze of our children across the map of the world to South—Eastern China, and inform them that from thence our good dames receive their tea; and thence to the United States, and add that from this place their worthy sires receive the greater part of their tobacco. But the affections of the Peruvian are not so divided; they are located upon one spot, and *that* the province of the "warm valleys," or the Yungas de la Paz; there dwells his patron saint, and from thence *he* receives the "keys of Paradise."

At the time of the conquest the Coca was only used by the Incas, and those of the royal, or rather solar, blood. It was cultivated for the monarch and for the solemnities of their religion; none might raise it to his mouth, unless he had rendered himself worthy by his services to partake of this honour with his sovereign. The plant was looked upon as an image of divinity, and no one entered the enclosures where it was cultivated without bending the knee in adoration. The divine sacrifices made at that period were thought not to be acceptable to Heaven, unless the victims were crowned with branches of this tree. The oracles made no reply, and auguries were terrible if the priest did not chew *coca* at the time of consulting them. It was an unheard of sacrilege to invoke the shades of the departed great without wearing the plant in token of respect, and the Coyas and Mamas who were supposed to preside over gold and silver, rendered the mines impenetrable unless propitiated by it. In the course of time its use extended, and gradually became the companion of the whole Indian population. To this plant the native recurred for relief in his greatest distress; no matter whether want or disease oppressed him, or whether he sought the favours of Fortune or Love, he found consolation in the "divine plant."

The word by which this plant is known has been referred, for its etymology, to the Aymara language, in which *Khoka* signifies *tree* or *plant*. It is known that the shrub producing the Mate or Paraguay tea, the favourite beverage of many South American nations, is called *la Yerba*, i.e. *the plant*. As also in Mexico tobacco was called *yetl*, and by the Peruvians *Sagri*, meaning in those languages *the herb*, so we, occasionally, are apt to designate the latter article *the weed*. Showing, that to those persons or nations who have appropriated such names, trivial in themselves, to the different articles of consumption, these plants were in themselves pre-eminent in the vegetable creation, as, in another instance, we have shown our appreciation of one book above all others, century after century, by the simple designation of *The Book*.

In Europe, the historians of the conquest gave the first information of the sacred plant of the Peruvians; this was, however, merely superficial. In 1569, Monardes, and in 1605 Clusius, wrote concerning it, but the leaves of the plant itself were not seen until brought over by one of the companions of La Condamine, Joseph de Jussieu, who nearly lost his life in 1749, while crossing the Cordilleras in search of this plant. He was compelled to cross the mountains, covered as they were with snow, on foot, descending by means of paths cut out like ladders, and overhanging frightful precipices. The intensity of the sun's rays, reflected by the snow, caused him the most distressing pains in the eyes, and almost blinded him, but the success of his expedition consoled him for the misfortunes that he had endured.

This shrub rises to the height of from four to eight feet, the stem covered with whitish tubercles, which appear to be formed of two curved lines set face to face. The leaves are oblong, and acute at each end, from an inch and a half to two inches in length. The leaves are the only parts used, for which purpose they are collected and dried. The shrub is found wild in Peru, according to Poppig, in the environs of Cuchero, and on the stony summit of the Cerro de San Christobal. It is cultivated extensively in the mild, but very moist climate of the Andes of Peru, at from 2,000 to 5,000 feet above the sea level; in colder situations it is apt to be killed, and in warmer to lose the flavour of the leaf.

The coca plant is propagated from seed sown in nursery beds and carefully watered. When about sixteen or eighteen inches high they are transplanted into plantations called *cocals*, in terraces upon the sides of the mountains. At the end of a year and a half the plant affords its first crop, and from this period to the age of forty years or more it continues to yield a supply. Instances have been noticed of coca plantations that have existed for near a century; but the greatest abundance of leaves is obtained from plants between the third and sixth years. There are four gatherings in the season; the first takes place at the period of flowering, and consists of the lower

leaves only. These are larger and less finely flavoured than those afterwards collected, and are mostly consumed at once. The next and most abundant harvest takes place in March; the third and most scanty, in June or July, and the last in November. The leaves are collected similarly to those of tea. Women and children are employed for this purpose. The gatherer squats down, and holding the branch with one hand, plucks from it the leaves, one by one, with the other. These are deposited in a cloth, from which they are afterwards collected into sacks to be conveyed from the plantation. The sacks of leaves are carried to the *haciendas*, where they are spread upon a floor of black slate to dry in the sun. They are then packed up in bales made of banana leaf, closely pressed together, each bale containing on an average twenty-four pounds. The price realised to the cultivator is one shilling per pound.

At first the Spaniards strenuously opposed the use of the coca—it was anathematized by them everywhere, as tobacco was by its zealous opponents in the old world, but this opposition only seemed to produce an extension of the habit. Then the Spaniards, appreciating the advantages which might accrue to them in a monopoly of the plant, took the culture into their own hands, and by force, enrolled the Indians of the Cordilleras in their service, much to the discomfort of the latter, who suffered extremely from the change of climate. Complaints to the government being so numerous, the Viceroy, Don Francisco de Toledo, espoused the cause of the Indians, published seventy-one decrees in their favour, and the speculation was abandoned. It is said, that in 1583 the government of Potosi derived a sum not less than £100,000 from the consumption of 90,000 to 100,000 baskets of this leaf. The cultivation of coca is therefore an important feature in Peruvian husbandry, and so lucrative, that a coca plantation, whose original cost and current expenses amounted to £500 during the first twenty months, will, at the end of ten months more, bring a clear income of £340.

The coca possesses a slightly aromatic and agreeable odour, and when chewed, dispenses a grateful fragrance, its taste is moderately bitter and astringent, and somewhat resembles green tea; it tinges the saliva of a greenish hue. Its effects on the system are stomachic and tonic, and it is said to be beneficial in preventing intermittents, which have always prevailed in this country.

The mode of employing coca is to mix with it in the mouth a small quantity of lime prepared from shells, much after the manner that the betel is used in the East. With this, a handful of parched corn, and a ball of arrow-root, an Indian will travel on foot a hundred leagues, trotting on ahead of a horse. On the frequented roads, we are informed, that the Indian guides have certain spots where they throw out their [illegible] accumulated into little heaps, that now serve as marks of distance; so that, instead of saying, one place is so many leagues from another, it is common to call it so many quids. Dr. Weddell states that the Bolivians are in the habit of using instead of lime with their leaf, a substance called *llipta*, which consists of the ashes of the Quinoa plant; in other parts the ashes of other plants are used, as on the Amazon, those of the leaves of the trumpet-tree. These alkaline ashes are made into little cakes, and sold in the markets.

"The Preuvian ordinarily keeps his coca in a little bag called *chuspa*, which he carries suspended at his side, and which he places in front whenever he intends to renew his *chique*, which he does at regular intervals, even when travelling. The Indian who prepares himself to chew, in the first place sets himself as perfectly at ease as circumstances permit. If he has a burden, he lays it down; he seats himself, then putting his *chuspa* on his knees, he draws from it, one by one, the leaves which are to constitute his fresh 'quid.' The attention which he gives to this operation is worthy of remark. The complaisance with which the Indian buries his hand in the leaves of a well-filled *chuspa*, the regret he seems to experience when the bag is nearly empty, deserve observation, for these little points prove that to the Indian the use of coca is a real source of enjoyment, and not the simple consequence of want."

Large heaps of the freshly-dried leaves, particularly while the warm rays of the sun are upon them, diffuse a very strong smell, resembling that of hay in which there is a quantity of melilot. The natives never permit strangers to sleep near them, as they would suffer violent headaches in consequence. When kept in small portions, and after a few months, the coca loses its scent, and becomes weak in proportion. The novice thinks that the grassy smell and fresh hue are as perceptible in the old state as when new. Without the use of lime, which always excoriates the mouth of a stranger, the natives declare that coca has not its true taste, a flavour which can only be detected after long use. It then tinges green the carefully swallowed saliva, and yields an infusion of the same colour. Of this infusion Poppig made trial, and found that it had a flat, grass-like taste, but he experienced the full power of its stimulating principles. When taken in the evening, it was followed by great restlessness, loss of sleep, and generally uncomfortable sensations, while from its exhibition in the morning, a similar effect, though to a slight degree arose, accompanied with loss of appetite. Dr. Archibald Smith of Huanaco, when on one occasion unprovided with Chinese tea, made a trial of the coca as a substitute for it, but experienced such distressing sensation of nervous excitement, that he never ventured to use it again. It is not at all uncommonly used in this way; and the Indians have tea-parties or *tertulias*, for taking the infusion of the leaves, as well as for chewing them. Some affirm that

in the coca-tea drinkings the effects are agreeably exhilarating. It is usual to say on such occasions, "*Vamos a coquear y acullicar*"—"*Let us indulge in coca.*"

The virtues of the coca must be of the most astonishing character. The Indians, who are addicted to its use, are declared to be thereby enabled to withstand the toil of the mines amidst noxious metallic exhalations without rest, food, or protection from the climate. They run hundreds of leagues over the deserts, and plains, and craggy mountains, sustained only by the coca and a little parched corn; and often too, acting as mules in bearing loads through passes where animals cannot go. Some have attributed this frugality and power of endurance to the effects of habit, and not to the use of coca; but the Indian is naturally voracious, and it is known that many Spaniards were unable to perform the Herculean tasks of the Peruvians until they habitually used the coca; moreover, it is affirmed, that without it, the Indians lose both their vigour and powers of endurance. During the siege of La Paz in 1781, when the Spaniards were constantly on the watch, and destitute of provisions, in the inclemencies of winter, they were saved, as chroniclers narrate, from disease and death by resorting to this plant. Some of those who deny many of the effects, said to be produced by its use, admit that the coca is useful medicinally as a preservative against the fevers which are consequent to a climate like that of Peru.

amphetamines is now limited to narcolepsy, appetite control in cases of obesity, and hyperkinetic behavioral disorders in children. Despite the recent reappraisal of the amphetamines, which resemble cocaine in effects as well as potential for dependence, they remain in wide distribution on the illicit market.

Cocaine is an alkaloid contained in the leaves of *Erythroxylon coca*, a hardy plant of the Andean highlands in South America, probably indigenous to the region that is now Bolivia and Peru. The crop is legally cultivated for domestic consumption. But a part of it is illegally converted to coca paste, then smuggled to clandestine laboratories capable of producing cocaine hydrochloride.

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After spreading out to dry coca leaves are raked up, baled and shipped to market.

Above: a typical cocal (coca plantation) on the slopes of the Andes. Below: harvesting coca leaves near Cusco, Peru.

Two Bolivian Indians with their coca cuds.

An Ica tribesman of Sierra Nevada, Columbia, using the lime stick which is put into his mouth with the mastication of coca leaves.

In the pictures, a Columbian coquero (coca chewer) shows how he prepares and stores the lime that he will use in chewing the coca leaves.

The lime, mixed with the coca leaves, permits the release of the alkaloids of the plant and facilitates their absorption by the body. It is extremely interesting to note that without, of course, any theoretical knowledge of chemistry, these people found out, centuries ago, a process which is perfectly efficient for bringing out the extraction of those alkaloids.

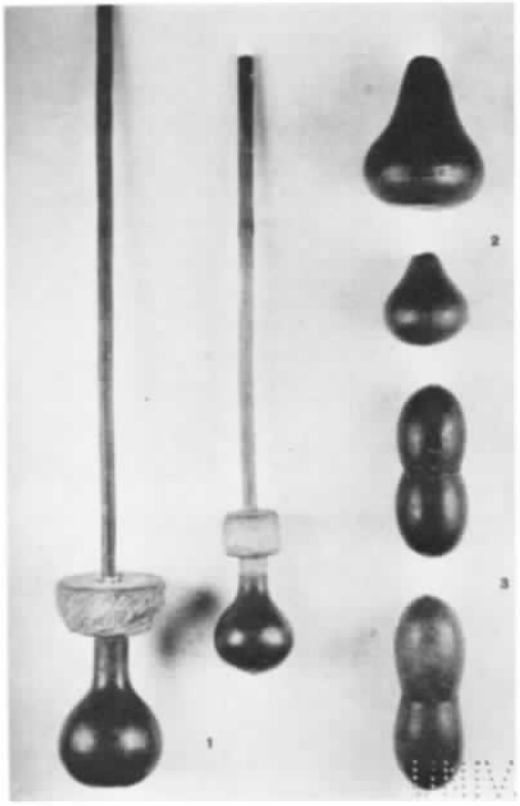
First he gathers and splits wood for the fire. A few sticks generally suffice, and on these are placed the shells that will calcinate and thereby produce the lime.

The lime is then gathered from the fire and placed in a mortar, where it is ground to a fine powder. It is then put in a calabash gourd, which the **coquero** *closes by means of a small sharp stick of hard wood. He uses the calabash gourd, such as displayed, as a container in which he carries the lime.*

In the next photograph, he picks up a small lump which he pushes inside the ball of half-chewed coca leaves.

A Burmese cocaine eater ca. 1900. Although illicit cocaine use was well known in India and southeast Asia it was until recently almost always eaten rather than sniffed. Eating cocaine diminished the high but may prolong the action.

Drawing of coca in flower. Note the characteristic venation of the leaves.



Lime mixed with chewed coca leaves facilitates the extraction of the alkaloids. The Columbian Indian above takes a little lime (llipta) from his gourd (poporo). Above are: 1. Arhuaco Indian lime gourds from Columbia, 2. Arhuaco tobacco gourds and 3. Chuncho Indian lime gourds from Peru.

Coca plants are harvested from two to six times each year. The leaves, after they have been stripped from the plants by hand, are dried in the sun before shipment (above and right). The ancient custom of coca-chewing is illustrated by a pot from the Mochica Culture that dates from 600 to 800 A.D. (below and right).

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Cocaine is an alkaloid contained in *Erythroxylon coca* Lamarck, a hardy plant of the Andean highlands, probably indigenous to the region that is now Bolivia and Peru. Here, on steep terraced slopes, it is legally cultivated to this day.

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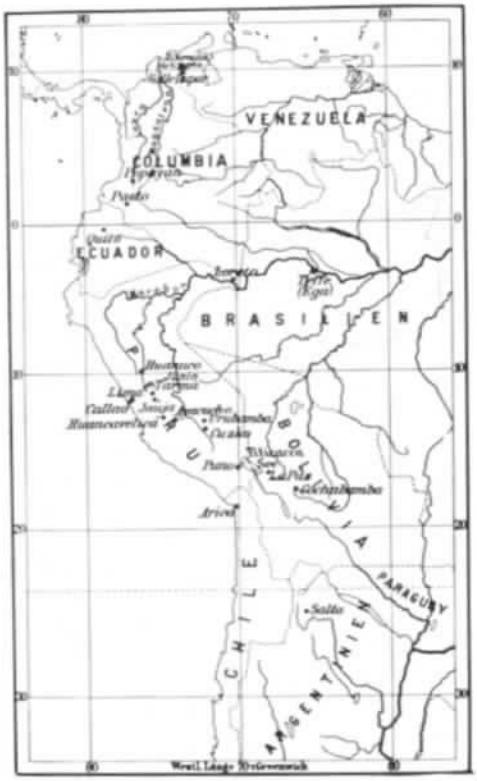
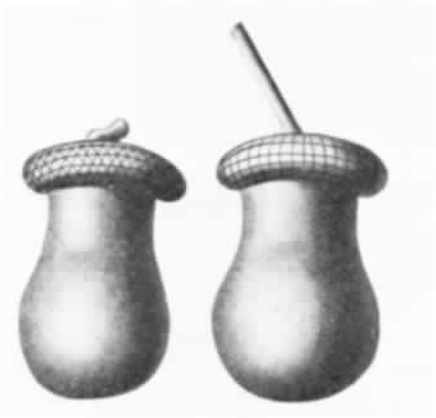


Area of South America where coca has been most used, though it has been exported virtually everywhere in the continent.

Jar in the form of a human head from a pre-Columbian grave in Peru. The swollen right cheek depicts a coca cud.



Two lime containers (poporos) made from gourds. The sticks at the top are used for removing some of the lime to add to the coca leaf cud in the cheek.

COLA—
Cola nitida

The population of the vast territory of the Sudan between the Atlantic Ocean and the source of the Nile crave for a substance which supplies them in everyday life with a slight feeling of stimulation and temporarily augments physical capacity. The kola nut is the drug which satisfies these desires. Its stimulating effects on physical activity have endowed it with a considerable market value, and have not prevented it from penetrating far into the north across the Sahara up to Fezzan. Mohammedans, "pagans," and others love the kola nut and make great sacrifices in order to procure it.

This nut plays an important part in the social life and commercial relations of these peoples. Much trouble is taken in order to obtain the drug. The Jaussa, for instance, organize long caravan-journeys for this purpose to the country of the Ashanti, and their arrival is an important event for the latter. Those who have no money to buy the drug beg. Rich people ingratiate themselves by distributing nuts or pieces of nuts. The inhabitant of Kano in Northern Nigeria does not hesitate to sell his horse or his best slave, his two most important possessions, in order to enjoy his favourite pastime. Indeed, it is not rare for a poor man to seize an already half-masticated piece of another person's nut and to continue chewing it.

The physical effects of kola must evidently be very considerable, or it would not be so highly esteemed. The habit of chewing it cannot alone be regarded as sufficient explanation. That is why the first discovery of kola, as in many other cases of similar kind, has been explained by a divine legend:

"One day when the Creator was on earth observing the sons of men and busy among them, he put aside a piece of kola nut which he was chewing and forgot to take it with him when he went away again. A man saw this and seized the dainty morsel. His wife tried to prevent him from tasting the food of God. The man, however, placed it in his mouth and found that it tasted good. While he was still chewing the Creator returned, sought the forgotten piece of kola, and saw how the man tried to swallow it. He quickly grasped at his throat and forced him to return the fruit. Since that time there can be seen in the throat of man the 'Adam's apple', the trace of the pressure of the fingers of God."

If, leaving the intervention of the Creator out of the question, we seek the epoch in which the first knowledge of this vegetable product was obtained, we encounter the first reports of the fruit in the writings of El Ghafeky, a learned Spanish physician, who lived in the twelfth century, and those of the botanist, Ebn El-Baithar, who lived in the thirteenth. The former's description of the fruit may apply to the kola-tree, but his characterization of the seeds does not agree so well ("Joudz ez-zenj is a fruit of the size of an apple, somewhat elongated, wrinkled and angular. It contains seeds similar to cardamoms which are flat (round), brown (red) and have an aromatic odour. They are brought from the mountainous territory of the Berbers and applied against flatulent colic."). We do not come across the name *kola* until the latter part of the sixteenth century, when it is mentioned by travellers and explorers, for instance Carolus Clusius, Duarte Barbosa, Dapper, etc.

The tree which furnishes the kola nut is *sterculia* or *Cola nitida*. It is about 15 to 20 meters in height and has a straight smooth trunk. Each female blossom has five carpels which after fecundation become follicles arranged star-fashion. Each follicle may reach 15 cm. in length and contains up to eight seeds which are approximately four cm. in length and three cm. thick, similar to horse chestnuts, light or dark red in colour and emitting an odour similar to freshly-cut Marechal Niel roses. These seeds are the kola nuts. There are also spurious kola nuts which are white and very bitter and originate from a tree called *Garcinia cola*. These latter do not contain an alkaloid like the genuine kola nuts. Many other seeds similar to kola nuts, but inactive, have appeared on the market, and probably also in preparations of kola, such as the seeds of *Cola supfiana* (Avatimeko kola nut), *Dimorphandra mora* (West Indian kola nut), *Pentedesma butyracea*, etc.

The genuine kola nut has various names: Goro, Guru, Ombene, Nangue, Biche, Makatso, Gonja, etc. The tree which produces them grows wild and is also cultivated on the west coast of Africa from Sierra Leone and Liveria up to the lower part of the Congo and Guinea, from 10° north latitude to 5° south latitude, most frequently out of the reach of the ocean winds, and in a wild state mainly in Futa Jallon, on the banks of the Rio Nunez, and in Ashantiland. It occurs in the interior as far as the mountain ridge to the south of the Mandingo territories. It does not grow on the Mandingo Plain. In the hinterland of Lagos, for instance near Ikere, there are even kola forests. The cultivation of the tree has been brought to a state of perfection by the natives. It grows in the south of Benue in Adamawa and the nuts are brought to Bornu. The plant also occurs in Monbuttuland and farther to the north in a wild state.

The kola-tree has been transported from Africa to India, the Seychelles, Ceylon, Damaraland, Dominica, Mauritius, Sydney, Zanzibar, Guadeloupe, Cayenne, and Cochinchina. After nine or ten years one tree supplies approximately 30 kg. of dry nuts.

In this immense zone of Africa the kola nut is utilized in some places, by the Monbutto and the Niam-Niam for example, only occasionally, and in Wadai it was only used by the king, who obtained it from Bornu. The kola nut is known to the Arabs as

"Sudan coffee", and it is also highly valued by the non-Arabic inhabitants of Africa, such as the Ashantis, the Wute in the Cameroons, the negroes of the Congo, and the tribes in the neighbourhood of and to the west of Albert-Edward-Nyanza. Many men are engaged in the commerce and transport of this relatively precious substance. From the coast of West Africa, from Futa Jallon, Sankaran, Kuranko, between the rivers Rio Grande in Portuguese Guinea and St. Paul in Liberia, the nuts were formerly transported (and it is not likely that great changes have taken place in the meantime) in basket-loads of 3,500 nuts on the heads of male and female slaves to the markets of Kankan, Time, Tenfrela, Maninian, and Sambatiguilla, by Mandingo merchants mainly in exchange for salt. Farther to the south there are also markets in Odienne, Kani, Siana and Sakhala, where the kola agents, the Mande-Diula, fix the prices. There they are exchanged for cotton and salt (the latter coming from the north of the Sahara, i.e. Timbuctu and Arawan) by merchants from Segu and Jenne. The cotton which serves as an object of exchange is produced by the Bambara, who inhabit the territory between the upper Senegal and the Niger. After marches which frequently last for months, the nuts, which often have to be repacked, are transported on the Niger to Timbuctu. The nuts of the Ashanti country and the Mohammedan state of Salaga, which is a kind of commercial metropolis, are also bartered in the north. Mossi and Haussa merchants transport the nuts to Sinder, Timbuctu, etc., or to Sokoto, Katsena, Kano and Bornu, from whence they are delivered via Kuka on Lake Chad in a northern direction and also by way of the desert and in the south-east via Shari to Bagirmi. Kola nut bearers also take other routes to the south and east through Nigeria and the Cameroons in the direction of the Congo, through forests, over rivers and mountains, to enable the population to make use of the drug. From Sierra Leone whole deckloads of nuts with Mandingos as deck-passengers go by boat to the ports of Senegambia.

The kola nut of Sakala is the largest and most expensive known. It is delivered for the greater part to Jenne and Timbuctu. The nuts from Khani, Siana and Toute are of middle size, and are especially in demand when of a red colour. A very small red nut, the kola from Maninian, can be bought in Jenne and Tiomakandugu. These nuts, like every eagerly desired substance which modifies cerebral activity, are fairly expensive. Everything, even slaves, can be bought with nuts. At times one nut costs in Gorea three to five pence; on the banks of the Niger four shillings had to be paid for one nut, and if money were short a slave could be bought for a few nuts. If the kola nut were exclusively used as a means to supply energy or pleasurable sensations it would not attain such high prices. It is, however, like the betel nut, so important a symbol in the various events of everyday life that the demand for it and its consumption are considerably increased. A proposal of marriage is accompanied by a gift of white kola; a refusal by red nuts. Kola must not be lacking from the dowry. Oaths are sworn on the kola nut, friendships or hostilities are symbolized by kola and some nuts are even buried with the dead.

Effects of Kola

As a rule pieces of the fresh nut are chewed. The taste is at first bitter and afterwards sweet. The powder of the dried nut is also consumed and occasionally e.g. by the Bagunda, the Banalya, and on the banks of the Lulua and the Aruwimi, a beverage is prepared from the dried nuts which is imbibed with the aid of a reed-cane. The effects are very similar to those of other substances which contain caffeine. In this case sleep is dispensed thanks to the excitation of the brain due to kola. The feeling of hunger does not appear in its habitual strength after consumption of kola and, if felt beforehand, is thereby considerably diminished. These statements are not only the result of experiences in Africa but also of observations during strenuous Alpine tours in Europe. An increase of muscular energy and resistance without a feeling of fatigue is even more marked. Physical strength is augmented without the intervention of the will. During long marches or difficult climbs in the mountains it is most evident that movement is facilitated and that the increased output of the muscles, even it if is hot, is not accompanied by exhaustion. These effects have been very frequently experienced not only under the influence of the pure drug by also after consumption of kola biscuits or other preparations from it.

Experiments carried out on horses which were fed solely of kola during their labours proved that the output of work increased. Thorough investigations of general metabolism in animals and in man have revealed the fact that the combustion of carbohydrates and fat is augmented under the influence of kola, but that of nitrogenous substances, both urea and the nitrogenous bodies in general, and of phosphates is very markedly reduced. Consequently the kola-nut may be regarded as an economizer of the organism not only with respect to the muscular but also to the nervous system.

It has repeatedly been stated that kola, like other caffeine substances, acts as a stimulant in the sexual sphere. According to the opinion of the inhabitants of Africa it has an aphrodisiac effect on men and promotes conception in women. In this general form this supposition is not correct; it may be, however, that kola acts in some individual cases in the manner indicated.

Personal disposition naturally exercises a great influence on the effects of kola, especially if it is taken in large quantities, as in every case where the chemical properties of a substance react on the

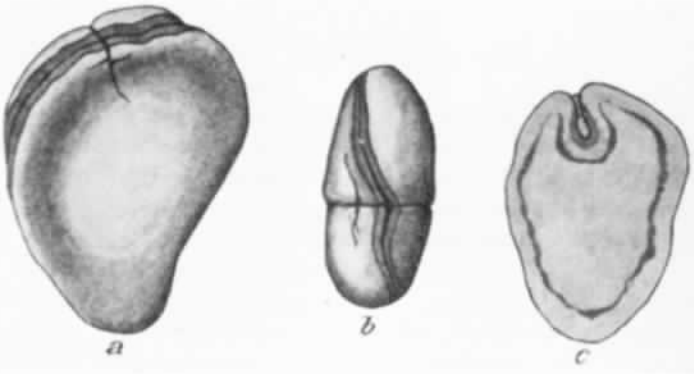
chemistry of the organism. It may happen, as I have heard from the experience of Count Goetzen himself, that a state of general weakness and prostration sets in. In the case of another, a vigorous and strong man, serious cephalic congestion, trembling and insomnia appeared a few hours after ingestion of two fresh nuts.

Exhaustive research work has been carried out in order to ascertain whether caffeine is the only active principle in kola or whether other substances contained in the nut are also of biological importance. Comparative investigations of the metabolism in animals seem to prove that powdered kola nut has a more powerful effect than a corresponding quantity of pure caffeine.

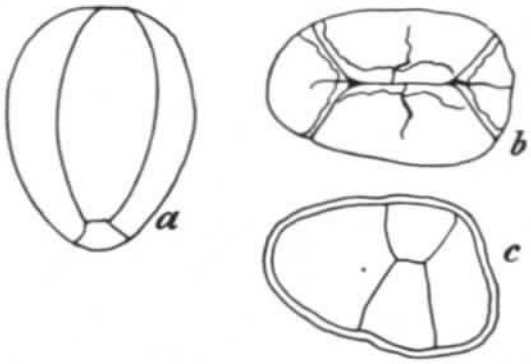
There is no doubt that the kola nut is chemically more complex than the other vegetable products which contain caffeine. An essential oil with strong aromatic taste is very probably also active in producing the effects described. Women who were engaged in the work of cutting up the nuts into small pieces at first became excited and then suffered from insomnia through the action of the odour of the essential oil. However it is caffeine which endows kola with its characteristic action. It is contained in the drug up to 2%. It may be that the theobromine which occurs to a slight extent in the nut is also active as an excitant. It has not been ascertained in spite of many experiments whether other substances co-operate with the caffeine. In fresh kola-nuts there is a crystalline phenolic principle belonging to the group of tannins, kolatin, which is present from 0.3% to 0.4% in unstable combination with the caffeine. Hot water dissociates the complex. Under certain circumstances kolatin can be oxidized into insoluble kola-red. In nuts which are dried in the usual manner the kolatin disappears, but it can be preserved by sterilization. The dark colour which appears during the process of exsiccation of the nuts is due to the decompostion of an oxydase which is present in the nut.

The conclusion at which we arrive after taking the chemical results into consideration is that from a pharmacological point of view the opinion which ascribes the principle part in the action of kola to caffeine should not be altered, even if further research should throw light on the interdependence of the various components of the nut and even if the crystallized kolatin is considered to be active. For this reason neither kola-red and the other substances cited above nor the enzymes, including kola-lipase, are of importance in the total effect. It is said that there exists a kind of antagonism between kolatin and caffeine whereby the former produces no increase of muscular work and no cerebral excitation. Even if this were true, caffeine would maintain its qualitatively and quantitatively predominant position in the action of kola, as may be ascertained in animals and man after the ingestion of the fresh nut. I myself have been able to make these observations with the fresh nuts which I have frequently obtained from Georg Schweinfurth.

Blooming branch of ***Coca nitida.***

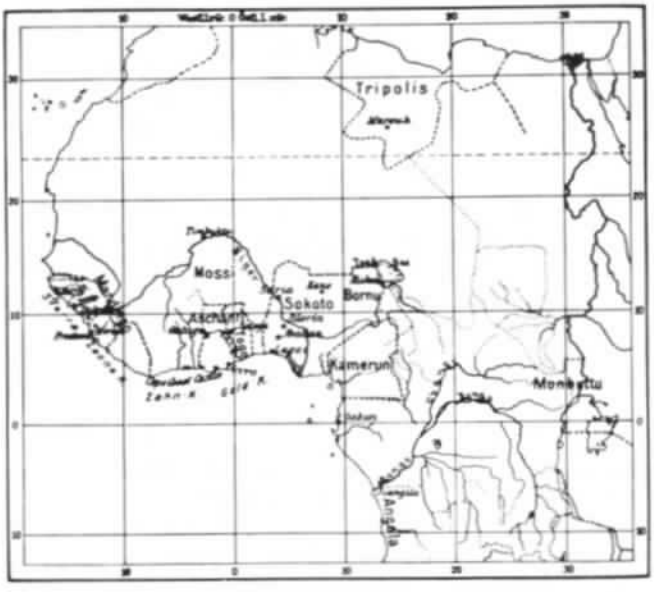


Cola nuts. a. Side view. b. Top view showing dividing line between the two cotyledons (seed leaves) and the secondary dividing line at right angles to this. c. Nut from inside showing primary bud and root both at upper end. Natural size.



Small southern variety of cola nut showing four cotyledons. a. Side view. b. Top view showing lines of demarcation between four cotyledons. c. Cross section of an entire seed in the shell. Natural size.

Entire fruit of ***Cola nitida*** *about ⅓ natural size.*



Areas of cola nut use in Africa about 1900.

Typical African basket used for storing cola nuts.

The cola nut and its substitutes and falsifications. Top row: 1. Single fruit of ***Cola nitida.*** *2. The same opened. 3. Cola nut removed from shell. 4. Embryo removed from nut. 5. Four embryos of the small southern cola nut. Middle row: 1, 2. Nuts of* ***Garcinia cola.*** *3, 4. Seeds of* ***Dimorphandra mora.*** *5. Seed of* ***Vitellaria mammosa.*** *Bottom row: 1. Seed of* ***Heritiera litoralis.*** *2, 3. Seeds of* ***Pentadesma butyraceum.*** *4, 5. Fruits of* ***Coula edulis.*** *6, 7. Seeds of* ***Napoleona imperialis.*** *1/3 natural size. Collection of Polytechnical Institute of Zurich.*

KHAT—
Catha edulis

My friend G. Schweinfurth wrote to me as follows: "When during my travels in Yemen I saw the high, many-storied houses of the mountian villages late at night brilliantly illuminated, and their windows shining in the darkeness, I enquired what the inhabitants did at that time of the night. I was told that 'friends and acquaintances meet and sit for hours round the brazier drinking their coffee prepared from the husks (In Yemen only an infusion of the husks of coffee is consumed.) and chew their indispensable kat, which keeps them awake and promotes friendly intercourse'."

The kat-eater is happy when he hears everyone talk in turn and tries to contribute to this social entertainment. In this way the hours pass in a rapid and agreeable manner. Kat produces joyous excitation and gaiety. Desire for sleep is banished, energy is revived during the hot hours of the day, and the feeling of hunger on long marches is dispersed. Messengers and warriors use kat because it makes the ingestion of food unnecessary for several days.

The above-described effects, which remind one of those of caffeine plants, are due to the mastication of the young buds and the fresh leaves of *Catha edulis (Celastrus edulis)*, a large shrub which can be grown to the size of a tree. It is only cultivated for consumption in the cool valleys situated at a height of 3,000 to 4,000 feet in north-east Africa and south-west Arabia and Abyssinia. It is cultivated to a great extent in Harar, Tiger, Shoa, Kafa, Yemen, etc. The northern limit of occurrence of kat is approximately 18° north latitude. It may be found in a wild state up to about 30° south latitude in Natal and Pondoland. The spread of Islam in the Galla countries has led to an increase of the consumption of kat, but not to its cultivation.

Kat (*cato*, khat among the Amhara, *cat* or *jimma* among the Oromo) was employed in Yemen even before coffee. The mode of application has not changed. The fresh green points of the leaves, and the shoots of the leaves and stems are eaten, and it is only in Arabia that an infusion of the plant is prepared. The passion for the drug is so great that even material sacrifices are made in order to indulge in it. There are epicures in Hodeida, Mocha and Aden who spend two dollars a day on kat. An explorer reported that the Sheikh Hassan of Yemen consumed more than 100 francs worth of kat per day because he was accustomed to have many distinfuished visitors. There is a special market in Aden, where many people from Yemen live as workmen, merchants, etc. The plant does not grow on the plain, and express messengers have to bring it during the night in bundles from the mountains to the market. Forty branches are tied together in a bundle and inserted into a sheath which is carefully prepared from banana-leaves or palm-leaves in order to keep the material fresh during the long horse ride to market. In some places, for instance in Harar, the consumption of kat is intimately connected with the observance of prayers. The Harari, the Mohammedan Oromo, the Kafficho, the Galla, etc., are also addicted to kat. The plant is also consumed in Eyssaland and is imported from Harar and Arabia. The chewing of kat is quite unknown in Hedjaz and in Jeddah.

The active element of kat is stated to be an alkaloid which occurs in quantities varying from 0.07% to 0.12% in the best plants. Certain analogies with several medicinal plants have led met to the conclusion that the essential oil or resin, similar to cinnamic esters, which is also contained in the plant takes part in the peculiar exciting action.

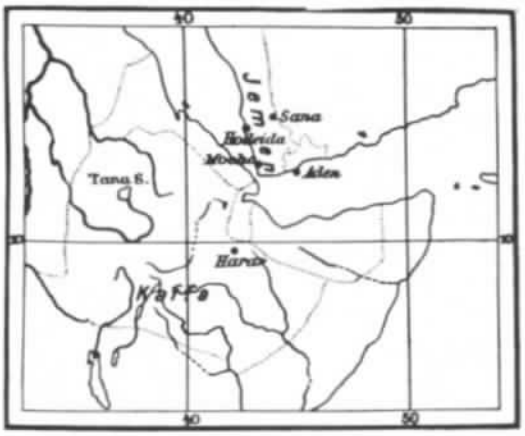
Kat, like all other powerful substances when excessively abused, inevitably gives rise to more or less serious consequences. Those organic functions which are incessantly subjected to the influence of the drug finally flag or are diverted into another channel of activity. And kat is indeed excessively employed by high and low. The kat-eater is seized with a restlessness which robs him of sleep. The excited cerebral hemispheres do not return to their normal state of repose, and in consequence the functions of the peripheral organs, especially those of the heart, suffer to such a degree that serious cardiac affections have been ascertained in a great number of kat-eaters. The disorders of the nervous system in many cases also give rise to troubles of general metabolism partly due to the chronic loss of appetite from the consumption of kat.

Schweinfurth told me that in no part of the Mohammedan East had he seen so many bachelors as in Yemen. In other countries of Islam this state is regarded as shameful. In Yemen it was openly stated that inveterate eaters of kat were indifferent to sexual excitation and desire, and did not marry at all, or for economic reason waited until they had saved enough money. The loss of the libido sexualis has been also observed in other inhabitants of these countries.

Mohammedan casuists have frequently discussed the question whether the consumption of kat is contrary to the law of the Koran which prohibits the use of wine and everthing that inebriates. Even had they come to the conclusion that kat belongs to those substances, no kat-eater would have renounced his passion.

The use of kat has become a permanent custom. Originating in Abyssinia, where it was mentioned for the first time in the year 1332, the plant penetrated into Yemen and other parts. There is no doubt that kat was consumed a long time before the date indicated, and will continue to be used in the future, for excitants of the brain defy the lapse of time.

Yemenese khat chewer holding a khat branch. Much of Africa's khat production is exported to Arabian countries.



Original area of khat use in Arabia.

Flowering branch of khat, ***Catha edulis,*** *grown in the Botanical Gardens in Strassberg, Germany. Slightly smaller than natural size.*

FLY AGARIC—

Amanita muscaria

The Exile of Siberia.

"Vilibus ancipites fungi ponentur amicis; Boletus domino."—Juvenal.

The rage for scampering half over the world in search of the picturesque has scarcely got far enough to tempt any, except a stray traveller or two, into the chilly regions of Siberia and Kamtschatka, and in these exceptional cases, perhaps, more from force than choice. These are regions, therefore, concerning which our information is remarkably limited. It is true the Captain Cochrane informs us that he married a wife from Kamtschatka—a virtuous maiden, who knew more of that region, perhaps, than he or she care to tell; for the one tells us very little, and the other nothing, of yon strange land, with an almost unpronounceable name. We are told, moreover, that the capital is called by the names of St. Peter and St. Paul. Fearing least one patron saint should not be sufficient to immortalize the metropolis of all the Kamtschatkas, the founders and inhabitants have wisely adoped two. This city also is stated to contain forty-two dwellings, besides fifteen edifices belonging to the government, an old church, and the foundation of a new one. The winters are declared to be mild, compared with those of Siberia; but even these are not very inviting, as the snow lies on the ground seven or eight months, and the soil, at the depth of twenty-four to thirty inches, being frozen at all seasons. Potatoes never ripen, cabbages never come to a head, and peas only flower. But the gallant captain adds: "I am certainly the first Englishman that ever married a Kamtschatdale, and my wife is undoubtedly the first native of that peninsula that ever visited happy Britain."

In such a land, there is little hope of cultivating poppy, tobacco, betel coca, hemp, or thorn-apple; and the poor native would have been compelled to have glided into his grave without a glimpse of Paradise beforehand, if, on the one hand, the kindly Russian pedlar had not found a way to smuggle a little bad spirits into the country, to the great annoyance of all quietly-disposed persons, or, on the other, nature had not promptly supplied an indigenous narcotic, in the form of an unpretending looking fungus or toadstool, to stimulate the dormant energies of the dwellers in this region of ice and snow.

That some kinds of mushrooms are poisonous is a truth of which every farm labourer seems aware. But that some of those which have been reputed poisonous are inert, is beyond their philosophy, and only receives at present the sanction of some of the more scientific, who have directed their studies thitherward. The fly agaric is one of those justly-reputed poisonous species, occasionally found in this country, but which grows plentifully in Kamtschatka, and Siberia. A recent author of an account of Russia states, "that mushrooms virulently poisonous in one country are eaten with safety in another, is well known in other cases, as, for instance, in that of the fly mushroom (*Amanita muscaria*), which is common in England, and always poisonous there, while in Kamtschatka it is used as a frequent article of food." Then he inquires into the reasons wherefore this should be the case:—"It is not enough to say that difference of soil and climate explain the mystery; for though we know that culture changes the properties of plants, converting what is poisonous in the wild state into a wholesome esculent when raised in the garden—as in the case of the common celery, for example—yet throughout the whole of the vegetable kingdom we find almost no other instance of a plant which is poisonous in one country becoming wholesome, without culture, when transplanted to another, and left entirely to itself, and in both placed in apparently the same circumstances as to soil,&c. After all, a great part of the secret may lie, not in the plant, but in the mode of preparing it for the table. So far as we can judge, the Russian cook, on first cutting up these spoils of the forest, makes a much more copious use of salt than is done with us; and the efficacy of this agent in deadening the poisonous quality, is sufficiently proved by the melancholy case recorded in medical treatises, of a French officer and his wife, both of whom died in thirty-two hours after eating certain mushrooms, while the person who supplied them, and his whole family, made a hearty and wholesome meal from the same gathering." In this case, it appears that while the former took them without addition, the latter first salted them strongly, and then squeezed them well before using them. M. Toques says distinctly that this plant has not its poisonous properties modified by any climate. The Czar Alexis lost his life by eating this mushroom. The details of its effects upon the Kamtschatkans by Krascheminikow, in his natural history of that country are explicit, respecting the delirious intoxication induced by it. Gmelin and Pallas also equally certifyng its intoxicating powers. Roques reports seven different sets of observations respecting its deleterious effects on man.

Unless we accept some such explanation of the phenomena as this, how can we reconcile the fact of their being eaten by the Russians without injury, whilst, on the authority of Dr. Christison, we have such a fatal case as the following, from eating the same kind of fungus, the growth of the same country and climate. Several French soldiers in Russia ate a large quantity of *Amanita muscaria*, some were not taken ill for six hours and upwards. Four of them who were very powerful men thought themselves safe, because, while their companions were already suffering, they themselves felt perfectly well and refused to take emetics. In the evening they began to complain of anxiety, a sense of suffocation, frequent fainting,

burning thirst, and violent gripes. The pulse became small and irregular, and the body bedewed with cold sweat, the lineaments of the countenance were singularly changed, the nose and lips acquiring a violet tint, they trembled much, the belly swelled, and a profuse diarrhoea followed. The extremities soon became livid and cold, and the pain of the abdomen intense, delirium ensued, and all the four died. Two of the others suffered coma for twenty-four hours.

This proves that the mushroom in question is possessed of undoubtedly poisonous properties, which are fatal in their effects, unless counteracted or dispelled by the method of preparing them for the table, That this method is known to the Russians and to some other nations, and is believed to consist in well saturating the fungi with salt before cooking them The Muscovite seems to have no greater dread of ill effects from the fly agaric than has the Brazilian from his cassava or mandioca flour, which is prepared from the equally poisonous root of the mandioca plant, the deleterious qualities of which are destroyed by the heat used in its preparation. Dr. Pouchet of Rouen seems to have clearly proved that the poisonous property of the fly agaric and a *venenata* may be entirely removed by boiling them in water. A quart of water in which five plants had been boiled for fifteen minutes, killed a dog in eight hours; and, again, another in a day; but the boiled fungi themselves had no effect at all on two other dogs; and a third which had been fed for two months on little else than boiled amanitas, not only sustained no harm, but actually got fat on the fare. Pouchet is inclined to think that the whole poisonous plants of the family are similarly circumstanced.

John Greenleaf Whittier
THE BREWING OF SOMA

"These libations mixed with milk have been prepared for Indra; offer Soma to the drinker of Soma."—VASHISTA, Trans. by MAX MULLER.

THE fagots blazed, the caldron's smoke
Up through the green wood curled;
"Bring honey from the hollow oak,
Bring milky sap," the brewers spoke,
In the childhood of the world.

And brewed they well or brewed they ill,
The priests thrust in their rods,
First tasted, and then drank their fill,
And shouted, with one voice and will,
"Behold the drink of gods!"

They drank, and lo! in heart and brain
A new, glad life began;
The gray of hair grew young again,
The sick man laughed away his pain,
The cripple leaped and ran.

"Drink, mortals, what the gods have sent,
Forget your long annoy."
So sang the priests. From tent to tent
The Soma's sacred madness went,
A storm of drunken joy.

Then knew each rapt inebriate
A winged and glorious birth,
Soared upward, with strange joy elate,
Beat, with dazed head, Varuna's gate,
And, sobered, sank to earth.

The land with soma's praises rang;
On Gihon's banks of shade
Its hymns the dusky maidens sang;
In joy of life or mortal pang
All men to Soma prayed.

The morning twilight of the race
Sends down these matin psalms;
And still with wondering eyes we trace
The simple prayers to Soma's grace,
That Vedic verse embalms.

As in that child-world's early year,
Each after age has striven
By music, incense, vigils drear,
And trance, to bring the skies more near,
Or lift men up to heaven!—

Some fever of the blood and brain,
Some self-exalting spell,
The scourger's keen delight of pain,
The Dervish dance, the Orphic strain,
The wild-haired Bacchant's yell,—

The desert's hair-grown hermit sunk
The saner brute below;
The naked Santon, hashish-drunk,
The cloister madness of the monk,
The fakir's torture show!

And yet the past comes round again
And new doth old fulfil;
In sensual transports wild as vain
We brew in many a Christian fane
The heathen Soma still!

Dear Lord and Father of mankind,
Forgive our foolish ways!
Reclothe us in our rightful mind,
In purer lives thy service find,
In deeper reverence, praise.

In simple trust like theirs who heard
Beside the Syrian sea
The gracious calling of the Lord,
Let us, like them, without a word,
Rise up and follow thee.

O sabbath rest by Galilee!
O calm of hills above,
Where Jesus knelt to share with thee
The silence of eternity
Interpreted by love!

With that deep hush subduing all
Our words and works that drown
The tender whisper of thy call,
As noiseless let thy blessing fall
As fell thy manna down.

Drop thy still dews of quietness,
Till all our strivings cease;
Take from our souls the strain and stress,
And let our ordered lives confess
The beauty of thy peace.

Breathe through the heats of our desire
Thy coolness and thy balm;
Let sense be dumb, let flesh retire;
Speak through the earthquake, wind, and fire,
O still, small voice of calm!

The most singular circumstance connected with the history of this fungus, is the place it occupies as a substitute for those narcotics known in other parts of the world, and which an ungenial northern climate fails to produce. What the coca is to the Bolivian, and opium to the Chinese—the areca to the Malay, and haschisch to the African—the tobacco to the inhabitants of Europe and America, and the thorn-apple to those of the Andes—is the fly agaric to the natives of Siberia and Kamtschatka. Why it has been called by this name has arisen from its use as a fly poison. Never having seen those dipterous insects while under its influence, we cannot detail the symptoms it produces.

This poisonous fungus has some resemblance to the one generally eaten in this country, yet there are also striking points of difference. As, for instance, the gills are white instead of pinkish red, inclining to brown and the cap or pileus, which is rather flat, is generally of a livid red colour, sprinkled with angular lighter coloured worts. These are distinctions broad enough to prevent any one having the use of his eyes, and who has ever seen the edible mushroom being deceived into the belief that the fungus thus briefly described is identical with the delicacy of our English tables.

These fungi are collected by those who indulge in them narcotically, during the hot, or rather summer months, and afterwards hung up to dry in open air. Or they may be left to ripen and dry in the ground, and are afterwards collected. When left standing until they are dried, they are said to possess more powerful narcotic properties than when dried artificially. The juice of the whortleberry in which this substance has been steeped, acquire thereby the intoxicating properties of strong wine.

The method of using this singular substance is to roll it up in the form of a bolus and swallow it without any mastication, as one would swallow a large pill. It is swallowed thus on principle, not that its flavour would be unpleasant, as compound colocynth might be when masticated, but because it is stated to agree ill with the stomach when that operation is performed. Nature is jealous of her rights, and it would appear from experience,that the gastronomic regions expect to receive all other supplies well triturated, except these—amanita and pill colocynth—which are both expected equally alike to arrive at the regions below without mutilation.

A day's intoxication may thus be procured at the expense of one good sized bolus, compounded of one large or two small toadstools; and this intoxication is affirmed to be, not only cheap, which is a consideration, but also remarkably pleasant. It commences an hour or so after the bolus has been swallowed.

The effects which this singular narcotic produces are, some of them, similar to that produced by intoxicating liquors; others resemble the effects of haschisch. At first, it generally produces cheerfulness, afterwards giddiness and drunkenness, ending occasionally in the entire loss of consciousness. The natural inclinations of the individual become stimulated. The dancer executes a *pas d'extravagance*, the musical indulge in a song, the chatterer divulges all his secrets, the oratorical delivers himself of a philippic, and the mimic indulges in caricature. Erroneous impressions of size and distance are common occurrences, equally with the swallower of amanita and hemp. The experiences of M. Moreau with haschisch are repeated with the fungus-eaters of Siberia; a straw lying in the road becomes a formidable object, to overcome which, a leap is taken sufficient to clear a barrel of ale, or the prostrate trunk of a British oak.

But this is not the only extraordinary circumstance connected therewith. There is the property imparted to the fluid excretions, of rendering it intoxicating, which property it retains for a considerable time. A man having been intoxicated on one day, and slept himself sober by the next, will, by, drinking this liquor, to the extent of about a cupful, become as intoxicated thereby as he was before. Confirmed drunkards in Siberia preserve their excretionary fluid as a precious liquor, to be used in case a scarcity of the fungus should occur. This intoxicating property may be again communicated to every person who partakes of the disgusting draught, and thus, also, with the third, and fourth, and even the fifth distillation. By this means, with a few boluses to commence with, a party may shut themselves in their room, and indulge in a week's debauch at a very economical rate.

The fly agaric ***Amanita muscaria,*** *a probable ingredient in the psychoactive drink soma, praised in the Vedas of ancient India.*

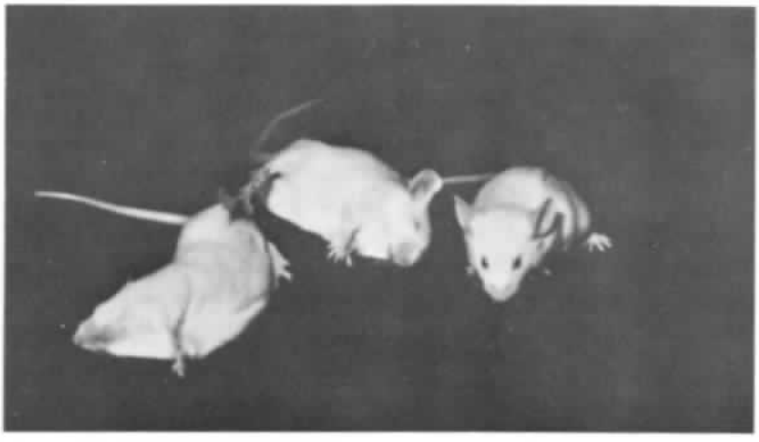
The god Indra, one of the Hindu Pantheon, drank soma as his favorite beverage. This bronze statue is from Bengal, India.

Koryak seal skin container for urine from those intoxicated with ***Amanita.*** *It is considered a mark of special favor to offer it to a guest. Muscimol is probably the only known intoxicant which passes into the urine unchanged in sufficient quantities to intoxicate. From Jochelson, The Koryak (1908).*

Distribution of the pines ***(Pinus)*** *and birches* ***(Betula)*** *which are necessary for the growth of* ***Amanita muscaria.*** *Also shown are the native people who used the mushroom.*

Eastern Siberia showing the distribution of the tree hosts of ***Amanita muscaria*** *and the peoples who used the mushroom.*

The locations of ***Amanita*** *host trees and the peoples who used the mushrooms in the north central plains area of Russia.*



Muscimol is the main active compound in ***Amanita muscaria.*** *The above mice are shown two hours after intraperitoneal injection of 5 mg/kg muscimol in various phases of sedation, catatonia, myoclonic cramps.*

KAVA KAVA—

Piper methysticum

The kava pepper or *Piper methysticum* is celebrated for its narcotic properties. This plant has a thick aromatic wood stalk, and a large root, and cordate or heart-shaped leaves. It is a native of the Society, Friendly, and Sandwich Islands, where it is largely consumed. Macerate in water, the stems and roots form an intoxicating beverage, and the leaves are used with the areca nut and lime, in the same manner as the leaves of the other peppers (The stem and roots of long pepper, cut in pieces and dried under the name of *Pipula moola*, are exposed for sale in all the bazaars of India, but these are not used with the areca nut, nor are the leavves applied to that purpose.).

Mariner gives an account, in his "History of the Tonga Islands," of the use of this plant. The root is split up with an axe into small pieces, and after being scraped clean with mussel shells, is handed out to those in attendance to be chewed. There is then a buzz in the assembly, contrasting curiously with the silence which reigned before, several crying out, "Give me some cava! give me cava," each of those who intend to chew it crying out for some to be handed to him. No one offers to chew the cava but young persons who have good teeth, clean mouths, and no colds. Women frequently assist. It is astonishing how remarkably dry they preserve the root during the process of mastication. In about two minutes, each person having chewed his quantity, takes it out of his mouth with his hand, and puts it on a piece of plantain or banana leaf, or he raises the leaf to this mouth, and puts it off from his tongue, in the form of a ball of tolerable consistence. The different portions of cava being now chewed, which is known by the silence that ensues, a large wooden bowl is placed on the ground before the man who is to make the infusion. Each person passes up his portion of the chewed root, which is placed in the bowl, wherein they are laid in such a manner that each portion is distinct and separate from the rest, till the whole inside of the bowl becomes studded, from the bottom up to the rim, on every side. The man, before whom the bowl is placed, now tilts it up a little towards the chief, that he may see the quantity of its contents, saying, "This is the cava chewed." If the chief thinks there is enough, he says, "Cover it over, and let there come a man here." The bowl is covered over with a plantain or banana leaf, if there is not enough, and a man fetches more root to be chewed. If there is enough, the chief says "mix." The two men, who sit on each side of him, who is to prepare the cava, now come forward a little, and making a half turn, sit opposite to each other, the bowl being between them, one of these fans off the flies with a large leaf, while the other sits ready to pour in the water from cocoa-nut shells, one at a time.

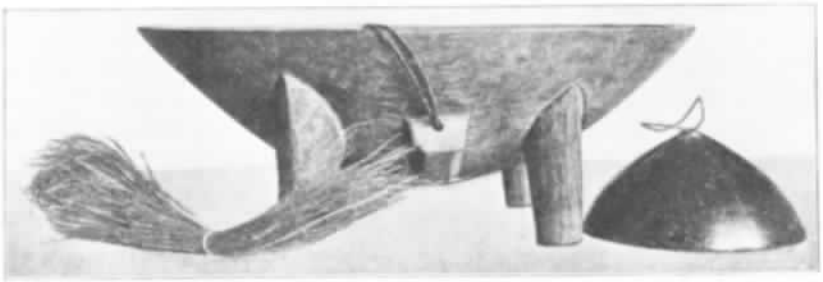
Before this is done, however, the man who is about to mix, having first rinsed his hands with a little of the water, kneads together the chewed root, gathering it up from all sides of the bowl, and compressing it together. Upon this an attendant says, "Pour in the water," and the man on one side of the bowl continues pouring, fresh shells being handed to him, until the attendant thinks there is sufficient, and says, "Stop the water." The mixture is stirred together at the command of the attendant, who then says, "Put in the fow." which is the bark of a tree stripped into small fibres, and has the appearance of willow shavings. A large quantity of this substance, enough to cover the whole surface of the infusion, is now put in by one of those seated beside the bowl, and it floats upon the surface. The man who manages the bowl now begins his difficult operation. In the first place, he extends his left hand to the further side of the bowl, with the fingers pointing downwards and the palm towards himself; he sinks that hand carefully down the side of the bowl, carrying with it the edge of the fow; at the same time his right hand is performing a similar operation at the side next to him, the fingers pointing downwards and the palm presenting outwards. He does this slowly from side to side, gradually descending deeper and deeper, till his fingers meet each other at the bottom, so that nearly the whole of the fibres of the root are by these means enclosed in the two, forming, as it were, a roll of about two feet in length, lying along the bottom from side to side, the edges of the fow meeting each other underneath. He now carefully rolls it over, so that the edges overlapping each other, or rather intermingling, come uppermost. He next doubles in the two ends and rolls it carefully over again, endeavouring to reduce it to a narrower and firmer compass. He now brings it cautiously out of the fluid, taking firm hold by the two ends, and raising it breast high, with his arms extended; by a series of movements the mass is more and more twisted and compacted together, while the infusion drains from it in a regular decreasing quantity, till, at length, it denies a single drop. He now gives it to the person on his left side and receives fresh fow from the one on the right. The operation is again renewed, with a view to collect what might before have escaped him, and even a third time till no dregs are left which this process can remove.

During the above operation, various people are employed in making cava cups from the unexpanded leaves of the banana, folded and tied in a peculiar manner. The infusion being strained, the performance generally occupying a quarter of an hour or twenty minutes, the man at the bowl calls out, "The cava is clear." The infusion is now filled into the cups by means of a bundle of fow which is dipped into the bowl, and when replete with the liquid, held over the cup, and being compressed, the liquid runs out till the cup is filled. With certain other ceremonies the cups are passed round amongst the company

From this account it will be seen that the beverage is drank immediately after it is prepaed, without being in any manner fermented, its intoxicating and narcotic properties must, therefore, be due to the root. This liquor is indulged in to a large extent in the islands of Oceanica, where the natives are generally passionately fond of it.

Preparing kava beverage in Samoa by girls in their usual dress. Utensils used: bowl in the middle, coconut shell nearby; "fau" held up by person in the middle of the picture. Photograph taken in the Samoan Islands in the pharmacognostical collection of the School of Pharmacy, University of Wisconsin, U.S.A.

Kava kava growing in the Samoan Islands. The plant is to the woman's left.



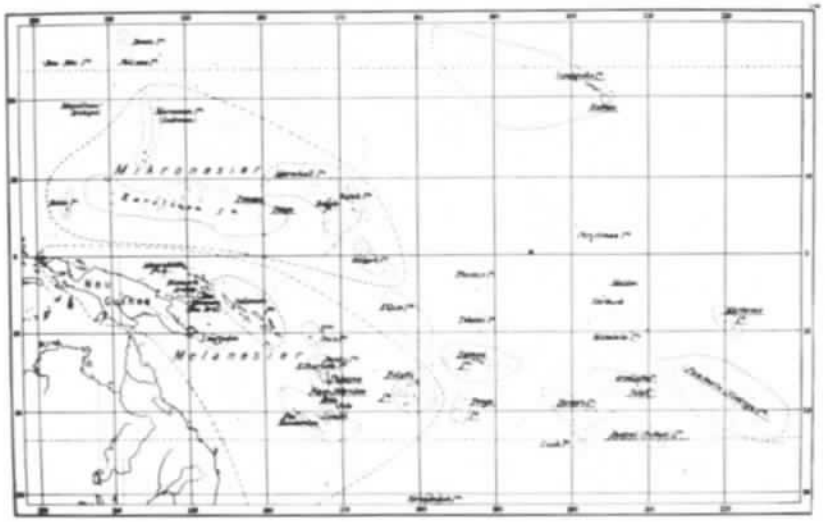
Kava kava dishes from Samoa. The bundle of fibers is for removing root remants from the liquid. The half coconut shell at the right is used for drinking the liquid. About 1/3 natural size.

Tonga natives making kava. From "Kava Drinking as practiced by the Papuans and Polynesians" by Walter Hough. Smithsonian Miscellaneous Collections, 1905.

Fijian kava ceremony. The cup bearer is about to present the cup ("bilo") of kava - yaqona to the guest of honour (behind the camera). The bowl ("tanoa") in which the kava drink is made, can be seen just behind the cup bearer. Public Relations Office, Fiji. Official photograph No. - 8418.

Elaborately carved kava bowls (called tanoa). Through permission of Bernice P. Bishop Museum, Honolulu (Hawaiian Islands).

Kava kava preparation in Samoa. The chewed roots are spit into the bowl, water added by the woman on the right and the root fragments scraped out with the bundle of fibers.



Area of kava kava use in the south pacific about 1900.

THORN APPLE—
Datura stramonium

"That skulk in the depths of the measureless wood
'Mid the Dark's creeping whispers that curdle the blood.
Where the wolf howls aloof, and the wavering glare
Flashes out from the blackness the eyes of the bear."

The thorn-apple and nightshade are types of a class of narcotics, which, though not largely employed either for their intoxicating effects or their medicinal virtues, are, notwithstanding, extremely powerful in their effects, and, when used, exercise a wonderful influence upon the brain. The majority of them belong to that family of plants, of which, not only tobacco, but the potato, are members; so that, if only from their family connections, independently of any other right, they have a claim upon our attention and respect. Beyond this, even, we shall find them insinuating themselves into the good graces of that portion of the creation who have taken to two members of the family already named under its protection, and adopted them as companions, the one to soothe and console after the hours of labour are past, the other to aid in giving strength to perform that labour, or satisfy the cravings of hunger.

Datura and its substitutes

Florispondio seeds	Datura sanguinea..	N. Granada.	Drank in infusion.
Thorn Apple leaves	Datura stramonium	Europe	Smoked.
Thorn Apple seeds	Datura arborea	Peru	Smoked.
Thorn Apple seeds	Datura fatuosa	Egypt	Smoked.
Thorn apple seeds	Datura ferox	China	Smoked.
Thorn apple seeds	Datura latula	Asia	(By the Delphic oracle.
Thorn Apple seeds	Datura metel	W. Asia	As an opiate.
Belladonna leaves	Atropa belladonna	Europe	Smoked.
Henbane leaves	Hyoscyamus niger	India	(Mixed with hashchish.
Leaves of	Rhododendron chrysanthum	Siberia	Chewed.
Flowers of	Rhododendren arboreum	India	..
Foxglove leaves	Digitalis purpurea..	India	(Mixed with hashchish

The solanaceous plants have, in general, narcotic qualities. In some species these are developed in a great degree, so as to render them extremely poisonous; in others, they are obscured by the prevalence of starchy matter. In some instances parts of the plant have narcotic properties, whilst other parts are used as articles of food. The Bitter Sweet *(Solanum dulcamara)* has slightly narcotic properties, and the scarlet berries are considered poisonous. The Common Nightshade *(Solanum nigrum)* has more active narcotic properties. The Potato *(Solanum tuberosum)* has slight narcotic qualities in its leaves and fruit, but its tubers are edible and nutritious. The Deadly Nightshade *(Atropa belladonna)* is a highly poisonous plant, narcotic in all its parts. Henbane *(Hyoscyamus niger)* contains also similar properties. Many species of Thorn Apple are powerfully narcotic, especially the seeds or fruit; this is especially the case with our common thorn-apple *(Datura stramonium)*, with the thorn-apple of the Andes *(Datura sanguinea)*, and of North America *(Datura tatula)*, the thorn-apples of India *(Datura metel, D. jerox,* and *D. fatuosa)*. Several species of *Nicotiana* furnish tobacco. The fruit of different species and varieties of *Capsicum*, which are used as pepper, possess irritant properties which obscure the narcotic action. Other species are used as narcotics, or as poisons, and some, as the Tomato and other Lycopersicums, as articles of food; but the majority give evidence, in some of their parts, of the existence of a narcotic principle.

The potato, the tomato, and egg plant possess, when uncooked, in a mild degree, the properties of the nightshade, the stramonium, and the henbane, confirming the remark of De Candolle "that all our aliments contain a small proportion of an exciting principle, which, should it occur in a much greater quantity, might become injurious, but which is necessary as a natural condiment." In fact, when food does not contain some stimulating principle, we add it in the form of spices.

The Kala dhatoora *(Datura fatuosa)* and Sada dhatoora *(Datura alba)* are very common species of thorn-apple over the peninsula of India, where they are also called *mazil* or *methel*. For the purpose of facilitating theft and other criminal designs, the seeds are very commonly given in Bengal, with sweetmeats, to stupify merely, but not with the intention of killing. Intoxication or delirium is seldom produced. The individual sinks into a profound lethargy, with dilated pupils, but natural respiration. These symptoms have been known to continue for two days. The vision often becomes obscured long after the general recovery takes place. Graham says that the seeds are often fatally used for these purposes in Bombay. The narcotic action is more speedy and powerful on an empty stomach than after a meal; hence death often ensues from the effects when the intention was only to produce narcotism.

In some parts of South America, especially in Peru, where a species of thorn-apple *(Datura sanguinea)* grows wild, the natives, in certain cases, drink a decoction of the leaves or seeds, which produces such violent effects as to cause them to fall into a state nearly resembling death, and lasting frequently two or three days. Every malady is there ascribed to enchantment, and this very singular plan is resorted to to discover by whom the mischeif may have been wrought. In cases of extreme illness the decoction is given, not to the sick person, but to the nearest relative, who devotes himself for this purpose, to discover during his sleep the sorcerer or Mohari who has inflicted the disease. The medicine soon causes the relative to fall under its influence, and he is placed in a fit position to prevent suffocation. On returning to his senses he describes the sorcerer he has seen in his dreams, and the whole family set out to discover the Mohari who bears the nearest resemblance to the description, who, when found,

they compel to undertake the cure of the sick person. When no sorcerer has been seen in the vision, or no one is found resembling the one which has been seen, the first Mohari they meet with is obliged to undertake the office of physician. Should the patient die during the vision of the relative, the sorcerer whose image is then supposed to be presented is subjected to the same fate.

This plant, which is called "Florispondio" in tropical America, appears always to have played, and still continues to play, a prominent part in the superstitions of the natives. The Indians of Darien, as well as those of Choco, according to Seemann, prepare from its seeds a decoction, which is given to their children to produce a state of excitement, in which they are supposed to possess the power of discovering gold. In any place where the unhappy patients happen to fall down, digging is commenced; and as the soil nearly everywhere abounds with gold dust, an amount of more or less value is obtained. In order to counteract the bad effects of the poison, some sour *chica*, a beer made of Indian corn, is administered.

It is this same thorn-apple which is used amongst the Andes of New Granada, and even as far south as Peru, for the purpose of preparing therefrom a drink, with very stong narcotic properties, which they call "Tonga." Dr. Von Tschuddi has given a description of the effects of this narcotic upon an old Indian. "Shortly after swallowing the beverage he fell into a heavy stupor. He sat with his eyes vacantly fixed on the ground, his mouth convulsively closed, and his nostrils dilated. In the course of about a quarter of an hour his eyes began to roll, foam issued from his half-opened lips, and his whole body was agitated by frightful convulsions. These violent symptoms having subsided, a profound sleep of several hours succeded. In the evening, when I saw him again, he was relating to a circle of attentive listeners the particulars of his vision, during which he alleged he had held communication with the spirits of his forefathers. He appeared very weak and exhausted."

By means of this plant they believe that they can hold communication with their ancestors, and obtain a clue to the treasures concealed in their *huacas* or graves—hence it is called huaca-cacha or grave plant. It has been supposed that the frenzied ravings, called prophecies, of the Delphic oracles were produced by this plant, which has been used, as Dr. Lindley asserts, in the temple of the sun at Sogamossa, near Bogota, in New Granada, for the same purpose.

The cunning few acquainted with some of the extraordinary properties of certain plants, which were unknown to the superstitious and barbarous multitude in days gone by, had ample means at their disposal for imposing on their credulity, by the performance of wonderful cures, working apparent miracles, and either in direct communication with the spiritual world, or had received a divine commission by which to govern. Most of the marvels of ancient times were no greater than the little experiments which the schoolboy now performs for his amusement and that of his companions, with a few crystals and powders, contained in as many pill-boxes.

The pots or gourds, in which cocoa nut sap to make arrack is drawn off in Ceylon, are sometimes visited and the contents carried off during the night. To detect the thief, the leaves of a species of datura or thorn-apple are occasionally put into some of the pots. By means of the highly intoxicating effect of this compound the marauder is often discovered. On the Coromandel coast the retailers of toddy sometimes rub the inside of the pots with the seed-vessel or leaves of this highly poisonous plant, to increase the intoxicating influence of the toddy.

The phrase "pariah-arrack" is often used to designate a spirit distilled in the peninsula of India, which is said to be rendered unwholesome by an admixture of Gunja, and a species of Datura, with the intention of increasing its intoxicating quality. It is not clear whether the term pariah-arrack be colloquially employed to designate an inferior spirit or an adulterated compound. It is curious that a system of "doctoring" beverages, to make them heady, should obtain abroad, as it does at home, and in both cases perhaps independently: for it does not seem probable either that we borrowed the system from the Hindoos, or that they copied it from us.

While under the influence of these narcotics the mind seems to be subjected to a troubled dream, and the person suffering from it indulges in fits of uncontrollable laughter. Beverley, the historian of Jamaica, quaintly describes the effects of the thorn-apple. Some soldiers, who were sent to quell the rebellion in the island, ate of it: "the effect was as very pleasant comedy, for they turned natural fools upon it for several days. One would blow up a feather in the air, another would dart straws at it with much fury. Another, stark naked, was sitting up in a corner grinning like a monkey, and making mouths at them. A fourth would fondly kiss and paw his companions, and sneer in their faces with a countenance more antic than a Dutch doll. In this frantic condition they were confined, lest in their folly they should destroy themselves. A thousand simple tricks they played; and, after eleven days, returning to themselves again, not remembering anything that had occurred."

The extract of Stramonium or common thorn-apple has occasionally, when injudiciously administered, produced similar effects upon the individual to whom it has been given, affecting the sense, particularly that of sight. "Imaginary objects are seen to play before the eyes, at which the victim strikes, as they seem to terrify him. And similar results have occurred from the use of the seeds." Fowler relates a

rabbits were running along the tops and sides of the room. Dr. Winslow says "that when inhaled, the smoke conveys a sense of gentle tranquillity, the muscles of the thorax, and those which have been called into action to assist them, in the paroxysms of asthma which the smoking is resorted to to relieve, are rendered less irritable and the fibre is relaxed, sleep is induced, but there is rarely any disturbance of the imagination."

In France and Germany, this plant has been resorted to for the basest of purposes, and many unhappy victims have been consigned to hopeless insanity by its means, details of which would be far more horrible than interestng. Faber also speaks of its use by the ladies of the Turkish harems; but there is doubt whether this is not one of those marvels, of which many may be met with inconnection with medicinal agents, containing more of romance than reality. Dr. Ainslie states that the seeds form one of the ingredients of the confection of hemp and opium known under the name of *madjoun* in India; as henbane is asserted to enter into the composition of that in use under the same, or a similar name in Egypt. The portion of either of these when used is doubtless small, and is in most cases dispensed with.

Etymologists declare that the name of belladonna, which has been given to the deadly nightshade *(Atropa belladonna)* was so given because those to whom it was administered fancied they saw beautiful females before them (Another fanciful origin for the name, which signifies "beautiful woman," is, that it was bestowed in consequence of the use once made of its berries by the Italian ladies as a cosmetic.). There is no doubt that it produces illusions of a singular character, and cases of impulsive insanity have resulted from its use in repeated doses. The effect of belladonna upon the brain is more extraordinary than those usually attendant upon the use of other narcotics. Persons who have been poisoned by the berries of the plant have become restless and delerious, complained of dimness of vision, and subsequently loss of sight. There were observed frequent spasmodic contractions of the muscles of the eyeballs and the throat, with strong symptoms of mania. Six soldiers who were poisoned by the plant exhibited delirium the most extravagant, and commonly of the most pleasing kind, accompanied with immoderate and uncontrollable paroxysms of laughter, sometimes with constant talking, but occasionally with complete loss of speech. Buchanan relates that the Scots mixed a quantity of the juice of belladonna with the bread and drink which, by their truce, they were to supply the Danes with, which so intoxicated them, that the Scots killed the greater part of Sweno's army while asleep.

The effects of belladonna on the brain are well described by Dr. Winslow, than whom no better effects of continued doses is the production of a singular psychological phenomenon. A delirium supervenes, unaccompanied by any fantasia, or imaginary illusion, whose marked characteristic is somnambulism. An individual who has taken it in several doses seems to be perfectly alive to surrounding objects, his senses conveying faithfully to the brain the impressions that they receive; he goes through his usual avocations without exhibiting any unwonted feeling, yet is he quite unconscious of his existence, and performs mechanically all that he is accustomed to do, answers questions correctly, without knowing from whom or from whence they proceed, looks at objects vacantly, moves his lips as if conversing yet utters not a sound, there is no unusual state of the repiratory organs, no alteration of the pulse, nothing that can bespeak excitement. When this state of somnambulism passes away, the individual has not the slightest recollection of what has occured to him; he reverts to that which immediately preceded the attack, nor can any allusion to his apparent reverie induce him to believe that he has excited any attention. The case of the tailor who remained on his shopboard for fifteen hours, performing all his usual avocations, sewing with great apparent earnestness, using all the gestures which his business requires moving his lips as if speaking, yet the whole of the time perfectly insensible, has been frequently quoted. It was produced by belladonna."

The use of this plant has been recommended as a preventive of scarlatina. An instance is recorded of a family consisting of eleven persons who took it for this purpose, in small quantities, twice a day. Five of these persons were domestics. On the fourth day, almost all of them became under the influence of the drug, two or three of them very slightly, simply complaining of having the vision disturbed by objects which they in vain attempted to remove, for they were fully persuaded that they existed. Two had singular fits of laughter which nothing could control. All complained of being in an unusual state. The servants were all of them able to go through their work, but all seemed to act mechanically, each independent of the other. Of this the most lidicrous example was in the course of the fourth evening. A carriage arrived at the street door, and the street bell was rung with considerable violence. They all immediately left their business, quietly walked up stairs as if they had not the slightest idea that they were all upon the same errand. They went to the door; two of them, however, only opened it; one of these walked away without waiting to know what was the reason of the ringing, and the other seemed not disposed to trouble himself with anything beyond the opening and shutting of the door. On the discontinuance of the medicine, they all soon returned to their usual state, and two of them had scarlatina, though only in a mild form.

Henbane *(Hyoscyamus niger)* is another of these powerful narcotic agents, educing symptoms analogous to insanity. In small doses, its effect is to

produce a pleasant sleep and soothe pain. In large doses, the effects are extremely deleterious. Two soldiers who ate the young shoots dressed with olive oil, became giddy and stupid, lost their speech, had a dull and haggard look. The limbs were cold and palsied, and a singular combination of delirium and coma manifested itself. As the palsy and somnolency decreased, the delirium became extravagant. Others who partook of the same species of plant by mistake were affected in a similar manner. Several were delirious and danced about the room like maniacs, and one appeared as if he had got drunk. A French physician gives an account of nine persons who were nearly poisoned by eating the roots of henbane. The effects of this poison were horrible in the extreme; in five, out of the nine, it produced raving madness. The madness of all these was so complete, and their agitation so violent, that in order to give one of them an antidote, six strong men had to be employed to hold him down, while his teeth were being separated to pour down the remedy. For two or three days after their recovery, every object appeared to them as red as scarlet.

The leaves of the three plants lately noticed—namely, thorn-apple or stramonium, belladonna, and henbane—are made up in the form of cigarettes; and the first of these also as cigars, to be smoked by asthmatic persons, for their soothing and sedative effects. These are all made and consumed extensively on the continent, and may be procured in many parts of London. They have also been recommended to those *not* asthmatical, as pleasant, harmless, and containing all the narcotising influences of a good cigar. They may be considered as truly narcotic substitutes for tobacco; but at the present rate at which they are sold, although not subject to either customs of excise, there is but little fear of their interfering prejudicially with the sale of the genuine article. In face of the facts already detailed, a good amount of courage seems necessary to make the attempt, lest they should prove cumulative in their action. Dr. Christison says, when writing of these narcotics "The action of such poisons is not always, however, entirely thrown away; they still produce some immediate effect; and further, by being frequently taken, they may slowly bring on certain diseases, or engender a predisposition to disease. A very singular exception to this rule prevails in the instance of tobacco, which, under the influence of habit, may be smoked daily to a considerable amount, and, so far as appears, without any cumulative effect on the constitution, like that of opium-eating or drinking spirits."

When the Roman soldiers retreated from the Parthians, under the command of Antony, Plutarch narrates of them that they suffered great distress for want of provisions, and were urged to eat unknown plants. Among others, they met with a herb that was mortal; he that had eaten of it lost his memory and his senses, and employed himself wholly in turning about all the stones he could find, and, after vomiting up bile, fell down dead. Attempts to unravel the mysteries of this plant have ended, in some cases at least, in referring it to the belladonna, a plant common enough in these our days, and known to possess poisonous properties of a narcotic-acrid character.

An analogous circumstance occurred in the retreat of the Ten Thousand, as related by Xenophon. Near Trebizond were a number of beehives, and as many of the soldiers as ate of the honeycombs became senseless, and were seized with vomiting and diarrhoea, and not one of them could stand erect. Those who had swallowed but little looked very like drunken men, those who ate much were like madmen, and some lay as if dying; and thus they lay in such numbers, as on a field of battle after defeat. And the consternation was great; yet no one was found to have died: all recovered their senses about the same hour on the following day; and on the third or fourth day theeafter, they rose up as if they had suffered from the drinking of poison.

Flowers and fruits of ***Datura sanguinea,*** *Zipaquira, Columbia. Photograph R. E. Schultes.*

Flowers and leaves of ***Datura candida.*** *Bogota, Columbia. Photograph R. E. Schultes.*

One of the atrophied "races" of ***Datura candida*** *which the Kamsa Indians reproduce vegetatively for use as a source of a narcotic drink. Sibundoy, Columbia. Photograph R. E. Schultes.*

Datura inoxia *or* ***tolohuaxihuitl,*** *a medicinal and narcotic plant of ancient Mexico. From "The Badianus manuscript" (Ed. E. W. Emmart) t. 49 (1940).*

Belladonna cultivation in England about 1910. The site shown is the Medicinal Farm at Long Melford, Suffolk.

Duboisia hopwoodii *is used by the Australian aborigines under the name pituri. Supposed to give endurance, it contains belladonoid compounds similar to those in* ***Datura.***

Cultivation of ***Atropa belladonna*** *in Dausse, France about 1890. Belladonna alkaloids are still widely used in medicine, though today they are wholly or partly synthetic.*

SUMMARY

The Narcotics We Indulge In.

I cannot dismiss the subject of the narcotics of common life, without drawing the attention of my readers to a few of the more interesting considerations which the facts above enumerated suggest to us.

Their extended use.—And the first reflection which occurs, as we cast a backward glance over the whole subject, is the almost universal use of narcotic indulgences. Siberia has its fungus—Turkey, India, and China, their opium—Persia, India, and Turkey, with all Africa from Morocco to the Cape of Good Hope, and even the Indians of Brazil, have their hemp and haschisch—India, China, and the Eastern Archipelago their betel-nut and betel-pepper—the Polynesian islands their daily ava—Peru and Bolivia their long-used coca—New Granada and the Himalayas their red and common thorn-apples—Asia and America, and all the world, we may say their tobacco—the Florida Indians their emetic holly—Northern Europe and America their ledums and sweet gale—the Englishman and German their hop, and the Frenchman his lettuce. No nation so ancient but has had its narcotic soother from the most distant times—none so remote and isolated but has found within its own borders a pain-allayer and narcotic care-dispeller of native growth—none so average which instinct has not led to seek for, and successfully to employ, this form of physiological indulgence. The craving for such indulgence, and the habit of gratifying it, are little less universal than the desire for and the practice of consuming the necessary materials of our common food.

Thus it may be estimated that the several narcotics are used—

Tobacco,	among	800	millions of men	
Opium,	"	400	"	"
Hemp,	"	200 to 300	"	"
Betel,	"	100	"	"
Cocoa,	"	10	"	"

A tendency which is so evidently a part of our general human nature, is not to be suppressed or extinguished by any form of mere physical, fiscal, or statutory restraint. It may sometimes be discouraged or repressed by such means, but even this lesser result is not always attainable. This was proved by the failure of the Spaniards, in their attempts to check the consumption of coca in Peru, of kings and priests to prohibit the spread of smoking in Europe and western Asia, and more recently by the similar failure of the imperial crusade against the use of opium in China. An empire may be overthrown by inconsiderate statutory intermeddling with the natural instincts, the old habits, or the growing customs of a people, while the instincts and habits themselves are only strengthened and confirmed.

While he laments, therefore, the excesses to which some are led in the use of narcotic substances, the enlightened philanthropist will look to moral rather than to physical or fiscal means as most likely to repress them. The minds of the people who use them must be enlightened. They must be taught to understand what will promote in the greatest degree both their bodily health and their permanent mental comfort. And what will operate more than all, they must be trained up to self-control and self restraint, and to the habit of reining in their natural desires for this or that form of gratification.

It is, indeed, not less melancholy than it is remarkable that some of the most striking known instances—of the abuse of opium, for example—have occurred among men of great mental powers, and of more than ordinary intellectual attainments. The reader of the preceding pages will recollect the total paralysis of the bodily and mental energies which befell our great Coleridge while he was a slave to opium; and how the English Opium-eater, as well as many others found mere intellectual power unable to contend with the excited instinctive cravings of the bodily constitutions when by long indulgence they had become diseased. Examples like these ought to impress upon every one a Christian sense of his own weakness, and incline him voluntarily to turn aside from the temptations which such men were unable to resist. It is comparatively easy to avoid acquiring habits, but it is very difficult to overcome such as are already formed. It was stated the other day at a temperance meeting in London, that of six hundred thousand persons in the United States who had taken the pledge, four hundred and fifty thousand had broken it!

Their agricultural and commercial importance. Then in regard to these narcotic substances, it may be questioned whether many more people are employed in raising the common necessaries of life, than in cultivating and preparing these apparently unnecessary indulgences. Certainly no other crops, except corn, and perhaps cotton, represent more commercial capital, employ more shipping and other means of transport, are the subject of a more extended and unfailing traffic, and the source of greater commercial wealth. The correctness of this may be judged of by the following estimates of the annual produce and value of a few of the narcotics I have mentioned (1855):

	Produce per acre.	Total produce in lb.	Acres employed.	Value per lb.	Total value in pounds sterling.
Tobacco,	800 lb.	4,480,000,000	5,600,000	2d.	£37,000,000
Opium,	20 lb.	20,000,000	1,000,000	20s.	20,000,000
The Hop,	660 lb.	80,000,000	120,000	1s.	4,000,000
Coca, . .	800 lb.	30,000,000	37,000	1s.	1,500,000
		5,610,000,000	6,725,000		£60,500,000

Besides these, there are consumed in the East five hundred millions of pounds of betel, and twenty millions of pounds of catechu and gambir extract.

Of course, all these estimates are to a great extent conjectural, but they are sufficiently near the truth to show how important an influence the narcotic appetite exercises upon the rural labors and commercial intercourse of mankind.

Its influence on domestic economy becomes equally apparent when we consider how large a proportion of the weekly earnings is often among ourselves expended in gratifying this appetite. But in India, where, on an average, not more than sixpence a-head is yearly spent by the whole population in the purchase of clothing, narcotic indulgences form the second great necessary of common life.

Their wonderful action upon the system is not less worthy of attention. The haschisch, besides the more usual intoxicating effect by which it makes the patient, like the infatuated lover, see

"Helen's beauty in a brow of Egypt,"

brings on that remarkable, rare, and inexplicable condition of the living body, which is distinguished by the name of catalepsy. The limbs of the patient may be moved at will by the bystander; but in opposition to the law of gravity, and apparently without an effort on the part of the patient, they remain for an indefinite period in any position in which they may be placed. The thorn-apple calls up spectral illusions before the deceived eye, and enables the forlorn and down-trodden Indian to hold refreshing converse with the spirits of his rich and powerful ancestors. The Siberian fungus gives insensibility to pain, while consciousness still remains, and, in common with the haschisch, it creates the singular delusion that a straw is too formidable an obstacle to be stepped over. The common puff-ball deprives the patient of speech, motion, and sensibility to pain, while he remains alive to all that passes around him. It thus realises, and proves to be possible, that nightmare of our dreams, in which we imagine ourselves stretched on the funeral bier, sensible to the weeping of real, and the secret satisfaction of pretended friends; aware of the last screw being fixed in the coffin, and the last sod clapped down above us in the grave-yard, and are yet unable to move a lip for our own deliverance! And then how melancholy the idiotic laughter produced by the deadly nightshade—so like that which, in rare and mournful cases, is seen on the old and withered features of one who, in the vigour of his manhoood, charmed the world by the brilliancy of his genius, or astonished it by the majesty of his intellectual powers! How singular in fine, that influence of coeulus indicus, which leaves the mind clear and strong after the limbs have become feeble and the gait tottering, as if the whole man were deadly drunk!

In all these effects the physiologist finds matter of most attractive, most interesting, most useful, and yet most profound and mysterious study. By what kind of action upon the system does the active ingredient of hemp produce the disease condition we call catalepsy; or that of the thorn-apple, the condition in which men see visions and dream dreams; or that of the fungus, the fearful state of the most fearful nightmares; or that of the nightshade, the melancholy drivelling of the long-strained and worn-out intellectual faculties? How interesting such questions, yet how impossible, in the present state of our knowledge, to answer them!

And yet towards the understanding of these remarkable phases of the human mind, chemistry has already brought us far on our way. It has put into our hands distinct chemical substances, by which any one of these states can be produced temporarily, and at will. Is it by the agency of similar substances, formed naturally in the system, that these diseased states of mind are naturally produced? If so, can we artificially, and by chemical means, counteract these, so as either to retain the mind in a sound condition, or to restore it to its natural health?

Can we produce, for example, virtual insanity—imaginary happiness (maddness hath imaginary bliss, and most men have no more." —Tupper) imaginary misery, or the most truth like delusions— by introducing into the stomach, and thence into the blood which is passing through the hair-like blood-vessels of the brain, a quantity of a foreign body too minute to be recognized by ordinary chemical processes; and may not real natural insanity, in any of its forms, be caused by the natural production the system itself of minute quantities of analogous substances possessing similar virtues? And, if so produced, will our future chemistry teach us to remove the mental disease, by preventing the production of the cause, or by constantly neutralising its effects?

And these are not merely ends to be aimed at. Even now they appear to be not beyond the pale of hope. For what are so like to each other as the natural and artificial states of mental derangement, and how much light do they throw upon each other? A monomaniac, in apparently perfect bodily health, takes the strangest fancies into his brain, and talks of and reasons upon them as if they were real. A person labouring under delirum tremens sees sights which are invisible to others, and speaks of them to his attendant, as real and present. The second-sighted seer, in his gifted moments, receives strange warnings from shadowy ghosts, and with full faith believes in and reveals them. A strong man, under the influence of haschisch, or the Siberian fungus, sees a huge tree in a tiny straw, and persists in his inability to step over it, as if the tree were really there. A child swallows common thorn-apple seeds, and forthwith spectral illusions dance before it, which the

child regards as real. A decoction of a similar plant calls up to the presence of the Indian of Peru the spirits of his ancestors; he converses with them; and when the effects of the drug have disappeared, he relates these imaginary conversations to his neighbours, believing them to be real, and, what is stranger still, they are listened to with an equal faith in their reality. An excited, nervous susceptible, or epileptic female sees lights streaming from human graves, and will-o'-the-wisps dancing around the pole of a magnet, or issuing in flickering mistiness from the finger-tops of an operator; she believes and describes them as real, and, like the credulous Indians, hundreds around her believe the fake moonshine to be real too. But are the things seen in any one of these cases more true and real than they are in all the rest? Are they not all delusions alike—mere mockeries, which deceive the diseased or drug-affected senses? And if so nearly allied in nature, may they not be so also in cause and in cure? At all events, what interesting chemico-physiological experiments are suggested by these striking analogies!

Some physiologists, reasoning from analogy, go still farther. They ascribe not only these rarer states of mind, but those also which are much more frequent and common, to the direct physiological action of material substances. M. Moreau, for example, guided by his personal experience of the action of the resin of hemp on his own mind, throws out the conjecture, "that every feeling of joy and gladness, even when cause of it is exclusively moral—that those enjoyments which are least connected with material objects, the most spiritual, the most ideal—may be nothing else but sensations purely physical, developed in the interior of the system, in the same way as those which are produced by means of the haschisch." In so far as relates to our internal consciousness, at least, he adds, "that there is no distinction to be made between these two orders of sensations, in spite of the diversity of causes to which they are due." This conjecture is eminently suggestive of experimental research, but it goes deeper into the connection between mind and matter than any positive knowledge we possess enables us as yet sagely to penetrate.

The special properties by which they are severally distinguished are also remarkable features of the narcotics I have described. Thus, while tobacco soothes, and, according to some, sets the mind to sleep, opium and hemp stimulate and exalt the mental faculties, giving the feeling and sense of increased intellectual power. In the case of opium, the activity of mind thus produced resembles the activity of the mind in sleep. It seems as if, all the bodily organs being at rest, the thoughts and images floated over or through the quiescent brain without fatiguing or wasting it as cloud and sunshine flit over a fair landscape without stirring or physically changing it. With hemp it is otherwise. It occasions hunger along with the mental activity. Prolonged thought in the waking man makes the head smoke, as it were. Like physical exertion, it exhausts the body, and brings on a hunger which can only be stayed by ordinary food. And so the mental activity occasioned by hemp resembles more that of the waking than of the sleeping man. This agrees with another observed difference between the two. Opium lessens the susceptibility to external impressions, while haschisch increases and quickens it in a high degree. The one shuts up the mind, as it were, within itself, while the other throws it open to the most lively influence of every bodily sense. It is also in agreement with all these differences, that the action of opium is interrupted and lessened by disturbance and bodily motion, while that of hemp is diminished by stillness and repose. In this latter quality hemp agrees with ardent spirits.

Coca and opium, again, agree in sustaining the strength, in certain circumstances, in a marvellous manner; yet they differ in two important qualities. The former never induces sleep as opium does, and even when taken in great excess, it moves the bowels, while opium usually makes them torpid and costive. Betel rouses from the effects of opium, as tea does from that of ardent spirits. The Siberian fungus opens and shows the heart as good wine is said to do. Secrets drop out spontaneously under the influence, and either the will or the ability to retain them has for the time gone to sleep.

Such specialities are curious and interesting in themselves; but they are so also in showing that the several narcotic substances act upon the system, and disturb the mind in different ways. They strengthen the probability, therefore, that, by the use of special chemical substances, we may be able hereafter to control the similarly differing mental affections by which natural diseases are so often accompanied.

How defective our knowledge is.—Yet though, from what we do know, we may venture to express such hopes as these, it must have struck the reader of the preceding chapters how very defective our knowledge is, both of the chemical nature and of the physiological action of the narcotics in which we indulge. The field of study which they present is indeed captivating and extensive; but hitherto the materials and opportunities for cultivating it have presented themselves rarely, at intervals, and to few individuals. The growing sense of the importance of chemical physiology to the art of medicine, however, promises, by-and-by to make the value of a higher acquaintance with chemistry more manifest to medical men, and thus to lead a greater number of that profession to qualify themselves for chemico-physiological investigations. As this desirable change takes place, we may expect to see many gaps in our present knowledge gradually filling up.

National influence of narcotics.—We have seen that almost every part of the world grows and consumes its own peculiar narcotic. The use of each of these in the country which produces it seem natural enough. It is consumed, as the national species or variety of grain is because it is most easily and plentifully obtained. But when different narcotics are equally accessible, why is one selected rather than another? England, for example, drinks much hopped beer, while Scotland and Ireland drink comparatively little. It is, no doubt, owing to some peculiarity in the national character and constitution that the narcotic hop, and probably also tobacco, are used more in the south than in the north of our island—that the German and Swede smoke more that the Frenchman—that opium and haschisch, so loved in the East, have made such slow progress in our European affections. And so the different forms in which the same substance is used are probably, in part at least, constitutional. France, the North of Scotland, Iceland, and Northern Scandinavia, are great consumers of snuff. England, Germany (high and low), Southern Scandinavia, and Russia, prefer to burn their tobacco and inhale its smoke. Snuff is much used also by the African races who live between the Red Sea and the Upper Nile, while the Mograbins are great chewers, and the Turks and Arabs as constant smokers—(Werne). It may be said that differences such as these are mere matters of taste; but national taste, though sometimes the child of habit, is more frequently the offspring of constitution and bodily temperament.

But does the use of the peculiar narcotic not again react upon the constitution, and gradually change the disposition and temperament? It probably does. The soothers and exciters we indulge in to excess are seen gradually to affect the constitution, and sensibly to modify the temper and constitution of individuals. Let the use of these become general, and similar changes will in time affect the whole people. We cannot tell how far such constitutional alterations may proceed. But it is a problem of interest to the legislator, not less than to the physiologist and psychologist, to ascertain how far and in what direction such changes may go—how much of the actual tastes, habits, and character of existing nations has been created by the prolonged consumption and prevailing forms of the narcotics in daily use—how far tastes and habits have been adopted within historic times and what influence their continued use is likely to exercise on the final fortunes of this or that people. The fate of nations has frequently been decided by the slow operation of long-acting causes, unthought of and unestimated by the historian, which, while the name and local home of the people remained the same, had gradually changed their constitution, their character, and their capabilities.

Asiatic and American customs.—In connection with this subject, it is also very striking that so many close coincidences should exist between Asiatic and American customs. Such are the very ancient use of tobacco in China, as well as in Central America—the use of hemp by the natives of Brazil, as well as by those of India and the East—the practice of chewing lime or plant ashes with the coca in Peru, and with the betel in India and China—the use of the red thorn apple by the hill people on the slopes of the Himalayas. All these coincidences can scarcely be the result of chance; they are evidences rather of ancient intercourse between Asia and America—possibly even of ancient family relationship between their early inhabitants.

We are accustomed to trace analogies among nations by means of alphabets, names of things, forms of speech, modes of writing, religious rites, &c., and from these to infer a family connection or a community of origin. But old habits and peculiar customs of common life, clung to often not only with the fondness of a natural instinct, but with a reverence inspired by high national antiquity—these are not less important evidences of ancient intercourse. They are also more persistent. They may survive after power, civilisation, language, alphabets, writings, and even old religions have disappeared. The chewing of coca in Peru has outlived all these. The common-life customs and the bodily features of the people have alone survived.

Philological travellers describe, as the most ancient race among the Mexican mountains, a tribe of Indians speaking a monosyllabic language which bears considerable resemblance to the Chinese. The similarity of customs above described is equally close and striking. And the most cautious ethnologist will scarcely refuse to consider the two kinds of evidence as materially aiding each other, and giving strength to the conclusion to which they both point—that a remote family connection exists between the Indian inhabitants of America and the most ancient populations of Eastern Asia.

General summary.—From all that we know on the subject of the narcotics, we may, I think, extract these general propositions:—

First, That there exists a universal craving in the whole human race for indulgences of a narcotic kind. This is founded in the nature of man.

Second, That this craving assumes in every country a form which is more or less special to that country. It is modified most by climate, less by race, and least, though still very sensibly, by opportunity.

Third, That among every people the form of craving special to the whole undergoes subsidary modifications among individuals. These are determined by individual constitution first, and next by opportunity. Hence different professions, in consequence of acquired habits and state of body, show the craving in differently modified forms. And hence, also, the different classes of society, because of their unlike means and opportunities, exhibit similar

differences.

Fourth, That differences in physiological action, which are sometimes very slight, seperate—

a. The more dreaded from the less dreaded narcotics—opium and hemp from tobacco and the hop.

b. The narcotics from the fermented liquors—opium from alcohol.

c. The milder from the fiercer alcoholic drinks—the beers and wines from the brandies.

d. The mildest fermented drinks from the beverages we infuse—the beers from the teas and coffees.

All these indulgences shade into each other, often by almost imperceptible degrees, and our constitutions, in favourable circumstances, insensible adapt themselves to all. How much, therefore, ought we to be on our guard against their insidious attractions.

Lastly, I may remark that, with the enticing descriptions before him, which the history of these narcotics presents, we cannot wonder that man, whose constant search on earth is after happiness, and who, too often disappointed here, hopes and longs, and strives to fit himself for happiness hereafter—we cannot wonder that he should at times be caught by the tinselly glare of this corporeal felicity, and should yield himself to habits which, though exquisitely delightful at first, lead him finally both to torture of body and to misery of mind;—that, debilitated by the excesses to which it provokes, he should sink more and more under the influence of a mere drug, and become at last a slave to its tempting seductions. We are indeed feeble creatures, and small in bodily strength, when a grain of haschisch can conquer, or a few drops of laudanum lay us prostrate; but how much weaker in mind, when, knowing the evils they lead us to, we are unable to resist the fascinating temptations of these insidious drugs!

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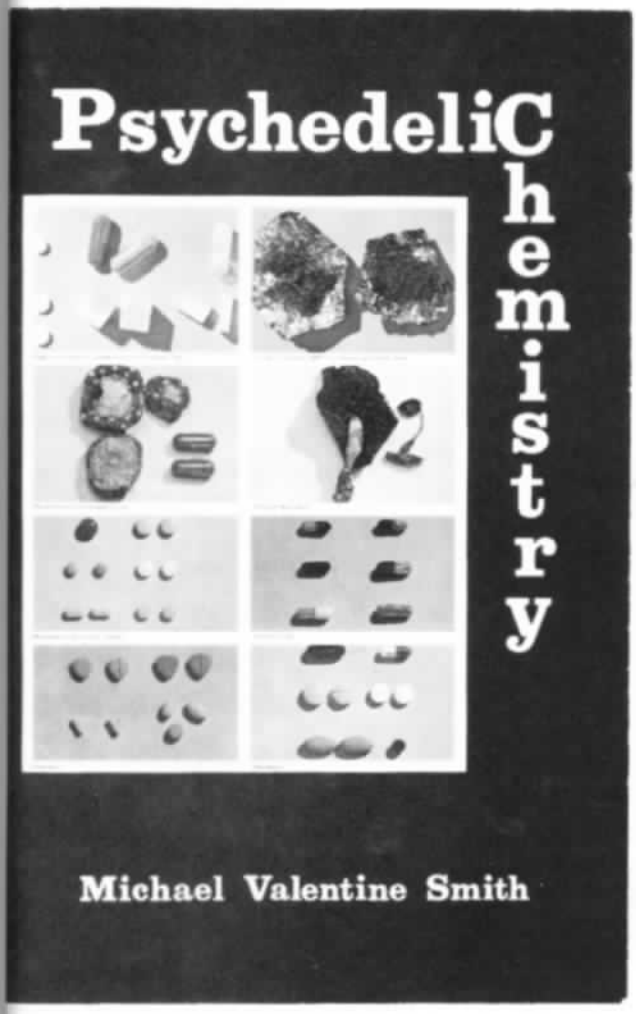

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L. Lewin (1924)

Cocaine Fiends And Reefer Madness

History of Drugs in the Movies
1894-1978

Michael Starks

Cocaine Fiends and Reefer Madness

History of Drugs in the Movies

1894 - 1978

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Berkeley, California

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History of Drugs in the Movies
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Table of Contents

Preface 7
Introduction 9
1. Beginnings: Opium in the SIlent Film 13
2. The Narcotic Spectre 21
3. Liquid Love and Goodfellowship Pills 25
4. Cocaine Fiends 35
5. Stars: Shooting and Falling 46
6 The Joint on the Cutting Room Floor: Censureship of Drug Themes .. 53
7. The Heroin Trail 61
8. Hopheads 79
9. The Opium War 90
10. Wild Weed 101
11. High Times in Hollywood 126
12. The Trip: Hollywood Hallucinations 139
13. Avant-Garde: Underground and Far Out 165
14. Up and Down and Sideways 174
15. Drug-Abuse Films 192
16. Televisions Discovers Drugs 208
Insert 215
Bibliography 223
Film Index 226
Drug Index 246
Country Index 247
Name Index 248
Author Bio 251

The original sin of art is that it wanted to convince and to please, like flowers that grow in the hopes of ending up in a vase.

Jean Cocteau

Whenever you see a film critic, pick up a brick and throw it at him. No great damage can be done to his head.

Jonas Mekas

Preface

Surveying the world's film literature is not an easy task. Only a few countries have adequate listings of their films and only one country has even attempted to compile a comprehensive listing of its entire film output complete with plot synopses of the films. The vast majority of foreign films are never reviewed in English-language publications, and it is often only by the most tortuous routes that one is able to learn of their existence. Film archives generally have no printed catalog of their holdings, and some of the largest archives (e.g., the Cinémathèque Française) will not even deign to reply to letters. Most films produced prior to World War II have vanished entirely and the preponderance of those produced later are virtually unobtainable. The only good way to assay the content of a film is to view it and this is usually not possible without considerable investment of time and money. Furthermore, the copyright laws render free circulation of films impossible for over fifty years after their release (in the United States). It seems preposterous that the greed of a small minority of film producers should take precedence over the needs of the world for entertainment and education. Patents provide protection of inventions for a period of only seventeen years (in the United States) and this seems quite sufficient for other creative works. Hopefully, the increased use of videotape will alleviate this situation. Meanwhile, millions of films (if one includes all the foreign films, documentaries, shorts, scientific films, and newsfilms) remain in limbo, almost as useless as if they had never been made, and the masses are doomed to the pabulum spewed forth by television.

Nevertheless, in this study I have made every attempt to be accurate and complete, but I realize that there will be some errors and many omissions. I will greatly appreciate corrections, additions, and stills, and will gladly reward contributors of such material with a still of their choice.

I have arranged the book as a whole, and the individual sections, in roughly chronological order, and often by country as well. This should make it easy to discover what films were made about a particular drug at a given time in a certain country.

I wish to thank the many persons and institutions that have helped me in this endeavor. Dr. Michael Aldrich and Michelle Cauble deserve special thanks for sharing their fund of information. The British Film Institute, Det Danske Filmmuseum, the Library of Congress, the American Film Institute, and the Cineteca Nazionale have been generous in assisting this research. Finally, I wish to acknowledge my debt to the Fitz Hugh Ludlow Memorial Library of San Francisco for permitting me the use of their superb collection of drug literature.

Michael Starks

Introduction

The term *drug film* is here interpreted in its broadest sense as a film having any reference to psychoactive drugs. Consequently, the films mentioned vary from those having a trifling reference to drugs ("What's he been smoking?" from *Gold Diggers of 1933*) to those concerned with little else (*Cocaine Fiends*). Far from being a recent phenomenon, even the latter type of reference to drugs has been common from the earliest days of the cinema. The usefulness of many of these references, and in some cases the films themselves, might well be questioned, but all of them reveal something of interest about the ways in which psychoactive drugs were regarded at the times the films were made.

Even films having drugs as a primary theme occur in nearly every country and time period for which there is a significant body of film literature. For instance, pre-World War I Italy produced many films of this sort. Films dealing with drugs vary along every parameter just as do films that do not. There is Katharine Hepburn's stunning portrayal of a morphine addict in *Long Day's Journey into Night* and the hackneyed stereotypes in *Psych-Out*; the visual beauty of *Chappaqua* and the sordidness of *The Panic in Needle Park*; the honest attempt at spiritual rebirth of *Turn On, Tune In, Drop Out* and the pornographic pandering of *Suburbia Confidential*.

It is also interesting to consider the effects of drugs on the style and content of films that have nothing specific to do with drugs. These range from the early American "cocaine comedies" and the bizarre opium visions of Cocteau to the psychedelic visuals and stoned humor of recent American films. In this connection the drug experiences of some filmmakers, actors, and actresses are examined. Many people regard the avant-garde or underground film as the source of much of the truly innovative technique in modern films, and the influences of drugs on such films are examined in detail.

Film provides some unique insights to the psychology of the scriptwriters, directors, and actors. The conventional view is that psychoactive drugs are an avenue of escape into fantasy and the cinematic portrayal of drug effects and drug users has usually reflected this view. Though opium visions and "pipe dreams" began to be seen in films of the late nineteenth century, it is for the most part only in the last ten years that filmmakers have been able to express freely their psychedelically inspired insights and visions. The drug film fantasies, like the drugs themselves, have tremendous potential for stimulating fantasy and creativity, which is still largely unexplored.

One can also view the drug cinema from the standpoint of censorship. From the first days of the motion picture, the film medium has struggled to free itself of the oppressive weight of convention and manipulation by special-interest groups. It is only within the last two decades that it has finally become possible to portray drug users and drug effects in an honest fashion. This struggle and some of its consequences are dealt with especially in the chapters on censorship, underground film, drug-abuse films, and television.

The ability of films containing drug themes to

stimulate experimentation with drugs is still hotly debated. Certainly the media have profound influences on human behavior and even in the nineteenth century, when the written or printed word was the primary means of communication, many people testified to the unhealthy interest in opium that the reading of De Quincey's *Confessions* generated in them. Even antidrug films have been prohibited in many countries and times, and in the past it was undoubtedly often true that no discussion at all was a wise path to follow. Now, however, the situation is dramatically different, and grade school children in rural Kansas are likely to know more about dope than *Easy Rider* can tell them. The media revolution is in full swing, and, with the extreme mobility of the population, differences between city and country folk are rapidly vanishing. Presumably, in the next generation the whole censorship problem will resolve itself, as it already has in some Scandinavian countries, into one of personal choice.

Cocaine Fiends and Reefer Madness

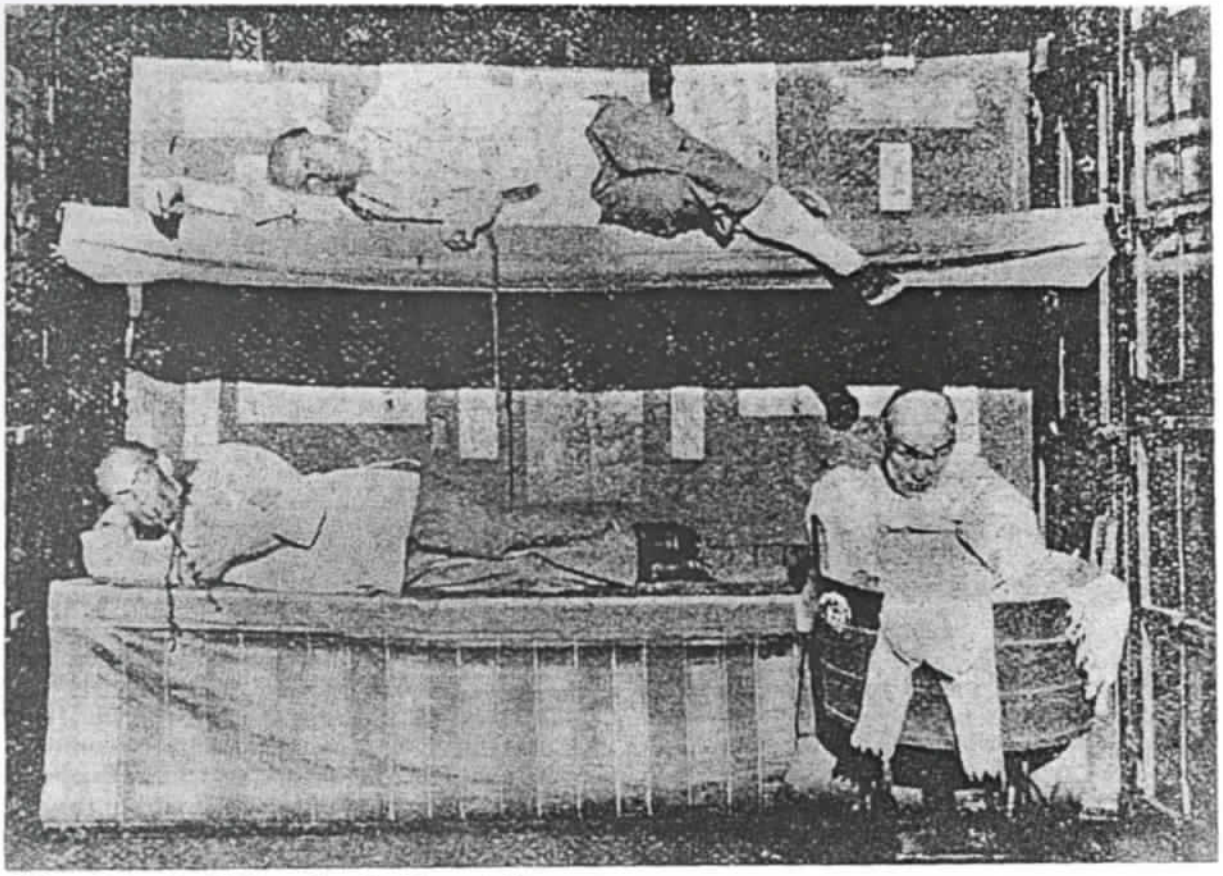
1 Beginnings: Opium in the Silent Film

If you strolled down to the penny arcade in the mid 1890s and dropped a coin into one of the newly installed kinetoscopes, you might have seen a half-minute film (then called a kinetograph) entitled *Chinese Opium Den* (also known as *Robetta and Doretto*, *Opium Joint*, *Opium Den*, and *Opium Smokers*), the subject of which was opium smoking. This film was made by W. K. Laurie Dickson for Thomas Edison in 1894 and is not only one of the first films (the first film copyright was granted to Dickson's *Kinetoscopic Record of a Sneeze* in January 1894) but the first to deal with psychoactive drugs.

This film seems to have also been exhibited as *Chinese Laundry*, *Chinese Laundry Scene*, *Fun in a Chinese Laundry*, *Row in a Chinese Laundry*, *Quarrel in a Chinese Laundry*, and *Heap Fun Laundry*. Though it sometimes appears that these latter titles apply to different films, it can be seen from the still that both the washtub and opium pipe are present and it is likely that only one film is represented.

As can be seen from the still, some details of the interior of Edison's Black Maria—the first film studio—are visible. One of the most eminent film historians—Georges Sadoul—has said that the popularity enjoyed by this film was responsible for the many opium films that were produced in subsequent years. However, opium smoking and opium dens were as obvious for movie settings as drinking and speakeasies were to become later, and opium visions provided a perfect excuse for the trick effects early filmmakers were so fond of. Ferdinand Zecca of France produced *Un Horrible Cauchemar* (*A Horrible Nightmare*) in 1901, which depicts a man intoxicated by nargileh smoke sleeping and dreaming while in prison. Sadoul has a blurry still from this film in the second volume of his *Histoire Génerale du Cinéma*, probably all that remains of the film. Edison's American Mutoscope and Biograph Company produced *Rube in an Opium Joint*, probably the earliest surviving American drug film, in 1905, the same year that British film pioneer R. W. Paul made *The Visions of an Opium Smoker*, a five-minute short that is apparently the same film sometimes referred to as *Opium's Dream*. The latter film followed the typical pattern of a man having weird dreams after smoking opium in a Chinese den. France produced five more films of this sort in the next seven years: *Rêves d'un Fumeur d'Opium* (1906) by Gaumont; *L'Opium* (1908) by the Eclair Company (the scenario for both of these by Jasset); *Dream of an Opium Fiend* by Melies in 1908; *Fumeur d'Opium* (1911) by Eclair, and *La Pipe d'Opium* (1912) (*Scènes de la Vie Cruelle*) again by Zecca for Pathé. The *Biograph Bulletin* for 1906 described the first of these under the title "The Opium Smoker's Dream" as follows:

> An Oriental phantasy of bewildering gorgeousness—the product of one of the Parisian Houses. An opium smoker in a Japanese



Chinese Opium Den (1894) produced by Thomas Edison was the first film to deal with drugs. The interior of Edison's "Black Maria"—the first film studio—is clearly visible.

Rube in an Opium Joint (1905) is one of the earliest surviving drug films. A Chinese is lighting the pipe for the rube while a lady and the man with the megaphone (presumably a tour guide) look on.

tea garden has visions which carry him through a succession of varying scenes. First he is in an inferno plagued by demons, then he is rescued by witches who, in turn, try to smother him. He descends into hell itself, where imps with pitchforks bar his escape. From the inferno he is transported to an Oriental heaven, where he is surrounded by voluptuous and enticing beauties who beckon him, but are forever out of his reach. The elaborateness of the production can only be compared to some of the greatest spectacles of the Metropolitan Grand Opera in New York. The film is one of the biggest sensations of the season abroad, and certainly has never been equalled before.

The 1912 German film *Die Jagd nach der 100 Pfundnote* (*The Pursuit of the 100-Pound Note*) followed the elusive bill to a Chinese opium den in a chase through Cairo, Bombay, and Nagasaki. Sweden also joined the parade with *Opiumhalan* (1911), which, however, was shot in the United States by Svenska Biograf. Denmark had developed a significant movie industry by this

time and the famous director Holger-Madsen made *Opiumsdrömmen* in 1914. Copyrighted in the United States as *The Opium Smoker*, at least a portion of this film survives. The superimposition of images was used to depict the opium smoker's dreams, and though it was sufficiently graphic to be forbidden by Danish censors (apparently because of kissing scenes!), it had considerable success in the United States. Also in 1914 the British director Stuart Kinder produced *The Opium Cigarettes*, a fifteen-minute film in which a man sees the familiar "weird visions" after smoking a drugged cigarette.

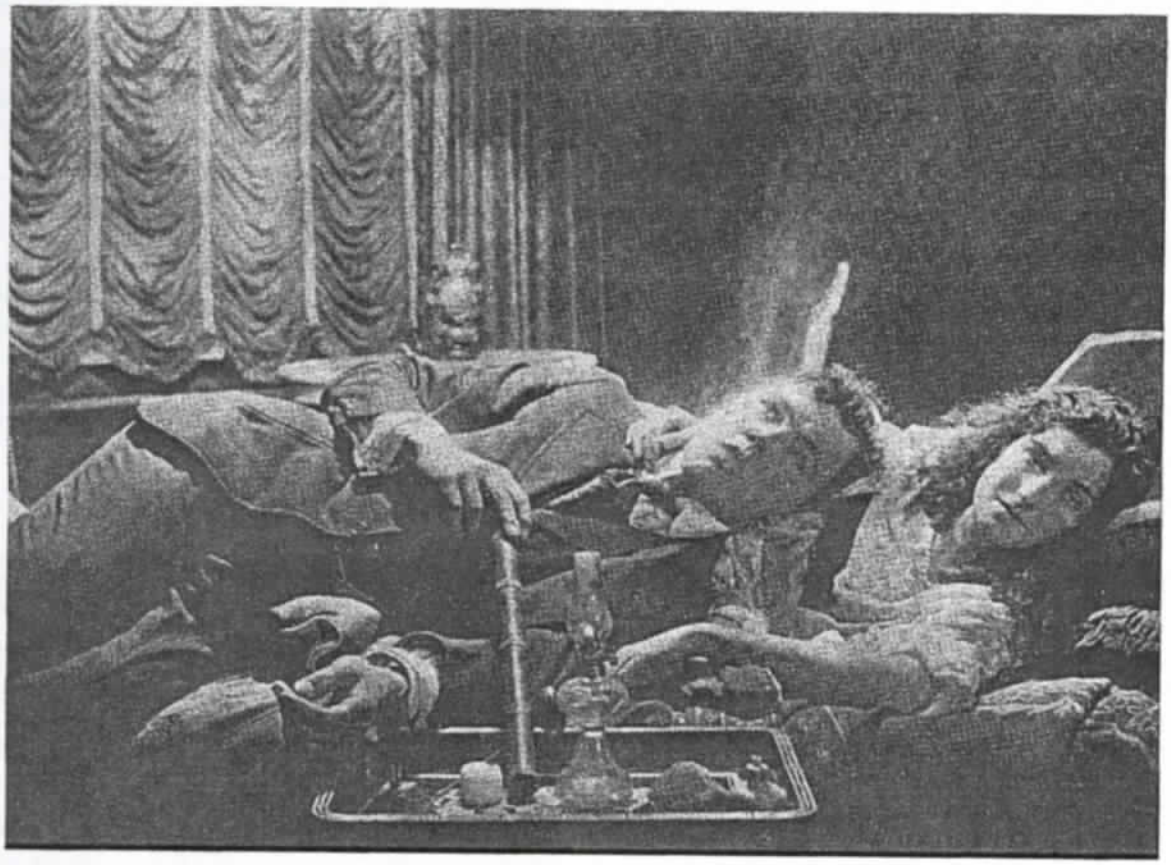
The 1916 Danish film *I Opiummets Magt* by Robert Dinesen again showed the "fantasms and hallucinations" after smoking opium. When the German realist film *Opium* (1919) by Robert Reinert (starring famous silent actors from *The Cabinet of Dr. Caligari*—Conrad Veidt and Werner Krauss) appeared, the German trade periodical *Der Kinematograph* said of this film: "The greatest success in the Marmor House was 'Opium' by Robert Reinert. Sold out for 3 weeks at prices from 2.5 to 10 marks. Theater owners, do you know what that means?" Austria produced the last of the silents to deal mainly with opium, *Opiumkur* (*Opium Cure*), in 1920.

Opium did, however, figure prominently in many other films. *Deceived Slumming Party* (1908) was about a trio visiting a Chinese opium joint in the Bowery. It is possible that this film is the same as *Rube in an Opium Joint*. Dickens's unfinished novel *The Mystery of Edwin Drood* was first made into a film of this name in Britain in 1909 with Arthur Gilbert directing. Edwin's mystery was that he wandered off from his dreary teaching duties to smoke opium whenever the chance afforded and the movie thus has one scene in an opium den. A five-reel American version of this novel was produced by Shubert in 1914, the same year Ella Hall was held captive in a Chinese opium den in *The Master Key*. Since Edgar Allan Poe's association with the products of the poppy was widely known, it is not surprising to find the French making *The Vengeance of Edgar Poe* (1912) in which a drug drives Poe insane.

Opium smuggling apparently began its long run as a favored theme with George Kleine's *The Opium Smugglers* (1913) and Chapter 8 ("The Opium Smugglers") of *The New Exploits of Elaine* (1915)—later to be included in the serial *The Mysteries of New York* (1915). Opium smuggling was one of the main themes in the parody *The Mystery of the Leaping Fish* (1916) discussed in the section on cocaine movies.

The New Exploits of Elaine **(1915) was one of half a dozen opium-smuggling melodramas appearing at that time. As usual it was foreigners who were depicted as overlords of the drug trade.**

Two rare stills from *Opiumsdroemmen* (Denmark, 1914) directed by film pioneer Holger-Madsen. Though very graphic in depicting the delights of opium, it seems to have been forbidden in Denmark because of kissing scenes!



Charles Ray and Ethel Ullman smoking opium in Ince's *The Dividend* (1916). Opium smokers were frequent characters in films of this time and this role led to fame and fortune for Ray. He later made bad investments and died in poverty.

Two scenes showing opium smoking from the Danish film *I Opiummets Magt* (1916). By this time censors in some countries were banning films with drug scenes.

***The Yellow Claw*, a 1921 British production, had arch-criminal Fu Manchu smuggling opium to keep his chain of dens supplied—an underworld equivalent of McDonald's hamburger restaurants.**

"The Fungi Cellars," chapter 6 of *The Mystery of Dr. Fu Manchu*, shows the evil doctor with two opium pipes, but he still looks more British than Chinese.

Richard Barthelmess and Lillian Gish in *Broken Blossoms* (1919). This was one of very few films to depict either Chinese or opium in a favorable light.

Winky's Ruse (1914) was one of the last British films to treat opium lightly, its comic plot showing a tramp tricking wine from a publican who then puts laudanum in the bottle. *Lieutenant Lilly and the Splodge of Opium* (1913), produced by the pioneer British filmmaker Cecil Hepworth, depicted (also in a comic vein) the good lieutenant and his men quelling a Boxer uprising and saving a girl from an opium den, but in 1915 the subject was treated in a serious manner in *London's Yellow Peril*, an early directorial effort of Maurice Elvey. The film took some twenty-five minutes to tell how a "dude saves missionary's daughter from Chinese opium den." In *The Smart Set* (1919) a detective poses as an opium fiend to save an addicted knight and his daughter from abduction by a jeweler, and in another British movie of that year, *The Case of the Doped Actress*, an agent causes an actress's death by inducing her to take opium. In *The Man with the Twisted Lip* (1921) Sherlock Holmes pursues the person who murdered poor Neville St. Clair into an opium den.

The Fu Manchu novels of Sax Rohmer (A. S. Wade) have been subjected to filmic treatment many times, most notably in the fifteen-part serial, *The Mystery of Dr. Fu Manchu* (1923), of which Chapter 6—"The Fungi Cellars"—contains an opium-smoking scene. In *The Yellow Claw* (1921), another British Fu Manchu entry, English and French detectives collaborate to catch opium smugglers who operate a chain of opium dens. Britain also produced the eight-part series *The Further Mysteries of Dr. Fu Manchu* in 1924.

Opium dens and smokers continued to be favored in American films also. One of Charles Ray's early roles was that of the opium smoker in Ince's *The Dividend* (1916) and Richard Barthelmess was the kindly, opium-smoking Chinese who saved Lillian Gish in Griffith's *Broken Blossoms* (1919). "The Den in Chinatown" was Chapter 10 of *The Lurking Peril* (1919) and Warner Oland played a Chinese in a serial of that year—*The Lightning Raider*. The 1920 version of *Dr. Jekyll and Mr. Hyde* had a brief scene in an opium den, and Lon Chaney, Sr., devised some ingenious makeup to play opium-smoking Chinese in *Bits of Life* (1921), *Outside the Law* (1921), and *Shadows* (1922). *After Midnight* (1921) begins in an opium joint where a stranger, asked to impersonate a dying man, recognizes him as his twin brother and eventually marries his dead twin's wife. Evidently audiences of the 1920s were expected to regard opium smoking as quite compatible with high moral standards and an upper-class background—in *Idle Hands* (1921) it is the vice commissioner's son who is an opium fiend. One of the early antidrug melodramas, *The Drug Monster* (1923), depicted opium smoking. *The Little Girl Next Door* (1916 and 1923 versions) showed an innocent lad becoming involved in an opium ring, and the eloping couple in *Driven from Home* (1927) have a brief adventure in a "Chinese hop joint."

Lon Chaney, Sr., in *Bits of Life* (1921). Chaney was the greatest master of makeup in the history of film and is best known for such movies as *The Hunchback of Notre Dame* and *The Phantom of the Opera*.

Opium was often depicted as the last resort of the deeply distraught as in *Worlds Apart* (1921) in which one of the leading ladies, Florence Billings, finds her husband, Arthur Housman, dying in a Chinese opium den. *Sowing the Wind* (1921) features a remorseful mother resorting to opium

Chaney, in another of his three portrayals of an opium-smoking Chinese, in *Shadows* (1922).

and dying, and *Java Head* (1923) has a dope addict and a Chinese princess (Leatrice Joy) who uses opium to commit suicide.

Opium smuggling was as popular a theme in the 1920s as heroin smuggling was in the 1960s. In 1921 alone four American scenarios revolved around this theme. Dustin Farnum played a South Sea captain who becomes wealthy from selling opium cargoes in *The Devil Within*; Viola Dana was a female Secret Service agent on the trail of opium smugglers in *There Are No Villains*; a revenue officer's daughter helps capture opium smugglers in *The Matrimonial Web*; in *Shame* a Chinese tries to bribe John Gilbert into helping him smuggle opium into San Francisco. The cast in this last film included Anna May Wong and a character called "Once-over" Jake. China, Chinese, and San Francisco were naturally involved in some of these films since some of the Chinese did carry their smoking practices with them all over the world. *Purple Dawn* (1923), so named from the last 200 feet of the film that were tinted a light purple, shows the smuggling of opium to a Chinese tong leader in San Francisco, and *The Warning* (1927) finds Secret Service agent Mary Blake pursuing opium smugglers in Shanghai, one of whom turns out to be a British Intelligence Service man—another favorite ending for early drug movies. Apparently the scenes in the opium dens in the latter film were tinted red to give them the flavor of hell. An American girl in China is the opium smuggler in *Drifting* (1923), a film directed by Tod Browning with a good cast including Wallace Beery and Anna May Wong.

The Northwest Mounted Police also had their day in the opium smuggling field. William Desmond trails opium smugglers in *McGuire of the Mounted* (1923), and Allan Penrose does likewise in *Dangerous Trails* (1923). In *Duty First* (1922) the chase proceeds to New York and finally to Canada.

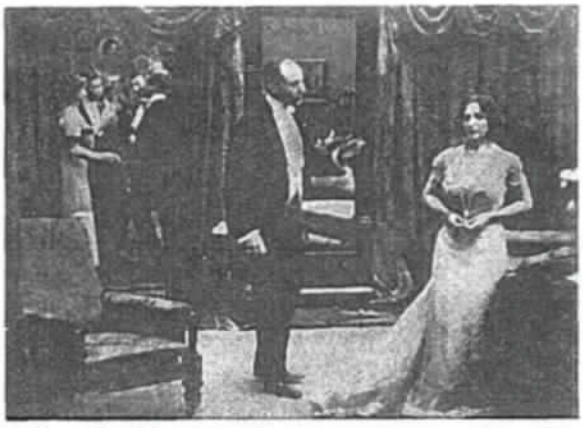
A Secret Service agent pursues smugglers to the Green Dragon Café in *Through Thick and Thin* (1927) and again there is the familiar ending where one of the supposed bad guys is yet another Secret Service man. This type of ending occurs so frequently that one has the impression that in order to depict this foul vice it was thought necessary to show that the government had two independent undercover agents on every group of smugglers. *Tearing Through* (1925) at least had a novel plot. Richard Talmadge, after freeing his sweetheart from a "narcotics hellhole," and her brother from drug addiction, finds that the district attorney is being bribed by drug peddlers. Novelty is likewise the only virtue of *The Loser's End* (1924), an opium-smuggling melodrama that takes place on a western ranch.

2 The Narcotic Spectre

By the end of the nineteenth century, the arsenal of medicine and drug addicts had been supplemented with the recent discoveries of cocaine, heroin, and barbiturates. Millions had become addicted or habituated to these substances via patent medicines or legitimate prescriptions. World War I, with its attendant chaos and the exposure of many soldiers to opiates and cocaine in Europe, resulted in a noticeable increase in the use of these substances. Maurice Chevalier disclosed that he began using cocaine heavily during the Great War. The first Pure Food and Drugs Act in 1906 and the Harrison Narcotics Act of 1914 (and similar laws in other countries) did much to ameliorate the situation but the drugs were still easy to get, especially if one could find a sympathetic or corrupt doctor. Addicts, peddlers, and drug smugglers were featured in perhaps 200 American films alone during the silent film era. However, the emphasis in movies, as in life, gradually shifted from smoking opium to injecting morphine and heroin and sniffing cocaine.

Morfinisten (*The Morphinist*) (1911), probably the first and the best of the early films on morphine addiction, was made by Danish filmmakers Lily and Kai Van der Aa Kuhle (Lily was also known as Louis von Kohl—presumably to escape the prejudice against women). It was the first film of the Scandinavian-Russian Trading Co. and was evidently successful as Sadoul says it

Albrecht Schmidt as the morphinist in the 1911 Danish film *Morfinisten*, probably the first and best of the early morphine films. The stock market drove him to it.



Robert Schmidt and Lilli Beck in another scene from *Morfinisten*. Lilli is concerned because she is playing second fiddle to John's morphine bottle.

made a fortune. The film seems to have used mirrors and superimposition to obtain hallucinatory effects. Although one historian says "the title gives the whole program," the film seems to have a reasonably interesting plot. Albrecht Schmidt plays stock market speculator John Robert, who reaches for his morphine bottle every time the market drops. One Danish writer claims that Schmidt dies at the end of the film, but the detailed plot synopsis indicates that he merely comes to the realization that morphine can no longer give him relief from life's disappointments. The film was shown in France as *Les Morphinomanes*.

Many of the subsequent films dealing with drugs had a decidedly propagandistic intent. *White Slave Traffic* (1913) was possibly the first film to regard drugs as a preliminary to, and adjunct of, prostitution. The American producer Carl Laemmle was inspired to make this film by the success of the Danish film *The White Slave Traffic* (1910), whose Danish title can be translated as *The White Slave Trade* and which was itself a remake by Ole Olsen for Nordisk of the same film made in the same year by another Danish company (Fotorama). *The White Slave* (1913) starring Clara Kimball Young and *The Great White Trail* (1917) with Doris Kenyon are but two of the countless "white slave" films to follow.

Dr. Killem's Dope, *The Drug Traffic* (a French film), *The Narcotic Spectre*, *The Drug Terror*, *Morphia—The Death Drug* (British), and *A Mother in Exile* (British) all appeared in 1914. *The Drug Terror* or *The Underworld Exposed* by Lubin was "written with the assistance and approval of the Director of Public Safety and the Police Department of the City of Philadelphia." *Morphia—The Death Drug*, another Cecil Hepworth effort, showed a doctor forcing his secretary to become a morphine addict, and another British production *A Mother in Exile* involves a woman who, divorced for having a convict brother, becomes a morphine addict and dies. Italy was the source of *La Morfina Indiana* (1913), although it is unclear whether this was an antidrug tract, and an Eastman film *The Dope Trade in Chinatown* seems to have been produced about this time. The year 1915 marked the appearance of *The Accursed Drug* and *Mr. Daly's Wedding Day*, the latter an Edison short about a counterfeiter who also traffics in drugs. *The Devil's Needle* with Norma Talmadge, a film still in existence, and *The Girl Who Didn't Care*—a British film about a girl who becomes a morphia maniac's mistress—appeared in 1916. *The Devil's Assistant* (1917), a six-reel feature, depicted drug hallucinations. A film of the same name was made in France in 1913, but it is unclear if it was based on the same theme. The German film *Morphium* appeared in 1919 and a German trade periodical said of it: "A sure bet. Every theater owner who does not show this masterwork of film art harms himself. Brilliant reviews in the newspapers and trade journals." In the same year Fritz Lang directed *Halbblut* (*Halfblood*), a remake of a 1913 Swedish film in which a femme fatale drags a man to ruin with opium. In 1922, Britain produced *Crushing the Drug Traffic*, in which an actress helps to unmask a theatrical agent as a dope peddler. The Austrian film *Moderne Laster* (*Modern Problems*) (1924) was an educational film directed against the use of alcohol, morphine, and cocaine, and is perhaps the first of the drug abuse films that were to proliferate in the 1960s.

Narcotics appear in unusual connections in some films. *The Vampire* (1914) is an early French film in which a psychologist is under oath to a strange organization to kill his wife with narcotics and a huge vampire bat. In *Easy Street* (1917) Charlie Chaplin finds himself in a gang of anarchists and drug takers. A dope fiend knocks Charlie onto a needle and he becomes a fighting maniac, subduing the mob with flying leaps. In *The Germ* (1923), serums destroy blood germs that produce personality defects such as greed or drug addiction. One person is turned into a butterfly, then a tarantula, a small price to pay for utopia. Pola Negri is kidnapped with the aid of drugs and hypnotism in *East of Suez* (1925) and Hope Hampton is drugged in *The Unfair Sex* (1926). Horse dopers appeared in a number of early British films such as *Attempted Nobbling of the Derby Favorite* (1905), which required nine minutes for Cricks and Sharp to show crooks thwarted in an attempt to dope a racehorse, and *A Late Guest* (1910) by Pathé shows a man sprinkling powder on a horse's nose to make it gallop. The 1914 British comedy *How Spotted Duff Saved the Squire* also spent some nine minutes showing a foiled attempt to dope the squire's horse, and in *Watching Eyes* (1921) it is a Pekingese dog that foils the horse dopers. *Cruiskeen Lawn* (1922) has the novelty that the squire's horse wins the race after being doped with the "elixir of life." *The Great Turf Mystery* (1924) has a woman's trainer doping her boyfriend's horse.

The Addict as Stock Character

By the end of World War I dope fiends had become standard characters in films. Their appearance in the films discussed in this section is largely incidental to the plots. Three British productions of 1915—*The Hand at the Window*, *London Nighthawks*, and *The Yoke*—had drug users as characters. The 1921 British film *Frailty* had both the hero and heroine overcoming morphine addiction to attain happiness. *The Foolish Matrons* (1921) had an overworked husband resorting to drugs, and *Reputation* (1921) has a female addict who commits murder and suicide. Addicts had a banner year in 1922, appearing in no less than six American productions—*Determination*, *Always the Woman*, *The Dungeon* (wherein a drug fiend is used to hypnotize a woman), *Pawned* (where the addict is a doctor), *The Worldly Madonna* (with Clara Kimball Young as the addict), and *White Hands* (which has characters "Hurricane" Hardy, "Grouch" Murphy, and Peroxide). Norma Shearer and Monte Blue are mong the cast of *Lucretia Lombard* (1923), a story of an elderly drug addict who finally dies of an overdose, and Ruth Clifford played a drug addict who commits suicide in *Daughters of the Rich* (1923). *Thundergate* (1923) takes place in China, where an American meets with trouble while in a dissolute stupor induced by his narcotic habit, and *The Man Who Came Back* (1924) tells the story of poor Marcelle, who has become hooked on morphine in Shanghai. *The Top of the World* (1925) takes place in South Africa where a drug addict is nursed back to health by "Doctor" Kieff, a narcotics peddler. *That Royale Girl* (1925) is of special interest

Before the fall—in the 1921 British film *Frailty*. The American lady leads him to the needle and morphine addiction.

because it was directed by D. W. Griffith and starred W. C. Fields as a drunken confidence man with a drug-addicted wife. Among other addict films of the 1920s are *Who Is the Man?* (1924, British), *Harbor Patrol* (1924), *Those Who Dare* (1924), *Midnight Girl* (1925, with Bela Lugosi), *A Modern Cain* (1925), *The City* (1926), *Wild Oats Lane* (1925), *The Fake* (1925, British), *The Drake Case* (1929), and *Voice of the City* (1929). In *The Pace That Kills* (1929) a country boy, looking for his sister Grace in the big city, soon becomes an addict and when he finally finds Grace she is an addict and a prostitute. Poor Eddie suffers months of agony in a hospital to be cured.

Across the Border and under the Counter

Many silent films accented drug smugglers and dope rings. Dope peddlers figured in *The Woman with Four Faces* (1923), *A Man Must Live* (1925), *The Prince of Pep* (1925, with Arthur Conrad playing "Eddie-the-Sniff"), *Big News* (1929), and *Welcome Danger* (1929), which reveals Oriental and American gangsters dealing drugs in San Francisco. The peddler is Flash, a nightclub owner, in the 1927 release *East Side, West Side*, not to be confused with the 1923 movie of the same title, which was based on a different story.

His Pajama Girl (1921) has Secret Service man Harry working on a drug smuggling case involving the kidnapping of the Mexican president. Noah Beery heads a narcotics gang in *The Lying Truth* (1922), and a naval lieutenant saves his fiancée from drug smugglers in *Lieutenant Daring R.N. and the Water Rats* (1924, British). *The Blue Eagle* (1926) had the smugglers using a submarine during World War I. It was inevitable the airplanes would be used to smuggle drugs and to carry lightweight plots. Warner Baxter thwarts a gang that uses planes to smuggle dope and aliens across the border in *The Air Mail* (1925), and the villain in the *The Cloud Riders* (1925) has a whole fleet of planes. In *The Devil's Masterpiece* (1927) it is the Northwest Mounted Police again on the trail of smugglers, and in *Moulders of Men* (1927) it is one Dr. Matthews—"noted physician and prominent member of the Elks." *Yellow Contraband* (1928) is unusual in that it specifically mentions heroin as the drug being smuggled across the Canadian border and then to Chicago. *After Many Years* (1930, British) is likewise offbeat in that the drug smuggler is captured in Peru, as is *China Slaver* (1929) in which both the smugglers and the Secret Service agent are Chinese.

A number of dope-smuggling melodramas took place on ranches, particularly near the Mexican border. *Quicksands* (1923) has the old familiar plot twist of the narcotics officer suspecting that his sweetheart is in league with the smugglers but finding that she too is a secret agent. The action takes place at the Mexican border and the final rescue (no good dope-smuggling drama was complete without it) is effected by the United States Army. The film is of special interest since the production and story were by Howard Hawks and the cast included Helene Chadwick, Richard Dix, Alan Hale, Noah Beery, and William Dyer. *Skedaddle Gold* (1927) also finds the law nabbing the smugglers at the Mexican border, as does *Hands Across the Border* (1926) in which the smuggling occurs on Tyrone Power Sr.'s ranch and the rescue is by the combined Mexican and American cavalry. In *Crashing Courage* (1923) it is the Rangers (Texas Rangers?) who take up the cudgel against dope, and in *The Border Sheriff* (1926) it is Cultus Collins (Jack Hoxie), sheriff of Cayuse County, who comes from a Washington conference on narcotics smuggling to San Francisco's Chinatown to eventually bust yet another gang of dopers. The genre was so popular that even cowboy stars Hoot Gibson (in *The Loaded Door*, 1922) and Tom Mix (in *The Drifter*, 1929) tried it. Tom at least was no stranger to busting dopers. The Bartlesville (Oklahoma) *Enterprise* for April 22, 1912, carried the following item: "State enforcement officer Tom Mix confiscated a quantity of booze and cocaine besides a lot of gambling paraphernalia on the midnight train from the north Monday."

3 Liquid Love and Goodfellowship Pills

Since the belief in aphrodisiacs is nearly universal, it is not surprising to find that most cultures have a well-developed lore on charms, spells, and potions that will bring not merely sexual arousal but true love. These have all found their way into numerous films of which we consider only those that treat love as a specific effect of a drug, a concept which, in the light of their experiences with psychedelics, many people no longer find as hard to accept as they might have a few years ago.

The recent development of the science of microbiology was probably responsible for the ideas behind *Love Germs* (1908) and *The Love Microbe* (1907), two American productions in which scientists discover the germs that cause love (perhaps an early filmic expression of materialism and cynicism). The latter film was advertised as "the tender passion microscopically treated in a Biograph comedy," and the plot described in these terms in the *Biograph Bulletin* for 1907:

> Love—H'm—that omnipotent potentate of this terraqueous globe; that recondite puissance which has bewildered scientists from the rose-scented era of Venus and Adonis to the present day, has at last been elucidated. Our friend, the erudite Professor Cupido, obsessed with the hypothetical assumption that love is due to inoculation by a specific germ, starts out in quest of the primordial atomic affinity bug. In a sequestered spot in the park, far removed from the tramp of travel, he encounters a pair of turtle doves billing and cooing. Stealthily approaching the maiden, he extracts from her neck with his needle-syringe the coveted microbe.

A drugged man kisses everybody in sight in the 1907 British short *An Overdose of Love Potion*, and in the 1910 Pathé film *Love and Goodfellowship Pills* it is a tablet that brings about this result. A love potion is administered in all six silent versions of *A Midsummer Night's Dream* (American, French, Italian, and three German versions). Chemical passion continued to be a popular theme in American films with *The Professor's Love Tonic* (1909), *Love Drops* (1910), *Love's Potion* (1911), *The Love Potion* (1911), *Kissing Pills* (1912), *The Wise Witch of Fairyland* (1912), *Goody Goody Jones* (1912), where the potion makes a husband chase *other* women, *Love Spots* (1914), *Love Charm* (1914), which features a hate potion as well, *Ham and the Experiments* (1915), which has the novelty of an injected potion, and *The Love Dope* (1917). Powders were common in Italian films such as *A Surprising Powder* (1909). British films tended to be variations of the American efforts such as *Modern Love Potion* (1910?), *Wonderful Marrying Mixture*

(1910), in which the fluid causes not only love but marriages, *Liquid Love* (1913), where merely squirting people with the potion inflames their passions, *Oh, My Aunt!* (1914), in which auntie pursues her niece's fiancé, and *One Thing After Another* (1914), wherein we find a French maid injecting a policeman with the liquid. The 1920 Swedish production *The Witch Woman* is of special interest since it was written and produced by Carl Dreyer who would later produce such classic films as *Vampyr* and *The Passion of Joan of Arc*.

Madness Inducers and Mind Control

Although the movies often presented madness as the end result of narcotics use, as in the French film *The Vengeance of Edgar Poe* (1912), some films showed insanity resulting immediately from exposure to drugs. A girl's guardian gives her a drug that reduces her to idiocy in the 1909 French film *In the Grip of the Vampire* and the antidote is even more remarkable—she is restored by watching a movie. People are driven mad with a drug in *The Last Days of Pompeii* (1913?), *The Strange Unknown* (1915), and *The Devil's Profession* (1915), a British crime drama with a doctor being paid to inject rich people with a madness simulant. Drugs could also effect miraculous cures as in *Zandori's Secret* (1914), a French film, and in the American productions *When the Mind Sleeps* (1915), where they cure idiocy, and in *The Germ* (1923) where they provide an antiserum to the germ causing madness. Sometimes people were turned into criminals by drugs as in *The Crimson Stain Mystery* (1916) and *Officer 444* (1926). *The Hypnotic Spray* (1909) similarly made the sprayee do the sprayer's bidding, and in *A Studio Satire* (1916) an actor gives "dream pills" to his director and scenarist in order to induce them to give him a better part.

Gas

Since nitrous oxide has been known for 200 years and was extensively employed for its anesthetic properties by surgeons and dentists, it was inevitable that its comic potential should be exploited in films. During its first year of production (1894) Biograph made *Dentist Scene*, also called *Dr. Colton*, showing Dr. Gardiner Q. Colton, "originator of nitrous oxide gas, anesthetic for the painless extraction of teeth" administering gas.

Another pioneering achievement of Thomas Edison—the first laughing-gas film. Called *Dr. Colton* or *Dentist Scene*, it was produced in 1894.

Dr. Colton was supposedly a practitioner in New York at the time. Several early French films such as *Chicot, Dentiste Américain* (1897) by Mēliès and *Dentiste* (1897) by Lumière may have shown laughing gas use but they have disappeared. In 1907, Edison produced *Laughing Gas* and Hepworth of England made *A Painless Extraction* in which the patient's head swells up with gas and floats away. *Casey's Jumping Toothache* (1909) again had a dentist's gas causing a patient to float around in a dream and a patient under gas dreams of imps pulling his teeth in the British *Have It Out, My Boy, Have It Out* (1911). In 1914, Chaplin wrote and directed *Laffing Gas* in which he plays a bumbling assistant to a dentist—Dr. Pain—whose use of gas on a patient results in problems when he laughs hysterically after waking up. Charlie's solution is to hit the patient on the head with a large mallet. Unfortunately, Chaplin had only been in films about a year, had not yet evolved the tramp character, and like many early films, this one contains mostly gags appealing to sadists. Laurel and Hardy had more success with their short of 1928 *Leave 'Em Laughing*. Though Laurel starts out as the patient, they both get blown away by the gas. The results are hilarious, but the effects are unrealistically long, lasting the remainder of the twenty-minute film. The 1921 film *Bits of Life*—mentioned elsewhere since Lon Chaney, Sr., played an opium-smoking Chinese in one episode—contains one story in which a man having fantastic adventures in the East Indies awakens to find himself in a dentist's chair having a tooth extracted. Sound films on this marvelous anesthetic are described later.

Early Uppers

Until the second decade of the twentieth century psychoactive drugs were controlled loosely, if at all, in most countries. Patent medicines containing large amounts of cocaine, heroin, morphine, barbiturates, opium and cannabis were freely available and a flourishing black market also existed. The United States alone may have had more than 5 percent of the population using these drugs frequently and perhaps a million opiate addicts. Nearly everyone had an Uncle Ben who got noticeably friskier after a snort of Dr. Cole's Catarrh Cure or a grandmother whose spirits improved when she had an ample supply of Hercules General Purpose Tonic. Given the general acquaintance with tonics, mood elevators, and strengtheners and their potential for comedy, it is no surprise to find dozens of shorts from 1907 to 1917 using their psychic effects as themes.

The French entered this field early with fluids that made people brave as in *Elixir of Bravery* (1910) or merely gave them strength as in *The Elixir of Life* (1907) and *A Strong Tonic* (1909). In *The Elixir of Life*, a timid husband buys Professor Rototo's Elixir of Strength, blows down a statue, stops a car with one hand, and subdues his wife and daughter who fetch his slippers and newspaper. Similarly, *Instantaneous Nerve Powder* (1909) made people happy, *The Rapid Powder* (1910) gave them energy, *The Crazy Dope* (1911) increased efficiency, and *The Dancing Powder* (1911) made them dance. French comic Max Linder gave himself a nasal injection of pepper and water to enable him to browbeat his wife and mother-in-law in *La Timidité Vaincue* (1910). Many other films from France and elsewhere, such as *Setting Back the Hands of Time* (1910), *Grandfather's Pills* (1908), both from France, and *Elixir of Youth* (1910) from Britain are excluded from consideration here since they depict such drastic effects (e.g., giving not merely strength but youth) that they belong more properly in a treatment of magic in the cinema.

In contrast to the French, the Italians seem mostly to have been concerned with powders. In *Frolicsome Powders*, produced by Ambrosio in 1908, people buy a drugstore powder that makes them happy, whereas in 1911 it was *Laughing Powder*. It is interesting to find the idea of uppers and downers already well established in the early Italian films *The Two Powders* (1912) and *The Wonder Powders* (1912?), both of which feature a pep powder that makes people rush around, and an antipep powder which slows them down. In *Wonderful Pills* (1909) laziness is dispelled and *Oh, That Tonic* (1910) shows a woman rushing around at super speed.

Americans have always consumed a disproportionate share of the world's uppers and many early American films dwell on the subject. Thus, we have *Acrobatic Pills*, *The Dancing Powder*, and *Energizer*, all from 1908, whereas *Salome Craze* (1909) includes a liquid spray that generates dancing. *The Bully's Doom* (1914) is electric snuff that gives super agility and the Crystal Corporation made lazy people active with *A Sure Cure* (1914). *Speed* (1917) has a scientist inventing a speed powder for typists, but was not patterned on the amphetamines, since these were not used for stimulating humans until the 1930s.

Britain seems to have initiated its prolific crop of uppers films with *Grandfather's Pills* (1908), which was produced by the British branch of Pathé and which survives in the collection of the British Film Institute. Drugs were the medium for putting an overbearing wife in her place in *Mr. Henpeck's Revolt* (1909), where the good man drinks a "vitaliser." Professors were the object of merriment in *The Professor's Great Discovery* (1908), where a patent snuff makes people dance, in *The Professor's Strength Tablets* (1909), where a strong man is turned into pills by a scientist, and in *Professor Piecan's Discovery* (1910) in which cowards become brave via a fluid. Things sped along with *Moveite, A New Hustling Powder* (1910), which gyrated burglars, cops, sailors, and sheep, and with *Dancing Tabloids* (1909) in which the leading lad slips dancing pills to his teacher, a cop, a beggar, and some chickens. One of the series of Algy films, *Algy Tries Physical Culture* (1910), has him gaining great strength with a potion and it is another potion that makes Sam speedy in *Sleepy Sam's Awakening* (1910). A chemist's buck-up formula makes a woman prance about in horselike fashion in *Mother Gets the Wrong Tonic* (1913), and *The Jovial Fluid* (1913) made them laugh like maniacs. *Winkel's Great Discovery* (1913) was unusual in that his powder made people argumentative and violent. Snuff was the origin of odd behavior in *Snuffy Stuff Snuff* (1914) and in *The Electric Snuff* (1913).

Early Downers

Barbiturates came into use in the late nineteenth century but probably because they are syn-

thetic drugs and because their medical use grew slowly, public awareness of barbiturates remained minimal and they seem not to have played an obvious role in many silent films. Preparations of opiates, chloral, and belladonna were, however, widely known and many pictures involved drugging people to dull their wits or to knock them out. Britain made most of these films, beginning with the burglar who drugs a policeman in *The Doctored Beer* (1906). A boy drugs a burglar's beer and exchanges his loot for toys in *Outwitted by a Child* (1910), and *Grandma's Sleeping Draught* (1912) defeats another burglar when a child pours the drug into his wine. A professor drugs his wife's lover and ties him to a time bomb in *Love Versus Science* (1909), and evildoers use drugs to attain their ends in *The Spy* (1909), *Lust for Gold* (1910), and *A Woman's Vanity* (1909). A jewel thief drugs his victims with an Indian flower in *The Female Swindler* (1916), and a detective is drugged with flowers and tied to a sawmill in *The Stolen Heirlooms* (1915). A person is rendered temporarily unconscious by a drug in the 1915 American production *The Sable Lorcha*.

Drugs capable of producing suspended animation have had a persistent fascination for filmmakers beginning with the Italian films *Dopo la Morte* (*After Death*, 1913) and *Randin and Co.* (1913). An oriental poison is the cause of catalepsy in *The House of the Lost Court* (1915) and catalepsy is also part of the plot in *Supreme Temptation* (1916), two American productions. A doctor's injection of a death simulant is the means to expose a murderer in the British film *Who Diggeth a Pit* (1915).

Miscellany

Some films that describe consciousness alterations by drugs do not clearly belong to any of the groups discussed. Méliès produced *Les Chevaliers du Chloroform* (*Chloroform Fiends*) in 1905, but since the film has vanished, it may never be possible to discover whether the film showed drinkers, inhalers, or merely criminals who used chloroform to knock out victims. The same is sadly true for *Il Chloroformio* (1911), an Italian effort some twenty minutes long. Chloroform was sometimes a tool of villains (although British censorship laws specifically prohibited this) as in *For Love of Gold* (1908) or even of the good guys as in *The Christmas Burglars* (1908), in which a man chloroforms a woman and her child in order to leave them presents.

Lethargy-producing gases are featured in *The Comet's Come Back* (1916), where they issue from a comet, and in *The Magic Jazz Bo* (1917). Professor Swank's pill gives a tramp wonderful dreams in Lubin's *The Dream Pill* (1910). An oriental drug makes its users walk in their sleep in Wilkie Collins's novel *The Moonstone*. Two silent versions of this novel were filmed in the United States (1909 and 1915) and one in Britain (1911). Collins, a morphine addict, wrote a number of unusual novels that were made into films including *The Dream Woman*, *The Dead Secret*, and *The Woman in White*, all filmed by 1915. As mentioned elsewhere, drugs were often an adjunct to hypnosis, and *Lightning Bryce* (1919) had an herb yielding such a fluid. Adrenalin made perhaps its first appearance in films in *Legally Dead* (1923) where it is injected into a dead man's heart to revive him.

A man adulterates his tobacco to catch a thief in the 1906 British comedy *The Valet Who Stole the Tobacco*. The tobacco was also spiked in two other British films, being admixed with liver powder to make people spin in *The Professor's Twirly-Whirly Cigarettes* (1909), and causing Mr. Mugwump to act drunkenly after smoking a cigar he won at a fair in *Cigars or Nuts* (1911). *Professor Rouff's Great Discovery* is a new and deadly drug in the 1911 French film and in another French feature, *La Chute de la Maison Usher* (1928), with Abel Gance in the cast, Sir Roderick's wife Madeline collapses from drugs. An early French color film, *The Elixir of Dreams*, has a painting come to life while a cook knocks a chemist's pills into the soup in the British comedy *The Pillmaker's Mistake* (1906). In *The Fatal Hour* (1908), "a stirring incident of the Chinese white slave traffic," a woman drugs one of the slavers to help the police. Pills contain unknown perils in the 1916 Triangle-Keystone film *Pills of Perils* and in the Indian film *The Enchanted Pills* (1913?). An unspecified drug is used in *Narcotico Orientale* (1914) made in Italy and it is the Devil's elixir in *Das Hexenlied* (1919, German) and *Elixiere des Teufels* (1921, Austrian).

Many films show drugs producing magical effects and a few are mentioned to indicate the range of actions ascribed to the drugs. A man is given a huge appetite in the 1909 British film *The Fatal Appetiser*, and in the 1915 American comedy *Jack Spratt and the Scales of Love* the newlyweds buy "Thino" and "Fato" at the drugstore and a few hours later she swells to 290 pounds and he shrinks to 85 pounds. A youth serum turns a man into a monkey in the 1912

Edison production *Dr. Brompton-Watt's Adjuster*, a theme also used in Laurel and Hardy's 1933 feature *Dirty Work*. *The Elixir of Long Life*, a 1912 Italian film merely revivified whereas *The Elixir of Life* (1911, British) gave immortality and *The Elixir of Life* (1916, U.S.) brought a mummy to life and turned sausages into dogs. *Invisibility* (1909) resulted from a powder and *Kleptomania Tablets* (1912) generate thievery in two British films, whereas a *New Pain Killer* makes one immune to pain and damage in the 1909 French film.

The lady wobbles to the table in *Drankersken* (Denmark, 1914), an early antialcohol film.

The Drunkard's Dream

Hallucinations, or delirium tremens, are one of the prominent features of terminal alcoholism, and so the cinematic treatment of alcoholism sometimes provides very graphic insights into popular notions of drug-induced hallucinations. No drug was more familiar than alcohol, and many early films exploited its comic potential or attacked it as the Devil's prime weapon. Pioneer French filmmaker Georges Méliès produced some half dozen films on the subject including *Les Ivrognes* (*The Drunkards*, 1896), *Vision d'Ivrogne* (*A Drunkard's Dream*, 1897) and *Hallucination de l'Alchemiste* (*An Hallucinated Alchemist*, 1897) by Méliès and Reulos. France soon distilled two more films on the subject—*Les Dangers de l'Alcoolisme* (1899) by the Gaumont Company and *Le Rêve d'un Buveur* (*The Drunkard's Dream*, 1898) by Lumière for Pathé, which, in its one and one-half minutes, depicted delirium tremens. *The Bibulous Clothier*, produced by Edison in the same year, showed a customer growing huge and *Histoire d'un Crime*, another French film by Zecca for Pathé, similarly depicted alcoholic hallucinations. R. W. Paul's British film *The Horrors of Drink* (1901) had the poor drunkard seeing a gnome, a snake, and the spirit of temperance, and in *D.T.'s; or, The Effect of Drink* (1905, British), the drinker's coat assumes the shape of a dog and walks away and his bed turns into a monster. A similar fate befalls the toper in *Le Matelas Alcoolique* (1906), a French film with a scenario by Louis Feuillade. In the same year, the Frenchman Emil Cohl, pioneer of animated films, made the first cartoon comedy—*Hasher's Delirium*, its subject being alcoholic hallucinations. Méliès turned out *Le Delirium Tremens; ou, la fin d'un Alcoolique* (*Drink—A Great Temperance Story* in the United States and *A Drink!* in England) and *Pauvre John; ou, les Aventures d'un Buveur de Whiskey* (*Sight Seeing Through Whiskey* in the U.S.) in 1907, the latter still in existence. An American film of the same year (*Drink*) has the drunkard dreaming that he is being chased by an auto whose driver turns into a bear and drives him to his den. In the next year, Vitagraph had the drunkard in *He Went to See the Devil Play* (1908) seeing everyone as the Devil after seeing that worthy gentleperson in a stage performance. This is possibly the same film as that of D. W. Griffith mentioned in the following paragraph. Méliès filmed *Hallucinations Pharmaceutiques; ou, le Truc du Potard* (Sadoul gives *la Fête du Potard*) in 1908 and Pathé did *A Drunkard's Dream* in the same year. The latter film was a bit unusual in that the dream was of beautiful fairies rather than monsters and was in color. The Finnish film shown in France as *Fabricants Clandestins d'Alcool* (literally, *Clandestine Manufacturers of Alcohol*, 1908) was the second film to deal with illicit drug manufacture, the first being American Mutoscope and Biograph's *The Moonshiners* (1904), "a stirring story of primitive life in the Kentucky Mountains." In *The Moonshiners*, which has survived in the Library of Congress paper print collection, a revenue spy leads federal agents to "a typical mountain dew distillery in full operation" where they kill the leader of the moonshiners with Winchester rifles.

An alcoholic dreams of heaven in the 1909 color French film *Pompey's Dream* and even D. W. Griffith entered the prohibitionist sweepstakes with *The Drunkard's Reformation; or, Saved by a Play* (1909), where we find a drunk being reformed by a temperance play. That same year Am-

brosio of Italy gave us the five-minute film *I Drammi dell'Alcolismo*. Delirium tremens is again the subject in the 1910 British effort *He's Got 'Em* of which the early film periodical *Bioscope* said:

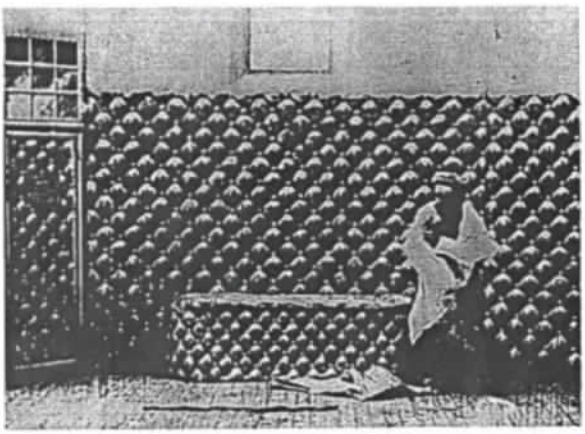
> This picture permits us to see things through the confused vision of an individual who has imbibed somewhat too freely, and the strange and fantastic shapes which are conjured up from the effects of a distorted vision are remarkable in the extreme. The kaleidoscopic changes of mosaic-like segments, as they merge from one unexpected shape to another, provide a series of views something out of the common and as a trick picture, embodying such mysterious powers of creation from the inanimate, possess a fund of entertainment.

Ferdinand Zecca made *Les Victimes de l'Alcoolisme* for Pathé in 1911 (1902 is sometimes given) and the French company Eclair provided *Le Poison de l'Humanité* (*Alcohol, the Poison of Humanity* in the U.S.) in 1912. The latter film unveils what were then considered to be the dire hereditary consequences of alcoholism. Gerard Bourgeois directed *Les Victimes de l'Alcool* for Pathé in 1912 but this may be the same film as Zecca's. The French Rigadin series contained *Conférence sur l'Alcoolisme* (1912) and the comic series starring Zigoto produced *Zigoto et le Narcotique* in 1912.

It is unclear which of these films corresponds to the French film shown in the United States as *The Evils of Alcohol* (1912). This film, sold by some companies with the original titling missing, is done with cutout animation. The titles tell us that "alcohol has extraordinary effects—at first one is gay . . . he lives 'La Vie en Rose'." Street lamps dance, but then we see men being poured out of a bottle into an insane asylum, a man in a straitjacket, a skull and crossbones, and the signs "Delirium Tremens" and "Mort". The short film ends with the admonition, "True athletes drink only water."

Absinthe, an alcoholic drink containing an extract of a species of *Artemisia* (wormwood) had been in use for some time, but its destructive qualities were only appreciated after many years of abuse began to destroy the liver. Luigi Maggi of Italy produced *Satan* (1912) showing the archfiend inventing absinthe in the Middle Ages and Herbert Brenon starred King Baggot in the

Hasher's Delirium **(1906) by Emil Cohl is probably the earliest animated drug film. In this sequence the sleeping drunkard is seeing bug-eyed monsters.**



Life in a padded cell is the fate of *Les Victimes de l'Alcoolisme*, a 1911 French film. People had neither tranquilizers nor meditation to counter the effects of industrial civilization, and delirium tremens was commonplace.

Zigoto et le Narcotique **(1912) was a comic treatment of intoxication, but most films of the time regarded alcohol as a tool of the Devil.**

Satan invents absinthe in the Middle Ages in the Italian film *Satan* (1912). At the time this alcoholic drink contained a highly toxic substance.

American film *Absinthe* the following year. Plain old alcohol made a drunken composer see his furniture dance in *Popsy Wopsy* (1913), an early effort of British director Maurice Elvey, and the hapless drunkard is again beset by animated objects in *A Merry Night* (1914, British). Denmark attacked alcoholism in *Drankersken* (1914) and Universal Studios did likewise—with Chapter 1, "Liquor and the Law" and Chapter 15, "The Patent Medicine Danger"—of *The Graft* (1915). Another American propaganda tool was *Prohibition* (1915), which took an hour to tell the familiar story and not only beset its drinkers with the "Demon of Rum" and Mephistopheles but even had "The Drink Octopus" sapping the blood of groveling victims in one scene. In *Distilled Spirits* (1915), on the other hand, the inebriate had to suffer visions of the Devil, giants, and other strange creatures for only twelve minutes. The drunkard is tormented by demons in Hades in *The Warning* (1915), based on the temperance play, though the film was actually shot in Mammoth Cave, Kentucky. Oliver Hardy starred in *The Battle Royal* (1917). This film has two families who manufacture illegal liquor preparing to battle when the police come, and they use their weapons to drive the police away. *Wild Women* (1918), a Western produced by Harry Carey and directed by John Ford, drew the comment "no rarebit fiend dream was ever half so vivid as the visions that follow the imbibing of too many Honolulu cocktails." *Alkohol* (1919), a realist film by the German Ewald-André Dupont and *The Curse of Drink* (1922) produced in the United States were some of the last silent films to be concerned almost exclusively with the evils of drink. Starevich's famous puppet animation film *Puppet Love* (1934) is also about the evils of intoxication. Though a sound track was later added, the style and content of this film consign it to the silent era.

Pipe Dreams

Until the 1920s the only knowledge that most Westerners had of the use of the products of *Cannabis sativa* for intoxication was the use of hashish by denizens of the East, and its effects were commonly confused with those of opium. Thus, Zecca's *Un Horrible Cauchemar* (1901), a variant on the opium smoking films, showed the typical opium dream resulting from the smoking of a nargileh (water pipe). *A Smokey Story* (1912) is a British comedy with a hookah smoker dreaming he is in a harem, and many other films, from *The Poetic Justice of Omar Khan* (1915) to Valentino's *Son of the Sheik* (1926), contained scenes of hookah smokers.

As the use of marijuana diffused from Mexico into the American Southwest, it began appearing in the plots of some films made or set in the West.

Notch Number One (1924) had cowboys getting violent or committing murder after smoking marijuana (also called locoweed in confusion with jimsonweed).

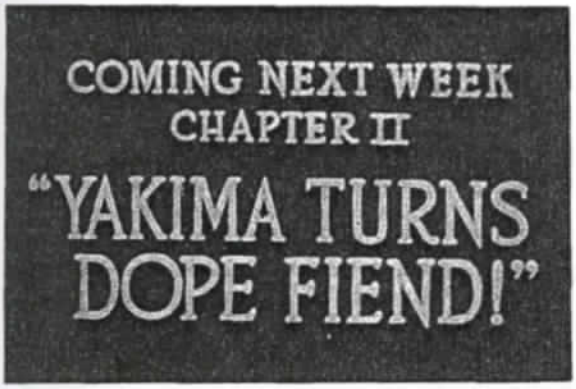
High on the Range (1929) is probably the most interesting of the silent films devoted to marijuana. Yakima Canutt, famous stuntman who had a hand in hundreds of films from *Stagecoach* to *Ben Hur*, had a leading role in this film. Merrill McCormack plays Chick—"a desert weakling"—who smokes dope constantly and is naturally the villain of the piece. In Chapter 1, "The Weed of Death," Chick gives some of his joints to Dave—beloved of the owner's daughter—and when Tom, the foreman, sees them he says, "They're marijuana weed, a devilish narcotic; and if you smoke them, you go bughouse, loco, and want to raise h——— in general." But Dave is "a young scamp" and replies, "I'd like to try one just to see what effect it would have on me," and insists "Why, I'd never let Beatrice know." Chick is fired for kicking horses and when he grabs a stick and walks up to the owner blowing a joint, the old man knocks Chick flat and says "There's too much marijuana smoking on this ranch and I'm going to stop it." Dave returns from a hard day's work and decides to relax by trying one of these "new kind of cigarettes." Dave smokes his way through three joints and is thoroughly stoned when the owner arrives and gives him a hard time. Chick shoots the old man through the window, and then Tom arrives. Tom decides to take the blame so he puts Dave in bed, after knocking him out, and comments, "You'll be sick in the morning, but thank God there'll be but little that you remember."

Horsebeater Chick blows a joint while demanding back pay from the owner.

A heavy moment as the camera pauses on Dave's stash.

"They're marijuana weed, a devilish narcotic; and if you smoke them you go bughouse." Wise old foreman Tom can tell by sniffing. This and the following four stills are from *High on the Range* (1929).

Young scamp Dave getting down with "locoweed"—probably the first time in films that marijuana smoking was shown.



Good Heavens!—Even the world's greatest cowboy gets hooked!

***Her First Cigarette* (1903) shows two shameless hussies lighting up. Unfortunately, she gets ill instead of seeing visions.**

A cigarette makes the lady hallucinate in one of Edison's earliest trick films, *A Pipe Dream* (1905).

Yakima and pal find Tom with the body but leave quickly when Tom pulls his gun and says, "Now beat it. I've been smoking Marijuana an' I'm out for game!" Tom leaves and the boys make plans to chase him with a rope. Thus ends Chapter 1 and as far as is known, the rest of the film no longer exists. All that is known of the rest of the film is that Chapter 2 is titled "Yakima Turns Dope Fiend." The confusion of marijuana with locoweed is extremely obvious in this film, and Dave is portrayed as being so stoned he has no idea of what is happening.

Numerous other Westerns may have dealt with marijuana, but unlike the previous two, they have vanished and the drugs with which they were concerned are problematic. Among these are *His Pajama Girl* (1921), *The Loaded Door* (1922), *Crashing Courage* (1923), *The Cloud Rider* (1925), *The Air Mail* (1925), *The Border Sheriff* (1926), *Hands Across the Border* (1926), *Skedaddle Gold* (1927), and *The Drifter* (1929).

The interpretation of drug effects in early pictures is complicated further by the fact that tobacco itself was sometimes the source of dreams and visions. *A Pipe Dream* (1905) was described in the *Biograph Bulletin* as:

> A novel picture showing a young woman smoking a cigarette and dreamily blowing the smoke over the palm of her hand. As she watches the smoke the figure of a young man appears kneeling on her hand and addressing her in passionate terms. The image seems to amuse her greatly, and she tries to catch it. It vanishes, just as her hand goes to seize it.

In *Princess Nicotine; or, the Smoke Fairy* (1909) the smoker again sees a little fairy appear. As was customary, Lubin stole the idea (and often the film itself) and offered *Pipe Dreams* in 1907. Selig copies the idea in turn with *A Turkish Cigarette* (1911) and Essanay did likewise with *The Pipe Dream* (1915).

Among Thomas Edison's many pioneering achievements was the first drug film to use puppet animation. *Morpheus Mike* was done by Willis O'Brien—later to gain fame for his animation of *King Kong* (1933). Completed in 1916, this short was similar to several others done by O'Brien, which featured animation of prehistoric creatures. Hobo Mike smokes a pipe in the film and is transported to prehistoric times.

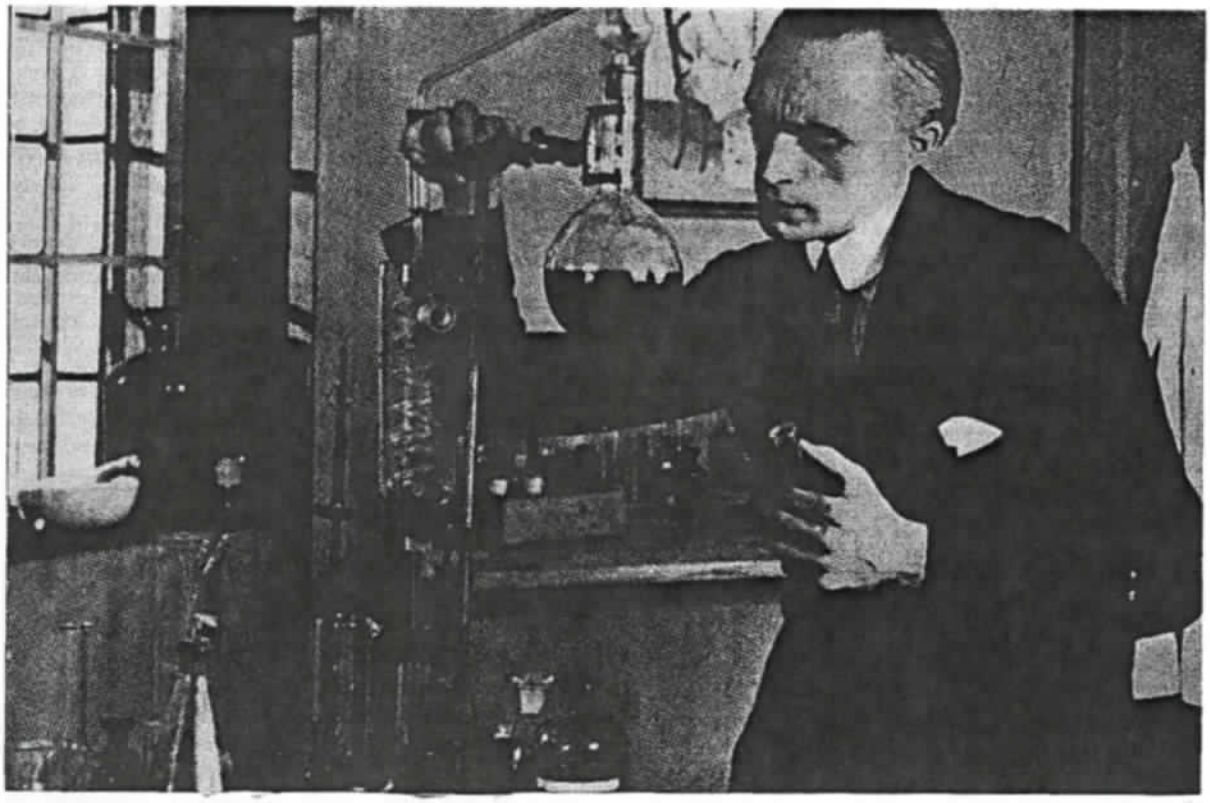
Another early animated film about tobacco smoking is Wallace Carlson's *Dreamy Dud* (1915) released by Essanay. Young Dud steals a pipe and before lighting up says, "Here's where I make Pittsburgh look like a million dollars worth of sunshine!" But after a few puffs, a weird creature appears, say, "I'm the spirit of smoke an' I'll fix you," and carries poor Dud up to hang him on the moon. The shameless woman who lights up *Her First Cigarette* (1903) gets sick rather than seeing visions.

4 Cocaine Fiends

Dr. Jekyll and Mr. Hyde

There is significant medical and literary evidence that Robert Louis Stevenson wrote *Dr. Jekyll and Mr. Hyde* under the influence of cocaine. In 1885, it was common to take cocaine orally in liquid preparations and the exhilaration and mania that cocaine can produce are certainly consistent with the effects of Jekyll's preparation. Rapid personality alteration via drugs has fascinated filmmakers and the general public and few stories (Stoker's *Dracula*, Shelley's *Frankenstein*, Hugo's *Les Misérables* and Merimée's *Carmen* are exceptions) have been cinematically treated with the frequency of *Dr. Jekyll and Mr. Hyde*. Although reference is sometimes made to an 1897 version, the earliest for which there is certain evidence are two American versions of 1908. One of these was simply a fifteen-minute photographed record of the play made by the Selig Company in Chicago and the other was directed by Sidney Olcott for the Kalem Company. *The Duality of Man* (1910, U.S.), *Den Skaebnesvangre Opfindelse* (1910, Denmark), which explained it as a delusion of a feverish mind, and *Les Trois Flacons de Gribouille* (1910, French), a rather watered-down version, were all based on Stevenson's story, though *Robert Hyde's Double Life* (1910, U.S.) and *A Modern Jekyll and Hyde* (1913, U.S.) seem not to have the essential drug-induced personality change. An American version of 1912 starred James Cruze and King Baggot played the role in the 1913 film. Kineto-Kinemacolor produced a two-color version in Britain in 1913, the same year that Max Mack of Germany starred Albert Besserman in *Der Andere*. The transition in *Der Andere* results from a periodic loss of consciousness after a fall from a horse and the Jekyll type is victorious at the end. The 1914 Warner's comedy *Dr. Jekyll and Mr. Hyde Done to a Frazzle* was the first comic treatment, followed by *Miss Jekill and Madam Hyde* in 1915. The latter is apparently the same film as *Dr. Jekyll and Madam Hyde* (1917), and seems not to be a legitimate treatment of the theme. American production continued with *Dr. Jekyll and Mr. Hyde* (1914), *Horrible Hyde* (1915), *Luke's Double* (1916)—this version with a man tormented by a double after falling asleep while reading the story—*Dr. Jekyll and Mr. Hyde* (1917), and possibly *Dr. Jekyll* (1917), though it is unclear whether this last was actually made. The year 1920 was a banner one, with five Jekyll and Hyde films appearing. The most famous and possibly the best of the silent versions featured Nita Naldi, Louis Wolheim, and a bravura performance with almost no makeup by John Barrymore. The transformation is at first effected with a drug—against a background of a giant ghostly spider—but later he transforms without it and only death reverts him to Jekyll. Barrymore's Hyde was superb, a sneering, leering, deformed old man whose sallies into Soho take him into an opium den in one scene.

Louis B. Mayer hurried to produce an inferior version starring Sheldon Lewis with the classic



Conrad Veidt as a Jekyll type in *Der Januskopf* (1920). More bad press for psychoactive drugs—he was shown murdering a little girl and dragging his wife to a brothel.

cop-out of many second-rate fantasy films—the whole thing turns out to be Dr. Jekyll's nightmare. Arrow Film Corporation made a version with Hank Mann, and the Aywon Company produced *When Quackel Did Hyde*. The eminent German director F. W. Murnau made the last of the 1920 versions *Der Januskopf* (*The Head of Janus*). This film has unfortunately perished, but some stills and the script remain. Conrad Veidt had the role of Dr. Warren, obsessed with the bust of the two-faced Roman deity (one a hideous, leering satyr) and Mr. O'Connor, a lustful, murderous maniac who kills a little girl and drags his wife to a brothel, terminating his mania with poison. Hans Janowitz, who had worked on the script of *The Cabinet of Dr. Caligari* the preceding year, apparently changed the Stevenson story to avoid payment of royalties. Bela Lugosi had a minor role in this film, having left Hungary for political reasons. Murnau's next film *Schloss Vogelod* (*Vogelod Castle*, 1921) also contained Jekyll and Hyde elements. Conrad Veidt again appeared in *Dr. Jekyll and Mr. Hyde* in one sketch of an episodic German film directed by Richard Oswald in 1923. Having exhausted its dramatic potential, the story was the subject of an American comic treatment in 1925—*Dr. Pyckle and Mr. Pride*, a twenty-minute film of no special interest other than its star, Stan Laurel, and some of the sets from *The Hunchback of Notre Dame*.

The many sound films on this theme are discussed later.

The popularity of Stevenson's novel was not the only stimulus for the appearance of numerous films on the theme of dual personality. Oscar Wilde's *The Picture of Dorian Gray* was a minor source and the development of psychoanalysis was a major source of inspiration. Among the early silents that dealt with dual personality as a psychological phenomenon not related to drugs are *The Two Natures Within Him* (1915), in which a dual personality resulting from a blow on the head is cured by an operation, *The Two-Soul Woman* (1918) and *The Untameable* (1923), in both of which a woman's dual personality is caused by hypnotism (shades of Bridey Murphy!), and *The Whispering Chorus* (1918), produced by C. B. DeMille, in which personifications of the good

and evil aspects of his mind whisper to Noah Beery.

Quick Watson, the Needle!

As a practicing physician in the 1880s, Arthur Conan Doyle had ample opportunity to learn about the stimulant and euphoric properties of cocaine, which by 1885 was being touted as a panacea. It is not too surprising then to find the hero of his early novels, Sherlock Holmes, using cocaine in *A Scandal in Bohemia*, written in 1886, and again in the *The Sign of the Four*, written in 1888. The great success of these novels led to their being treated in films as early as 1903. Dozens of Holmes films were made during the silent era, some of which depicted his drug use. William Gillette injected cocaine in one scene of the stage play *Sherlock Holmes* and consequently the eighty-minute film of the play made by Essanay in 1916 probably contains this scene. *A Scandal in Bohemia* was filmed in 1921 by Stoll with Maurice Elvey directing and Ellie Norwood playing the lead. The same personnel made *The Sign of the Four* in 1923.

Comic treatments of the Sherlock Holmes theme began appearing such as Edison's *Squeedunk Sherlock Holmes* (1909), and even Pearl White of *The Perils of Pauline* starred in one—*Homlock Shermes* (1913). Cecil Mannering played Holmes in *The Affected Detective* (1922),

Ellie Norwood (right) as cocaine-injecting master sleuth Sherlock Holmes in *A Scandal in Bohemia* (1921). Censorship was strong in Britain at this time and the needle may have been omitted from this version.

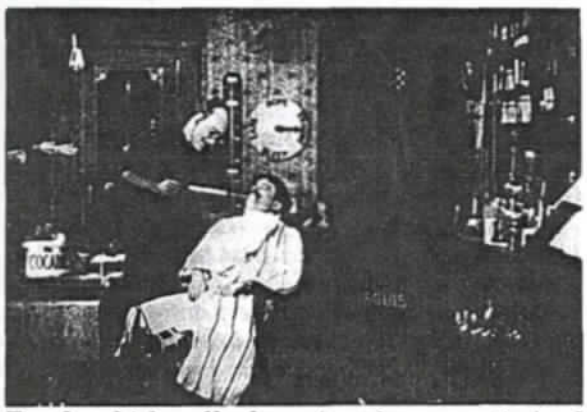
A tense moment from the 1921 British Sherlock Holmes story *The Devil's Foot*. The devil's foot is an African root which, when burned, gives off vapors which produce madness and death.

a British production in which he takes cocaine and dreams he is in the Orient. Filmmakers had the same difficulty that novelists such as Doyle, Rohmer, and Hammett had in distinguishing the effects of cocaine and opiates. By far the best of these comic treatments, and one of the few to survive, is *The Mystery of the Leaping Fish* (1916), starring Douglas Fairbanks, Sr., as detective 'Coke Ennyday'! The cast included Bessie Love as "Inane, the little fish blower of Short Beach," and Alma Reubens, later to become one of Hollywood's more notorious addicts, as an opium smuggler's mistress. At one point the smuggler says to Alma, "Woman, we've got to make a quick getaway," a scene full of irony and pathos in view

Tod Browning, who wrote the story for *The Mystery of the Leaping Fish*, later attained fame as the director of many of Lon Chaney, Sr.'s silent classics as well as *Freaks* and *Dracula*.

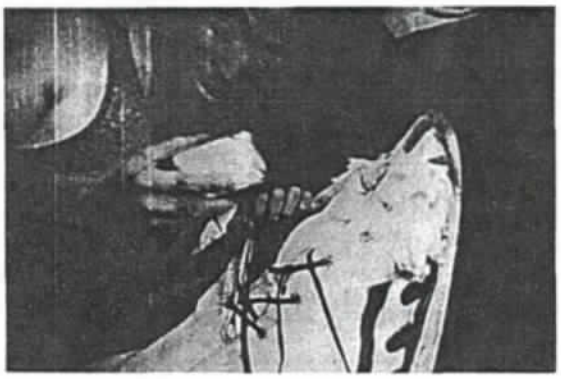
Coke Enneyday (Douglas Fairbanks, Sr.) in good spirits after a hit from his ammunition belt. This and the following six photos are from *The Mystery of the Leaping Fish* (1916).

"Quietly, Coke Enneyday stole out on the trail."



Time for a drink— of laudanum (an opium preparation) and prussic acid.

Inscrutable Chinese removes smuggled opium from a leaping fish.



Coke stimulates his mental processes with a little snort.

Coke tests out the opium, and tests and tests.

He vanquishes enemies with a quick jab.

of the fact that she was to play this role in real life a few years later.

The story was written by Tod Browning, who became famous in ensuing years as the director of bizarre films, including many of Lon Chaney, Sr.'s films as well as *Freaks* and *Dracula*, and the film was supervised by D. W. Griffith. "Coke" sits in his bank vault office scooping handfuls from a can on his desk labeled "Cocaine," blowing it all over the room and jabbing himself with a needle from time to time. Coke keeps a battery of needles in a special belt. He determines his activity by spinning a pointer on a card with the four positions "dope," "eats," "sleep," and "drink." When it comes up drink, his assistant prepares a solution containing laudanum (an opium extract) and prussic acid and injects it into his mouth with a huge syringe.

Coke is overflowing with energy and never stops laughing and dancing around. A caption informs us that "even the Secret Service was often forced to appeal to Coke Ennyday," and a policeman delivers a telegram asking his help in catching a wealthy gentleman of Short Beach with no visible means of support. Coke and his buddy in checkerboard costumes and car follow the man to the beach where he finds Bessie, with a sign on her back saying "Fish Blower," and accidentally knocks her into the sea. After Coke gets stuck, Bessie rescues him and revives him by injecting cocaine into his nose.

Renting one of the large rubber fish, he swims out to find the villains retrieving floating packages of drugs from the water. His pursuit proceeding too slowly, he pulls out a syringe, jabs his fish, and goes zooming across the waves. Coke sneaks into a bathhouse, sniffs, tastes, and then gobbles the opium. He begins hopping around—a flashcard says "Full of Hop"—which he continues to do for the rest of the film. Chinese load the dope into the Sum Hop Laundry truck, along with the girl, and Coke and buddy, who is blowing a trumpet, drive after them to a Chinese laundry. Coke rushes into battle, knocking them out with cocaine injections when he can. After flooring the leader, the rest of the gang rushes him, but he flattens them all by blowing cocaine at them. In the final scene the editor tells him, "No Douglas, you had better give up scenario writing and stick to acting."

The film very carefully demarcates all the dope dealers as foreigners, and is heavily laden with other instances of racial prejudice—one title has Doug referring to a Chinese as "a Jap" and one of his tasks is to rescue Bessie from miscegenation as she is being forced to marry Fishy Joe, a Chinese.

Many other lost or rarely seen films based on Doyle's stories may also show the master detective's dalliance with drugs. American releases included *Sherlock Holmes Baffled* (1903). *The Adventures of Sherlock Holmes* (1905), *Miss Sherlock Homes* (1908), *Sherlock Holmes in the Great Murder Mystery* (1908), *Trailing the Counterfeiter* (1911), *The Sherlock Holmes Girl* (1913), *Sherlock Holmes Solves the Sign of the Four* (1913), and *Sherlock Holmes* (1922) with John Barrymore. French efforts included *Sherlock Holmes par Rigadin* (1911), *Gontran Émule de Sherlock Holmes* (1912), and a series of Franco-British films *The Speckled Band*, *Silver Blaze*, *The Beryl Coronet*, *The Musgrave Ritual*, *The Reigate Squires*, *The Stolen Papers*, *The Mystery of Boscombe Vale*, *The Copper Beeches* (all 1912), *A Study in Scarlet* (1914), and *Hound of the Baskervilles* (1914).

Other than the aforementioned Franco-British collaborations, the first British Holmes film was *The Isolated House* (1915), followed by *Valley of Fear* (1916). In 1921, 1922, and 1923, Britain churned out forty-seven Holmes films, all of about a half-hour's duration and starring Ellie Norwood as Holmes and Hubert Willis as Watson. Denmark filmed some dozen Holmes stories between 1908 and 1910, most of which were directed by and starred famous Danish director Holger-Madsen. Among these were *Sherlock Holmes* (1909), *Sherlock Holmes in the Gas Chamber* (1908), *The Murder in Baker Street* (1910), *The Grey Dame* (1909). Italy generated four early Holmes parodies—*Il Piccolo Sherlock Holmes* (1909), *Rival Sherlock Holmes* (1908), *Piu' Forte di Sherlock Homes* (1913), and *Fricot Emulo di Sherlock* (1913). Germany filmed *Der*

An early Danish Sherlock Holmes picture which probably depicted his affinity for white powders, *Sherlock Holmes i Livsfare* (1908, *above*) and *Den Skaebnesvangre Opfindelse* (1909), a Danish Jekyll and Hyde film.

D. W. Griffith's *For His Son* (1912). The secretary pushes the boy out of the way to get Dopokoke—"for that tired feeling."

"The drink no longer satisfies," so Sonny helps the lady out with a little pinch from dad's cocaine stash: *For His Son* (1912).

Hund von Baskervilles in 1914, 1917, and 1929 and also released two Holmes films in 1910 based on apocryphal stories. The sound films based on Doyle's stories are discussed later.

An early treatment of cocaine was *For His Son* (1912) directed by D. W. Griffith. A father, who needs money for his son's wedding, develops a new soft drink with cocaine in it and is soon doing a landslide business selling "Dopokoke" for that tired feeling. But soon, a title informs us, "The drink no longer satisfies," and the son and secretary start taking an extra pinch from the cocaine bottle. The son is soon shooting up and when his fiancée refuses to "turn on," he and the secretary run off with the cocaine stash. After several months they are old and haggard and the son dies. The last title of the film repeats the first one for those who have not grasped the message—"The awful result of criminal selfishness." Griffith's biographies seem not to mention drugs and it is a moot point whether he made this film because he viewed drugs as a menance or whether he was merely responding to pressure from outside (as mentioned previously, the Harrison Narcotics Act was passed in 1914). Griffith was later advisor to the producers of the cocaine comedy *The Mystery of the Leaping Fish* (1916), and in 1921 he made *Dream Street*, based on Thomas Burke's stories of opium-smoking Chinese and other seamy aspects of London lowlife.

The last serious treatment of cocaine to appear in America seems to be *Sisters of Eve* (1928), in which Betty Blyth "cokes up" her husband (Charles King) to get money out of him. The prison scene in Chaplin's *Modern Times* (1936) is often mentioned in reference to cocaine. A convict puts his "nose powder" in a saltshaker and

Charlie sprinkles it on his food, sniffing up some excess that gets on his mustache and becoming a ferocious fighter soon after. This powder could possibly have been intended to be heroin.

Britain also produced a serious crime drama involving this drug in *Cocaine* (1922), which was retitled *While London Sleeps* after encountering trouble with the British Board of Film Censors. This is not to be confused with other films of the same title, such as the 1926 American production in which Rin Tin Tin kills an ape man, or the 1934 British film in which an insane radio magnate dynamites trains. The story centers around a drug king who murders a man who gave cocaine to the king's teenage daughter.

Although cocaine would continue to be the occasional subject of comedy abroad as in *Cocktails* (1928), a British film in which an heiress's crooked guardian plants cocaine on her lover, and in *El Cocaine* (1930) made by and starring Egyptian film pioneer Togo Mizrahi, the censors in the United States saw to it that its few subsequent appearances were serious business. Cocaine garnered a lot of bad publicity and Hollywood, fearful of government regulation, instituted its own censorship. Consequently, in the next two cocaine movies made in Hollywood the titles tell the whole story—*The Pace That Kills* (1928) and *Cocaine Fiends* (1939).

The Pace That Kills

It is 1928 and the country is roaring with booze, sex, and drugs with a frenzy that will not be reached again until the 1960s. Conservative elements in the country have been outraged by the licentiousness both on and off the screen but they have learned the value of film as a propaganda tool. Cinematic antidrug propaganda was not new. Dozens of early films attacked drugs as tools of the Devil. The Gaumont company of France produced *Les Dangers de l'Alcoolisme* in 1899, and in 1914 three antinarcotics films—*Dr. Killem's Dope*, *The Drug Terror*, and *The Narcotic Spectre* were produced in the United States. Some of the leading lights of the silent cinema joined the crusade. Norma Talmadge starred in *The Devil's Needle* (1916) and director D. W. Griffith entered the prohibitionist sweepstakes with *The Drunkard's Reformation; or, Saved by a Play* (1909) and a few years later produced the anticocaine melodrama *For His Son* (1912).

It was, however, a rather obscure assortment who turned out *The Pace That Kills* in 1928. Norton Parker and Willis O'Connor directed and except perhaps for Thelma Daniels, who plays the sweetheart, virtually all the cast are unknown even to most silent-film buffs. Produced by Truelife Photoplays, the film begins with this timeless quote:

> Since the dawn of creation race after race has emerged from the dim shadows, flourished, then faded away into the mists of obscurity. History teaches that each nation, each race perished miserably when they ignored their problems and failed in their struggles against debauchery and sin. Today we—the highest civilization the world has ever known—are faced with the most tragic problem that has ever confronted mankind—a menace so threatening so all embracing that if we fail to conquer it our race, our people, our civilization must perish from the face of the earth! What is this octopus—this hideous monster that clutches at every heart. Creeping slowly, silently, inexorably into every nook and corner of the world?—It is the demon DOPE! In its slimy trail follow misery, degradation, death; and from its clutching tentacles no community, no class no people are immune regardless of birth, training, or environment—

The film then begins with a scene of Country Boy Eddie (hereafter referred to as CB) pitching hay. He embraces his sweetheart (Thelma Daniels) and asks, "We'll always be sweethearts, won't we, Mary Jane?" But the idyll ends soon as CB leaves for the big city to get a job and to search for his sister Grace. As he departs, his mother with tears in her eyes asks, "I wonder what will happen to my boy—So many good clean boys leave home and never return." Working in a department store, CB soon discovers girdles, women ("Call me Fanny, Country Boy"), and headache powder. ("Here's something 'll fix that headache, Country Boy.") Fanny and CB put some white powder on their hands, face away from the camera, and snort it. The next evening they are off to a nightclub. Prohibition is in force but, "don't worry, little Fanny knows her way about," says she, slipping a flask out of her purse. Also at the club are the king of the underworld and his woman, whom CB recognizes as his sister Grace. Grace insists that he's mistaken and gives him the brush.

Back at work the next day CB asks, "Say Fanny—have you got another headache powder?" Another quick snort and CB is all smiles. "That's certainly great stuff! I feel better already!" Into the store with his little packets of powder slinks

Snowy, the peddler—archfiend of society! Time for a little moralizing.

> You will find him next door, in your community, in your offices. . . . One of the most dangerous features of the dope evil is that each addict has the burning desire to induce all of his—or her—associates to try it just once. And experience teaches us that after two or three trials the initiate becomes an addict."

Fanny promises, "I'll take you to a party soon and treat you to a real sleigh ride." Before you can say "dope fiend," they are at the party. Several of the people are showing signs of withdrawal and CB remarks, "Your friend isn't getting much kick out of the party, is she?" But Fanny assures him, "Oh, she'll get a kick out of it soon." and in walks Snowy with his sinister smile, long sideburns, and bottle of cocaine.

> A bunch of "SnowBirds" with their "happy dust" or "joy powder"—but it's slimy. Peddlers call it "Kid Catcher" because it is the first drug that starts boys and girls on the downward path: on The Pace That Kills.

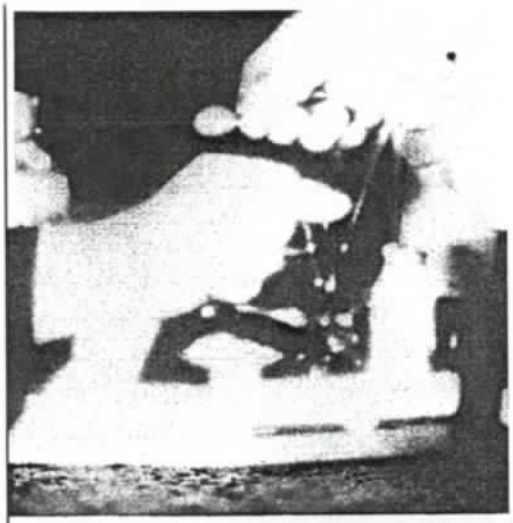
Shaky hands pour out little mounds of powder and soon the joint is jumping. The scene gets hazy as they start dancing, kissing, and smoking six-inch long cigarettes. Then lights out on the ultimate degradation—illicit sex. In the next scene, CB and Fanny are both fired for petty theft. "Soon, all sense of honor and decency lost, the addicts will do anything to get the money for their dope!" Next CB is kicked out of his apartment by his landlady. "Down, broke, discouraged—just a bit of human wreckage in the city streets." In a flash CB is on the needle. "I'm a wreck—I haven't had a shot since yesterday." But Fanny has a little stash so he quickly cooks up a shot of morphine.

> When "Snow" no longer satisfies then MORPHINE—the needle that momentarily soothes and deadens while destroying all ambition, all hope, all conscience. Then the "black smoke"—THE DEADLY OPIUM PIPE that dulls the sharp ache of living for a time—rots the moral fiber and paves the way for HEROIN—the drug that both soothes and stimulates while destroying the soul. Then the downward trail! Down to misery and shame, to degradation and despair. DOWN, DOWN, DOWN!!

Country Boy down on the farm. "We'll always be sweethearts, won't we Mary Jane!" This and the following six stills are from the 1928 drug melodrama *The Pace That Kills*.

"Call me Fanny. Here's something'll fix that headache, Country Boy."

Sure enough, soon CB is writhing in agony, "Sell something, trade something, do something only get me some dope." But Fanny has nothing left to sell but her charms, so, surrendering to the inevitable, she becomes a prostitute.



"I'll take you to a party soon and treat you to a real sleigh ride." Shaky hands reach for snow.

"God—a baby born to a dope fiend and a...!"

Snowy the peddler—archfiend of society—offers Eddie a snort of "kidcatcher."

Heavy with child and eyeshadow, Fanny heads for the river.

"Oh Eddie, has it got you too?" Country Boy meets sister Grace in an opium den.

> Days, weeks, months—time is forgotten—hope long since abandoned. Nothing remains except the overwhelming need, the incessant craving, the driving urge for dope and still more dope! THE FEARFUL PRICE THEY PAY—THE LIVING DEAD! Hopeless addicts, chained, helpless, tormented! Willing to pay any price—do anything just so they get their dope.

In the next scene CB is lying in an opium den in a stupor when a hollow-eyed blonde enters demanding, "No, No not the pipe—heroin!" You guessed it—sister Grace—"Oh, Eddie has it got you too?" It turns out that Diamond Lil (Grace's underworld name) is on the lam, having murdered Handsome Nick, king of the tenderloin when he discarded her. The police raid the den and catch Grace but Eddie escapes because of the den's warning system—a cute little Buddha whose eyes light up when intruders enter. Another heavy shock awaits CB at home. "Eddie, we've gotta get off the dope—we've got to go straight because. . ." "God—a baby born to a dope fiend and a . . ." "Don't say it Eddie—Don't say it." But Eddie decides on one last shot—"the only way to quiet his tortured nerves," and while he's lying in a stupor on the bed Fannie leaves him a note telling him to go back to his golden-haired sweetheart, and then drowns herself in the river.

Snowy drops by to tell Eddie of Fanny's demise and leaves a packet of dope, but Eddie can't shake horrifying visions of Fanny drowning, writhing addicts, and the like. So he rushes down to the pier where he sees her smiling face in the water and jumps in.

> How many mothers, how many sweethearts are waiting—always waiting for the boys who will never come home? What can you do about it? Write to your Senator and lend your support to the Porter Bill for the segregation and hospitalization of narcotic addicts—the greatest constructive measure ever offered for the abatement of the narcotic evil!

Originally Eddie had been cured after suffering months of agony in a hospital, but evidently a more horrific ending was later added. It is interesting that the film does not mention marijuana, which was not to receive its share of propaganda until the next decade, when, thanks to the single-mindedness of Harry J. Anslinger and a lot of yellow journalism, it was to take over as the country's number one narcotics problem. Except for the anomalous 1939 feature *Cocaine Fiends* and the 1932 Austrian film *Der Weisse Daemon*, cocaine would not again receive much attention from the cinema or the general public until the 1960s.

5 Stars: Shooting and Falling

In 1922 *Vanity Fair* printed the following piece under the title "Happy Days in Hollywood":

> With the brightening influence of spring there has been a distinct quickening of the social pace. Drugs are not as much in evidence as during the more trying days of winter, but they still spread their genial influence at some of the more exclusive functions. Last week little Lulu Lenore of the Cuckoo Comedy Co. gave a small house dance for the younger addicts. "Will you come to my 'Snow'-ball?" read the clever invitations. In one corner of the living room was a miniature "Drug-store," where Otho Everard kept the company in a roar as he dispensed little packages of cocaine, morphine and heroin. The guests at their departure received exquisite hypodermic needles in vanity boxes which have caused many heart-burnings among those who were not invited.

Although fast living and drug use peaked in the early 1920s, they had been an integral feature of the movie colony from its inception. The wacky antics of stars on and off the screen owed much to psychoactive drugs. Kenneth Anger has epitomized the situation admirably in *Hollywood Babylon*:

> And if the "nouveau riche" film folk got tired from the furious pace, there was always "joy powder," as cocaine was called in those days, for a sure-thing pick-you-up. In fact, a "joy powder" manic movie comedy style rapidly evolved—the prime example being the Triangle-Keystone "cokey-comedy," "The Mystery of the Leaping Fish," with Doug Fairbanks as a bombed-out-of-his-skull detective, "Coke Ennyday." In 1916 "dope" could be the subject of comedy. The year of that film, English drug expert Aleister Crowley passed through Hollywood, taking note of the natives as "the cinema crowd of cocaine-crazed sexual lunatics."

The public began to learn of these activities but the power and money of Hollywood were able to keep things quiet until a series of sex and drug scandals occurred that nothing could cover up. When Olive Thomas, the beautiful star and wife of Mary Pickford's brother Jack, was found poisoned by her own hand, it was rumored that she had been trying to score heroin for Jack, and a subsequent investigation revealed her name on the list of clients of a United States army officer busted for dealing large quantities of heroin and cocaine. Almost exactly a year later, the Fatty Arbuckle scandal broke revealing no solid evidence of dope, but plenty of sex and booze. While Arbuckle was being exposed, director William Desmond Taylor was found murdered. When the police arrived, various stars and studio executives were scurrying in and out trying to eliminate some of the store of incriminating liquor, letters, and lingerie (initialed and dated) he had accumulated. To quote Anger once again:

> As if all this did not suffice, there was a "dope angle" to the case. Reporters stated that

> Taylor had recently been visiting the "queer meeting places" in L.A. and Hollywood, dens where strange effeminate men and peculiarly masculine women dressed in kimonos sat in circles, where guests were served marijuana, opium and morphine, the drugs wheeled in on tea carts. It was soon revealed that Taylor's good friend Mabel Normand, whose antic clowning for Sennett gained her fans by the millions, owed her effervescence at least in part to Cocaine and Co. Mabel's monthly expenditure for "cokey" was in the neighborhood of $2000, blackmail included.

It was said that Taylor's murderer had been a dope peddler whom Taylor had warned to stay away from his actresses. B. B. Hampton in his *A History of the Movies*, written some eight years later, described the situation this way:

> The legitimate facts of the Taylor mystery were soon exhausted, but the dirt writers had found the dope trail and this enabled them to produce lurid tales of dope fiends to add to their fabrications of drunkenness and sexual excesses. . . . Every star, every player, every executive, was under suspicion as any day might bring an exposé of one's favorite hero or heroine as a dope addict, a drunkard, or a sex degenerate.

As if all this were not enough, America's best-loved star, handsome, talented, charming Wallace Reid, entered the Banksia Place Sanitarium in an effort to cure his morphine addiction in March 1922, the same month that Hollywood appointed Will Hays to oversee its morals (more on Hays later). The story of Reid's addiction was splashed across the front pages and hit the public like a bomb. Unlike the other scandals, however, Reid's evoked a great outpouring of sympathy, a response that Paramount, with millions of dollars to lose, did everything to encourage. Will Hays remarked, "If Reid's condition is a result of indulgence in narcotics as has been reported, it's a matter to be prayed over." Reid's doctor said, "His present illness has no connection with overindulgence in alcohol or narcotics." His mother-in-law revealed, "I know there are 'dope' parties in Hollywood—everyone knows that—and I suppose Wally has attended some of them. . . . I have seen him sadly shake his head and say, 'Mother I don't like it—that isn't the way to have pleasure. It's all so false and artificial.' " Though Reid had been living a fast life, everyone tried to emphasize that he always copped his dope from legitimate sources. His wife insisted that he always obtained his morphine tablets from a doctor and that he only took it orally. How Wally came to be an addict is unclear, with everyone giving a different story. Depending on whom you believe, Reid began taking morphine after a back injury on the set, after being given some by a fellow actor to combat exhaustion, or after suffering spinal injury and headaches as a result of a train wreck. The last of these is the version provided by his wife in subsequent years, though at the time of his death, she gave the police a list of "Bohemians" who had dragged him into debauchery. However nebulous its origin, there can be no argument about the end of Reid's addiction. He died in the sanitarium in January 1923.

Wallace Reid's favorite publicity photo. His death in 1923 while trying to withdraw from narcotics shocked America.

The role played by Wally Reid's addiction in his debilitation and death is debatable, though his wife claimed, "Only a return to the drug under control could have saved him. He refused." All agree that Paramount was driving Reid very hard and he was visibly sicker in each film until he collapsed in the middle of making *Mr. Billings Spends His Dime* (*Thirty Days*). It was an interesting postscript on the case when the manager of Reid's sanitarium was arrested for violating the Harrison Narcotics Act by providing dope for his patients.

Wallace Reid was one of the few names of the 117 Hollywood figures in the Doom Book, compiled

True to the American tradition Hollywood capitalizes on the Wallace Reid tragedy for a few quick bucks.

by studio moguls (with Hays's approval) in 1922, who might have survived the purge. As it turned out, his widow was determined not to let anyone forget Wally's "sacrifice." She stumped the country for several years talking to anyone who would listen to her about the evils of drugs. She spoke before the National Antinarcotic Conference, urging them to treat addicts as sick people and even campaigned for an antidrug memorial for Wally. Reid's memorial turned out to be an exploitation film about drug addiction made by the Ince Corporation and released in June 1923. Produced with the cooperation of the Los Angeles Anti-Narcotic League, the film's cast included Mrs. Wallace Reid, Bessie Love, the mayor of Los Angeles, the president of the University of Southern California, the Los Angeles chief of police, and park commissioner, a U.S. federal judge, an I.R.S. official (retired), a P.T.A. leader, and Brigadier General C. R. Boyd of the Salvation Army. This sociological melodrama "treats of the evils of drugs, pointing out the

Mrs. Wallace Reid looks on as lady shoots up in a scene from *Human Wreckage* (1923). The drug-induced fantasy sequences were interesting but unfortunately the film has vanished.

disasters that visit several figures in general and the MacFarlands in particular. The husband is an attorney who suffers a nervous breakdown, becomes addicted to morphine, and his efforts to shake off the habit are fruitless until he realizes that his wife is encouraged to take up the habit because of his weakness and the futility of trying to cope with it." The film is of special interest because it is one of the few Hollywood films in the Caligarist style (after *The Cabinet of Dr. Caligari*, a 1919 German expressionist film that employed bizarre sets and lighting). Distorted sets and fantasy sequences (the "Sea of Dreams" and "Ballet of the Addicts") depicted the addicts' world. The drug peddler is symbolized by the double exposure of a hyena "who prowls throughout the scenes in ghostly form." One reviewer noted that the film "might appeal to an audience of those who need narcotics but to the average person it is not pleasing," and that though the drugs came in chocolate creams, hollow shoes, and books, "all seem to make so much fuss about getting the little piece of paper that their suspicious conduct might be more easily detected than if they brazenly took the drug by a shake of the hand." It is notable that the lawyer in the film began his addiction with a doctor's prescription, thus evoking more sympathy than if he had gotten hooked through debauchery.

Other antidrug exploitation films appearing in 1923 were *The Drug Traffic* and *The Greatest Menace*. In the first film, a noted surgeon begins using drugs to enable him to operate (he is worn out from socializing with his fiancée) and eventually slides into the slums and a life of crime. After burglarizing his former hospital for drugs, the surgeon repents, spends a dreadful night fighting his craving, and dies victorious. In *The Greatest Menace*, a district attorney's son, in order to gather material for a novel, visits the haunts of drug addicts and ends up being charged with the murder of a woman for whom he was obtaining drugs.

The heat was on in Hollywood and elsewhere and drug users began exercising more caution than they had previously. Hard drugs became harder to find and more expensive while marijuana slowly climbed in popularity. The papers would occasionally print a story of a drug bust such as "Actresses Birdie Green, Paulette La Fargue, May Hoffman, Minnie Leder and Lilian Miller Arrested on a Charge of Having Drugs" (*New York Times*, August 1923), which revealed that they had heroin in their purses and that all admitted it. Also in 1923, the Paris correspondent of the *Journal of the American Medical Association* wrote a letter calling attention to a cause of "cocainomania" among motion picture actors—they used it to dilate their pupils and give an expression of "astonishment, depth, brilliance and wildness." For the most part, however, drug use went underground and only a few titillating details in later biographies reveal whose eyes were shiny (or glazed) and why. Mabel Normand's affection for "cokey" was well known, and Mack Sennett's biographer in trying to defend her merely clinches the case. "She had sinus trouble and to alleviate it, she occasionally took a narcotic. This gave rise to the persistent report that she was a 'dope'." Normand's career was terminated by the Arbuckle scandal and she dropped from sight, but another flapper fond of "joy powder" was to retain her star status for forty years. Tallulah Bankhead had been warned by her family about alcohol but nobody mentioned cocaine. To quote her biographer Lee Israel in *Miss Tallulah Bankhead*:

> Tallulah bought it from the urchins who hung around the tea shoppes in the West Forties. It was dispensed in little packages the size of tea bags and sniffed up the nose. The price was $50 a bag and Tallulah purchased some whenever possible. In the superlative style of the day, one said, inhaling, "Cocaine. It's absolutely divine. Will you sniff some?" When Tallulah did not have $50, she crushed an aspirin tablet and pretended. There was nothing the curious Tallulah would not try. But of course she needed stimulation as much as Rip Van Winkle required Tuinal. Whenever possible, Estelle Winwood flushed Tallulah's cocaine down Tallulah's toilet. "It made her dirty

Mabel Normand was Hollywood's leading comedienne, and one of its best known lovers of "cokey" before the Arbuckle and Taylor scandals caused her to fade from view.

Mary Miles Minter, another star, fell when the initials M.M.M. were found on one of many pairs of panties in the collection of a murdered director.

and rude to people," Estelle Winwood recalled. "I introduced her to two or three friends and they remarked how rude she was. But that wasn't Tallulah. It wasn't the real Tallulah." Tallulah sometimes took a bag with her to parties. In the beginning of the evening, she was this piquant little match girl, perhaps showing the picture of her sainted mother, which she carried around with her at all times to the other guests. As the evening wore on, however, when she failed to receive the kind or quality of attention she demanded, Tallulah sniffed some snow and proceeded to do her famous cartwheels. When the cartwheels qua cartwheels ceased to amuse or shock, Tallulah took to doing them without any underwear on.

One of Sennett's actors known as "The Count" was supposedly responsible for supplying many stars with their favorite fix. Wally Reid and Mable Normand are said to have started with him as well as Juanita Hansen, Barbara La Marr, and Alma Reubens. Juanita Hansen also started with the Count's fixing up a hangover and soon she was fixing her own. Her name appeared in the Doom Book after the discovery that she was seeking a cure for her addiction from an Oakland doctor. Though she was not hooked at the time, the scandal ended Hansen's career and she ended her days as head of the Juanita Hansen foundation, with white robe and cross, trying "to help the thousands of narcotic addicts now living in darkness—alone, ashamed, bewildered." Barbara La Marr was one of the most beautiful women in Hollywood, but she went through six husbands, dozens of lovers, and vast quantities of heroin, cocaine (kept in a gold casket on her piano), opium, morphine, and anything else she could find before

Alma Reubens played an opium smuggler's mistress in the classic cocaine comedy *The Mystery of the Leaping Fish* (1916). A long-time addict, she was busted by the San Diego police a decade later with 40 cubes of morphine sewn into the lining of her dress.

"Too beautiful" Barbara LaMarr kept cocaine in a gold casket and died of a heroin overdose at the age of twenty-six.

her suicidal overdose in 1926 at the age of twenty-six. Like La Marr, Alma Reubens somehow managed to avoid inclusion in the Doom Book and kept her addiction secret until 1929, when she lost control on Hollywood Boulevard and stabbed the ambulance attendant who was helping her doctor take her to a sanitarium for a cure. Two years later she returned to Hollywood for a comeback but, after a quick trip to Mexico, she was busted in a San Diego hotel when police found forty cubes of morphine sewn into the seams of one of her dresses. Alma Reubens was seriously ill and she died a few weeks later. Shortly before her death in 1926 she gave the following interview to the *Los Angeles Examiner*.

I only went to professional men to seek relief from my pain. Each time they said, "Take this for the pain and you will be able to go on." When they first started giving me this horrible poison I did not know what it was. I went from one to the other. One even laughed when I told him I craved the drug and said, "Don't be afraid, you will not need any more after you are well." But they went on and on giving me this thing. As long as my money held out I could get drugs. I was afraid to tell my mother, my best friends. My only desire has been to get drugs and take them in secrecy. If only I could go on my knees before the police or before a judge and beg them to make stiffer laws so that men will refuse to take dirty dollars from murderers who sell this poison and who escape punishment when caught by buying their way out.

Sex and drug scandals involving Hollywood stars along with some loose scenes in films led to intense pressures for censorship, resulting in the introduction of the Motion Picture Production Code in the year the talkies made it big (1930). Among other things the code outlawed drugs, but it was not given effective enforcement until 1934 so that a few drug references managed to slip by in films. In Busby Berkeley's *Gold Diggers of 1933* Ruby Keeler comments of a musical producer's wild schemes—"Say, what's he smoking?", and Cole Porter's "You're Getting to Be a Habit with Me" is a featured song. Cab Calloway does a beautiful version of "That Old Reefer Man" in *International House* (1933) and Gertrude Michael sings a bizarre version of "Sweet Marijuana" in the 1934 film *Murder at the Vanities*. By 1935, however, H. J. Anslinger and the Federal Bureau of Narcotics were hard at work trying to convince the American public that marijuana was the root of most evil and *Assassin of Youth* appeared in that year. This film depicted the wild passions unleashed by the killer weed in reefer addicts.

Two independent productions (i.e., made outside of Hollywood) appeared in 1936—*Marijuana—Weed with Roots in Hell* and *Reefer Madness*. These were both in the same vein as *Assassin of Youth*, but the Marijuana Tax Act passed Congress in 1937 and we would not see another marijuana film until *Wild Weed* appeared in 1949.

As we come to the end of the drug films of the silent era, we reach a natural place for a discussion of the subject of the censorship of drug themes in the cinema, since censorship in the United States and some other countries became intense almost coincidentally with the arrival of talkies. The drug and sex scandals of the 1920s that led to the appointment of Will Hays as filmdom's moral overseer and the institutionalization of conservatism and prudery on the screen have already been described. However, censoring of drug themes in films started much earlier, so let us, as the Queen said to Alice, "begin at the beginning and go on until you come to the end and then stop."

6 The Joint on the Cutting Room Floor: Censorship of Drug Themes

One of the earliest American films showed a couple kissing (the *Irwin-Rice Kiss*, 1896) and this brought cries for censorship from outraged viewers. Films have been plagued by censors and the threat of censorship ever since, though censorship has probably been more severe in most other countries than in the United States. However, Mack Sennett once had a delegation from the Edendale Deaf and Dumb Institute object to his actors cursing (in silent films) since this was offensive to their lip-reading inmates, and several decades later a women's group objected to a film on poppies because one species was the source of opium.

Most states had censorship laws by the time of World War I, and when *Wild Weed* was refused a permit by the Pennsylvania Board of Censors in 1956, it was on the basis of a law passed in 1915. A 1915 British censorship report mentioned as things to be eliminated not only "references to controversial politics" and "relations of Capital and Labour" but also "the drug habit, e.g., opium, morphia, cocaine, etc." and enlarged on the latter as follows:

> Another question has however come to the fore, namely the drug habit and the use of morphia, cocaine, and other narcotics. It is claimed for such films that they serve to warn the public against the dangers of the abuse of such drugs, but the Board decided that there being no reason to suppose that this habit was prevalent in this country to any serious extent, the evils of arousing curiosity in the minds of those to whom it was a novel idea far outweighed the possible good that might accrue by warning the small minority that indulged in the practice.

Accordingly, the 1922 feature *Cocaine* was forced to change its title to *While London Sleeps*. *Morfinisten* (1911) had no trouble with Danish censors, except that the Fredericksberg film censor stipulated "children not allowed," but *Opiumsdrömmen* (1914) was forbidden there, though it seems to have encountered no problems in the United States. France had a commission of five censors beginning in 1916 that allowed "no opium smoking, no displeasing Mexicans, Chinese or Negroes." Censorship usually becomes more active during a war and since war also tends to encourage drug use, it is to be expected that some of the attention of censorship should be directed to drugs.

Hollywood's first statement on the issue of censorship of drug use in films came from the Na-

In 1936 sex and drugs were out of bounds to Hollywood, but independent producers made *Marihuana—Weed with Roots in Hell*.

tional Association of the Motion Picture Industry on March 7, 1921, when point 7 condemned films "of stories which make gambling and drunkenness attractive, or of scenes which show the use of narcotics and other unnatural practices dangerous to social morality." In 1922 the movie industry chose Postmaster General Will Hays, a Presbyterian elder, as head of the Motion Picture Producers and Distributors of America, but though Wallace Reid's morphine addiction headed the list of drug and sex scandals issuing from Hollywood and filling the front pages in that and ensuing years, the Motion Picture Production Code was not introduced until 1930 and was not given effective enforcement until 1934. It was also at this time that the Catholic group, the Legion of Decency, was formed, primarily to police films for anything offensive to Catholics. From 1934 to 1967 only five films which had been granted a code seal were condemned by the legion.

The individual states had long before begun censoring films on their own, Pennsylvania passing one of the first laws specifically mentioning drugs in 1915 and Virginia becoming the first state to license all films in 1922. It is of importance to note here that the First Amendment to the Constitution did not begin to be regarded as binding on the states until the 1920s. The Maryland State Board of Censors prohibited films showing instructive details of the "use of opium and other habit-forming drugs" as well as "drugging and chloroforming victims for criminal purposes' and "advocacy of the doctrine of free love", whereas the Ohio State Board of Censors forbade "scenes which show the use of narcotics and other unnatural practices dangerous to social morality attractive." In Massachusetts the law provided that "pictures and parts of pictures dealing with the drug habit: e.g., the use of opium, morphine, cocaine, etc. will be disapproved."

The Code of the Motion Picture Industry, adopted at a trade-practices meeting in New York City in October 1927, publicized a list of "Don'ts and Be Carefuls" that included along with "Children's Sex Organs" and "Ridicule of the Clergy," "the Illegal Traffic in Drugs" and recommended that special care be used in treating many topics including "Deliberate Seduction of Girls," "First Night Scenes," and "The Use of Drugs." A resolution of the Association of Motion Picture Producers, Inc., and the Motion Picture Producers and Distributors of America, Inc., in excluding the illegal traffic in drugs commented:

> Occasionally a picture has appeared showing an agent of the law in pursuit of smugglers and the suggestion has very discreetly been made that the contents being smuggled were drugs. In such cases, however, the drug itself was never specifically mentioned, and the main theme of the story concerned itself, not with the methods of smuggling but with the chase and the capture of the criminals. The present tendency, however, is to disallow even the use of the term drugs in connection with smuggling. Naturally, the methods of distributing illegal drugs, and of peddling dope may never be shown, since this is a part of the "traffic" in drugs.

Though many films only dealt with drugs in general terms, the material presented here shows clearly that some films produced in Hollywood told about the specific drugs involved and the methods of their smuggling, peddling, and use.

The Motion Picture Production Code, adopted in 1930, stated as a general principle that "no plot should present evil alluringly" and accordingly states in the addenda:

> Illegal drug traffic must never be presented. Because of its evil consequences, the drug traffic should never be presented in any form. The existence of the trade should not be brought to the attention of the audiences.

This position was amended in 1946 to read:

> The illegal drug traffic must not be portrayed in such a way as to stimulate curiosity concerning the use of or traffic in such drugs; nor shall scenes be approved which show the use of illegal drugs, or their effects in detail.

Not content with this, New York State legislators passed a law in 1954 that outlawed films that "incite to crime," including any film "which advocates or teaches the use of, or methods of use of, narcotics or habit-forming drugs." In 1940, Joseph Breen in rejecting a novel submitted to the Production Code Authority as a possible basis for a film, wrote that "Illegal drug traffic and its effects are portrayed. The code says that 'illegal drug traffic must never be presented'." Both *Reefer Madness* and *Marijuana—Weed with Roots in Hell* were made by independent producers and were subsequently submitted and rejected by the Production Code Administration in 1938. In rejecting the latter film the PCA commented:

> One section of the production code provides that illegal drug traffic must never be presented. This is the central theme of your story. . . . Another section of the code specifically states that "excessive and lustful kissing, lustful embraces, suggestive postures and gestures are not to be shown." The sequences where the young men and girls at the beach party under the influence of drugs are shown rolling around on the floor in one anothers arms, exposing their persons unduly and giving play to their passions seems to us a violation of this section.

The PCA continued to refuse a Certificate of Approval to films dealing with the drug traffic until 1948. In that year *To the Ends of the Earth*, which included in its cast U.S. Commissioner of Narcotics H. J. Anslinger, was released. Anslinger had almost single-handedly succeeded in having marijuana outlawed in 1937 and had been fanatically trying to eliminate the narcotics traffic for some two decades, so the PCA could hardly refuse to give its approval to this film. The ice was now broken and the following year the Federal Bureau of Narcotics again cooperated in the making of a film about tracking down drug peddlers. In return for their help in the making of *Johnny Stool Pigeon* (1949), the FBN was allowed to check all scripts before shooting started and the film was screened in Washington, D.C., before the secretary of the Treasury and officials of the Narcotics and Customs bureaus prior to its theatrical release.

The year 1949 also saw the appearance of *Slattery's Hurricane*, by 20th-Century Fox, with Richard Widmark in the role of a naval reserve man flying planes for dope smugglers. Presumably this film made it past the censors because of Navy cooperation in its production and the happy ending. Dick is back in uniform (with a medal) reunited with his ex-addict girl friend.

Dick Powell gets the drop on Asian opium smugglers menacing America's youth in *To the Ends of the Earth* (1948)—the first Hollywood film to deal with drugs in almost two decades.

Foreign films and television were able to present many topics, including drugs, with greater freedom and created pressure for Hollywood to do likewise. Otto Preminger was instrumental in changing the code when he released *The Man with the Golden Arm* without a Seal of Approval in 1956. The picture, which portrayed heroin addiction, was widely seen and rather than allow the code to fall into disrepute, the following paragraph was appended in December of that year:

> Drug addiction or the illicit traffic in addiction-producing drugs shall not be shown if the portrayal:
> (a) Tends in any manner to encourage, stimulate or justify the use of such drugs; or
> (b) Stresses, visually or by dialogue, their temporarily attractive effects; or
> (c) Suggests that the drug habit may be quickly or easily broken; or
> (d) Shows details of drug procurement or of the taking of drugs in any manner; or
> (e) Emphasizes the profits of the drug traffic; or
> (f) Involves children who are shown knowingly to use or traffic in drugs.

The Man with the Golden Arm was eventually granted a seal.

The Maryland Board, although it failed in its attempt to censor *The Man with the Golden Arm*, cut several scenes from the educational film *The Narcotics Story* after consulting local and federal officials. This film showed growing and extracting drug plants and the preparation and injection of drugs. Three other films revealing the pitiful world of the addict followed quickly. *Bigger*

Frank Sinatra and Kim Novak in Preminger's *The Man with the Golden Arm* (1956), the first modern Hollywood portrayal of drug addiction.

Than Life (1956) starred James Mason as a man dependent on cortisone, *Monkey on My Back* (1957) told of Barney Ross's morphine addiction, and *A Hatful of Rain* (1957) was another sad tale of a junkie who picked up his habit during the Korean War. *High School Confidential* followed in 1958 and *The Gene Krupa Story* was released the next year. A decade later *Easy Rider* was able to present marijuana and LSD use as pleasant recreation.

With intense competition from foreign films and television and the growth of liberalism, the code had to give ground rapidly, and in 1968 the Code and Rating Administration (CARA) was established. Each film was now assigned a letter indicating whether it was deemed suitable for all, for adults only, and so on. Although this may seem to be an improvement, this rating scheme is in fact even more severe than previous censorship since the threat of a more restrictive rating can force the elimination of anything offensive to the board. Not only are the films subjected to cutting after completion but prior censorship eliminates difficult parts from the script before shooting starts. Studios now commonly require a director to sign a contract that specifies the rating a film must obtain. Severe restrictions are placed on the films even before they are begun just because a censor exists, undoubtedly a significant contributing factor in the production of so many poor films.

In 1971 about 50 percent of all films rated were first edited at CARA's direction. In addition to the big three—nudity, sex, and swearing—the board pays special attention to drugs, often overreacting to any film dealing with drugs, particularly marijuana. Films are given an R (restricted) rating if the drug sequences are not removed, even when the drug use is presented in a most unglamorous light as in *The Panic in Needle Park* (1971), *Dusty and Sweets McGee* (1971), *Cisco Pike* (1972), and many others. However, if there is a strong appeal to conventional morality, a PG (parental guidance suggested) rating may be obtained. This was the case with *The Cross and*

Peter Fonda gets off with acid in *The Trip* (1967). As a result of this film and *Easy Rider* he was accused of glamorizing drug taking.

Jack Nicholson takes another toke of the evil weed and expounds on his ideas of Venusian invasion to Peter Fonda in the trend-setting *Easy Rider* (1969).

Dealing (1972) treated drugs very openly, but had to eliminate promarijuana dialogue to avoid an X rating.

Alice's special brownies and LSD catalyze Peter Sellers's transition from straight lawyer to hippie and the rating from PG to R for *I Love You, Alice B. Toklas* (1968).

Waiting for the Man. Al Pacino and Kitty Winn hang ou with junkie friends in *The Panic in Needle Park* (1971) The censors approved its depiction of the degradation o drug addiction, but still gave it an R rating.

the Switchblade (1972), which, though it contains a long scene of preparing a fix and injecting heroin as well as some pot smoking, has Pat Boone converting junkies to Jesus. *Gimme Shelter* (1970) also somehow managed to escape the R rating, perhaps because of the bad vibrations associated with its drug use and its documentary nature. *Woodstock* (1970), though it contained a warning about "bad acid," a death from heroin, and anti-drug comments from several youths, was unable to escape the R rating, presumably because of the five-minute sequence in which the audience is shown puffing on pipes and joints and the generally happy, healthy feeling pervading the film. *Alice's Restaurant* (1969) also clearly condemned hard drugs, but the two scenes in which people in the background pass around those funny little cigarettes meant the difference between an R and a PG rating, apparently, because of an agreement between CARA and the Los Angeles Police Department, which arose in the filming of *I Love You, Alice B. Toklas* (1968), which treated grass and acid in a fairly sympathetic manner. In the case of *Dealing; or, the Berkeley to Boston Forty Brick Lost Bag Blues* (1972), the board asked for the elimination of dialogue indicating "an endorsement of marijuana and the 'hoax' by society against its use" from the script if it was to avoid an X rating. And so it goes—if a film is to have a big budget it will need a large audience and a PG or at worst an R rating, but if it is to be honest, realistic, intense, and effective it will often be desirable or necessary to include elements that will result in an R or an X rating. Consequently the producers, writers, directors, and actors are restricted, censored, and inhibited at every stage of the filmmaking process, one of the reasons a major proportion of the films produced are so insufferably dull, lifeless, and unbelievable.

Censors in other countries have been just as strict as those in the United States. English censors in 1936 deleted the March of Time number 9 from British release since this concerned a Central American antinarcotic campaign and the subject of drugs was not considered suitable. To give some idea of the mentality prevailing then, in 1939 British censors passed *The Wizard of Oz* with an "A" certificate (adults only) because "the witch and grotesque moving trees and various hideous figures would undoubtedly frighten children." Even Danish censors were bizarre—they banned *Frankenstein* in 1937. By the 1950s, English censors had relaxed to the point where they passed *The Man with the Golden Arm* because it was "clearly deterrent," but in the next decade they refused a certificate to Roger Corman's *The Trip* (1967) after three psychiartists condemned it as "meretricious, inaccurate in its representation and therefore dangerous." The film still has not seen general release in England. In the same year, however, the board passed Conrad Rooks's *Chappaqua* (1967) since "they all agreed that we should pass the film which they considered totally genuine and accurate in its representation and therefore a deterrent and not an encouragement." The pot-smoking scenes in *Easy Rider* (1969) and *Taking Off* (1970) were also passed "particularly since medical opinion about its harmful effects is divided."

In viewing films, particularly older ones and those having controversial elements such as drugs, it should be kept in mind that even after they have been released and distributed, the films are still subject to mutilation by censors in various countries, states, and towns and one will sometimes find that no two prints of the film are quite the same—each group having chopped out different parts. The distributors have often helped in this regard by releasing different versions of the film in different areas as well as later release of reedited versions. On top of all this, sections are often lost when the film breaks or is otherwise damaged.

Film has never been able to attain the freedom of expression that the printed word has achieved. One major reason is that the production and distribution of films have always been largely monopolistic, and if one does not go along with moneyed conservatism one does not get to make films, or once the film is made, one cannot get them shown. Similar considerations hold for television. Making films is an expensive proposition and big money is not noted for open-mindedness and aesthetic sensitivity. There are some bright lights on the horizon. Independent production is increasing and even Hollywood films seem to be striving for greater honesty and social relevance. Massive government support of independent filmmaking and television might be a good thing, but is a remote possibility. The rise of the super-8 format may be the best thing that has happened to filmmaking since Edison, for it is now possible with super-8 as well as with videotape to produce films and television programs with a sharpness comparable to 16mm at a fraction of the cost. The next few decades may justify Cocteau's assertion, "The cinema will only become an art when its raw materials are as cheap as pencil and paper."

7 The Heroin Trail

The American Connection

As mentioned elsewhere, severe censorship arrived in the United States almost simultaneously with sound in films and so the first two decades of talkies saw relatively few films dealing with the traffic in narcotics. However, the censor's hand was a bit uncertain at first, so a few "dope operas" made it to the screen. Both *The Drake Case* (1929) and *Welcome Danger* (1929) were produced so early in the sound era that they were also released in silent versions. The former film shows how a woman makes an addict of her stepdaughter in order to divest her of her inheritance, and the latter was a comic vehicle for Harold Lloyd in which he tracks down a narcotics gang and exposes a fake reformer who is actually the head of the gang. *The Fall Guy* (1930), based on the comedy of that name, told of government agents pursuing a suitcase full of narcotics left for safekeeping with an innocent clerk by racketeer "Nifty" Herman. *Conspiracy* (1930) marked the second appearance in a drug melodrama by Bessie Love. Margaret Holt (Love) and her district attorney brother try to smash the narcotics ring that did away with dear old dad. After a series of unlikely occurrences, they bring the villains to justice. *Big News* (1930) featured Robert Armstrong as a reporter investigating a dope ring and Carole Lombard as his wife. Boris Karloff, fresh from his triumph as the monster in *Frankenstein* (1931), plays the henchman of a morphine gang in *Behind the Mask* (1932). Based on the story "The Secret Service" and featuring a pre-King Kong Fay Wray in a small role, we follow undercover narcotics agent Jack Holt as he flies a seaplane from Long Island 200 miles offshore to pick up the dope from an Antwerp freighter. The gang hides the dope in a coffin and buries it in a cemetery. At the head of the ring is Dr. X, who has his agents everywhere, and performs "operations" on those who get in the way. Dr. X turns out to be a member of the Narcotics Council who offered a $2,500 reward for the capture of drug dealers. Poor Jack only discovers this after being strapped to the operating table. While admiring the finely honed edge of the scalpel the doctor (Karloff) informs him: "It is only when I begin to cut on the inside that you will realize you are having an experience." But, just in the nick of time, Jack's lady-friend kills the doctor with a well-placed bullet and the gang is defeated. *Soldiers of the Storm* (1933) starred Regis Toomey as a two-fisted lad fighting a gang that smuggles dope and aliens from Mexico.

From 1934 to 1948 Hollywood was running scared and failed to produce a single film on the heroin traffic, though a few films discussed later contained addicts as minor characters. Over four decades were to elapse before *Superfly* created a scandal by showing a drug dealer emerging victorious, thus breaking the final taboo.

In 1948 the Federal Bureau of Narcotics permitted *To the Ends of the Earth* to be made. The appearance of this film, discussed in the section on opium, opened the doors and since then Hollywood has produced narcotics films of almost every conceivable variety. Three such films were

made in 1949 and five were released in 1950.

Slattery's Hurricane (1949), based on the story by Herman Wouk and starring Richard Widmark, tells the story of an ex-Navy flier who now pilots for a candy bar mogul who frequently stashes dope in with the load of confections. On one trip from a small island in the Caribbean the boss has a fatal heart attack and Slattery (Widmark) finds a package of dope inside his shirt. "If this is what it looks like, it's worth a lot of dough." But Slattery is not a bad boy at heart and we next see him being given the Navy Cross for sinking a Japanese cruiser (he's still in the reserves). He has been making time with his best friend's wife, so his girl friend (Veronica Lake) tries to end it all with an overdose of narcotics. The filmmakers were obviously nervous about making a drug film and Lake's addiction is only vaguely hinted at. Slattery's friend is called upon to fly into a hurricane, but Slattery knocks him out, flies out to give the Navy weathermen a report, and saves Miami for the real estate men and shuffleboard games. As his plan crashes Slattery completes his expiation by revealing information on the dope ring. Of course, he survives, is reunited with Veronica ("I'm all well now and I'm going to stay that way"), and flies into the sunset secure in the knowledge that whatever the fate of this dismal flick, he has managed to stash a few grand in the bank.

Port of New York (1949), "the story of the men who stand guard at America's front door," follows the customs agents as they crack a dope-smuggling gang headed by Yul Brynner, in his film debut. With dumb dialogue and plot, and pacing evoking the serials and comic books of the early 1940s, the film only has interest as a camp period piece. Agents searching parcels in a train station find some powder and tell by tasting that "it seems like the pure stuff." (Taste lost favor as an identification method when LSD came on the scene.) They replace the stuff and a man picks it up and carries it to the Club Gay, where twenty-five ounces of "pure" are sold for 25 g's. This foolishness continues for another forty-five minutes before the coast guard nabs Brynner on his yacht.

Johnny Stool Pigeon, the third 1949 entry in the dope sweepstakes, stated, as did all three films, that it was "produced with the cooperation of the Federal Bureau of Narcotics" and other agencies. Howard Duff plys a con who is sprung from the pen to help the feds crack a drug gang. The T-men chase the dope from Mexico to Tucson, San Francisco, and Vancouver. Surprisingly, the film is not quite as dull as it sounds.

Everyone got on the dope-movie kick in 1950 and the five entries of that year competed for the most incoherent plot and dismal dialogue. The "traumatics" department of Bellevue Hospital was the unlikely site for undercover narc-doctor Richard Conte's prying eyes in *The Sleeping City* (1950). Someone has been peddling dope and an intern has been murdered. Conte soon finds that nurse Ann is pushing pills to support her crippled child and that hospital janitor "Pop" doubles as a bookie who takes the doctors' bets and triples as a pill pusher in order to pay his gambling debts. "You get ten bucks a pill," he says while asking Conte for "some of the white stuff—just a couple of half grain pills." Ann then tries to get Conte to write unnecessary prescriptions so she can pocket the pills and give the patients phenobarbital instead. The city may not be sleeping, but the patients are! Soon "Pop" has to "bump off" another intern whom he's addicted to the morphine, and Conte cracks the case.

A sweet, homey-type narc is killed by a "murderous dope ring" and this triggers an undercover operation in Tijuana in *Federal Man* (1950). Although featuring Lyle Talbot in yet another of his narc portrayals and a narrative style later made famous by "The Untouchables," this juvenile effort would put even Harry Anslinger to sleep. The dirty dealers tape the drugs under their cars for the run to Los Angeles, where they kill several people and have a shoot-out with the feds. Yawn! At least *Woman from Headquarters* (1950) had the novelty of a female narc, and *Border Outlaws* (1950) had musician Spade Cooley busting a gang led by "The Phantom Rider."

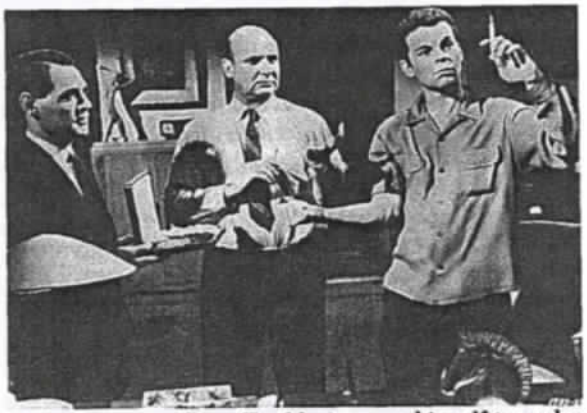
Customs Agent (1950) likewise had a novel twist—the antibiotic streptomycin is smuggled to Shanghai and dope is smuggled to California on the return trips. The villains even cut the streptomycin with salt. Soon the authorities lay a trap. A customs agent is fired and goes the rounds of the Shanghai bars. Soon he is drunk and is corralled by the smugglers. He agrees to make a trip to the United States with a trunk containing seventeen bags of narcotics, though why they bother with this is unclear since they insist there is lots more money in streptomycin. As the plot bumbles along, agent Stewart takes the dope through Los Angeles customs in a smuggler's jacket. To make it look completely real, Stewart steals the dope and sells it to an ex-junkie whom the cops have paid to set up a fake bust so they can recover the dope. Eventually, of course, the villains get their just deserts and the agent gets his medal.

Orson Welles wrote, directed, and starred in

Mr. Arkadin (1955), a story about a mysterious financier whose fortune derives from a dope and prostitution ring. Retitled *Confidential Report*, this brooding drama features several other stars, but never seems to click.

Tip on a Dead Jockey (1957) used the theme of American-flyer-gets-entrapped-by-dope-smugglers, just as in the earlier *Slattery's Hurricane* (1949) and the later *The Hell with Heroes* (1968). This time Robert Taylor plays the World War II veteran. While smuggling money from Egypt to Madrid, he discovers that he is also carrying dope. The air cops are soon on his tail, but being a good boy, Taylor tips them off and saves his skin.

The year 1958 was remarkable in the annals of cinematic heroin dealing with no less than ten such films appearing that year. Space travel had center stage and everyone who could not manage to make a science fiction quickie seems to have reached for the next most sensational topic. Two of these seamy flicks exploited the possibilities of the high school scene. *High School Confidential*, which played the pot-leads-to-heroin angle for all it was worth, is discussed in detail in the marijuana chapter. *The Cool and the Crazy* asked viewers to believe that a reform school graduate (Scott Marlowe) went to high school solely to hook the kids on the dope he peddled. The plot strains credulity, but the acting is occasionally tolerable. A variation on this theme is presented in *Stakeout on Dope Street* (1958), which had three teenagers stumbling on a two-pound can of heroin in a vacant lot. Though the ads for this film claimed that it "pours the first blazing spotlight on kids who rumble down the dark alleys of 'the hooked'," it is terminally dull. The kids just don't have the necessary expertise in dealing and the dope is dumped in a mobster's face at the end.



Undercover narc (Russ Tamblyn) proves himself to pusher (Jackie Coogan) by shooting heroin in *High School Confidential* (1961). Although intended as antidrug propaganda, the film has become a comedy classic.

***City of Fear* (1959). Murder and mayhem over heroin that turns out to be radioactive cobalt.**

The youth angle was also used in the independent film *The Narcotics Story* (1958), later issued as *The Dread Persuasion*. Actor Richard Carlson wrote the story for *Johnny Rocco* (1958), the narrative of a thirteen-year-old boy whose father is part of a narcotics-smuggling operation.

This year was so crowded that two of the films took place in New Orleans. Two detectives track a murderer to a narcotics syndicate in *New Orleans After Dark*. Posing as seamen, they follow the trail to tobacco importer Nick Livorno, who soon is wearing a prison uniform. *Street of Darkness* is more colorful with characters such as Coke, Slavo, Flaky, and two whose real-life monikers are Pork Chops and Kidney Stew. Two war veterans are hired to dig up a treasure chest that turns out to be filled with dope instead of doubloons. They are attacked and the chest vanishes into the night, but they run into nightclub singer Danielle who charms one of them into helping her retrieve a box of instruments (actually narcotics) from a ship. Shortly, the whole gang is broken up and the heroin operation is blamed on the Cubans.

San Francisco cops battled heroin merchants in *The Lineup* (1958). The gang secrets the dope in luggage arriving from the Far East. They round up the dope and eliminate the innocent carriers one by one but run afoul of a narc (Eli Wallach) while trying to retrieve their stash from a little girl's doll. "The kid used the stuff as dusting powder for her doll!" declaims Eli. The old heroin-in-the-doll trick was also used in *The Man Who Died Twice* (1958) and *Wait Until Dark* and

Puppet on a Chain, both of which are vastly more entertaining than the 1958 films.

Bodies and "B"-film clichés are strewn at random throughout *The Man Who Died Twice* (1958). Rod Cameron plays a narc with the same dull manner he used in the once-popular television series "Highway Patrol." Cameron's numerous appearances in third-rate films, his limited dramatic abilities, and his general appearance bring to mind Lon Chaney, Jr. Vera Hruba Ralston, former Czech ice skater, plays a singer in a nightclub owned by her husband, Rod's brother. Hubby has been dealing junk on the side and when he gets bumped off, stereotyped hoods come looking for his stash. Rod alerts the feds, and they stake out Vera's apartment. The mobster's landlady is one Ms. Hemphill, who rats on her tenants to get money for "cooking sherry" and is soon done in. Cameron wants to romance Vera but it is still the prudish 1950s and he thinks she's a bad lady because she seems to have slept with the bartender (Mike Mazurki). The mob stomps Mike, gets stomped by the police, and Rod finds the heroin in Vera's Mexican doll. Vera's husband only faked his demise to dodge the mob and when he returns to collect his stash Rod turns him in.

Touch of Evil (1958) is the only drug film of the decade that seems destined to stand as a significant cinematic event. One of Orson Welles's better efforts (he wrote, directed, and starred in it), it pits corrupt border town sheriff Welles against Pan American narc Charlton Heston in a town dominated by the Grande family and its reefer-smoking punk offspring. The film even has bit parts for Marlene Dietrich and Joseph Cotten. Murder, however, is the topic of interest and the Grandes' involvement in the dope traffic is only briefly alluded to.

City of Fear (1959), although several notches lower than *Touch of Evil*, is nevertheless quite gripping at spots. It stars Vince Edwards, later renowned as television's moody medic Ben Casey, as a con who escapes from San Quentin with a can full of radioactive cobalt that he believes to be heroin. He makes a frenzied attempt to unload his dope while being pursued by cops and assorted underworld types but he dies of radiation poisoning before he can succeed. Critics of the film were generally very favorable considering the obvious low-budget nature of the production. Look for Lyle Talbot, once again playing a narc (Chief Jensen).

Dope-dealing punks captured center stage in such negligible efforts as *Wild Youth* (1960), *This Rebel Breed* (1960), and the Canadian *The Bloody Brood* (1959). In the first of these we are treated to some unbelievably poor dialogue between Frankie and Switch (he carries a switchblade), who just escaped from an honor farm, and the charming duo who give them a ride—Revis (a murderer) and his dope-crazed moll Madge. A large narcotics stash in the car leads to a free-for-all but Treasury agents and border police settle things down. *This Rebel Breed* was yet another boring essay on the high school dope scene with little to commend it except Dyan Cannon before she gained fame and fortune by marrying Cary Grant. The appearance of Peter Falk (Colombo of television) is likewise about the only saving grace of *The Bloody Brood*. He plays Nico, the psychopathic head of a beatnik gang that pushes heroin. To show how tough he is he puts ground glass in a lad's hamburger just for kicks!

***Stakeout on Dope Street* (1958) had little to recommend it but a novel plot—kids trying to peddle heroin they found.**

Okefenokee (1959) could also be bad-mouthed, but it does have some novel features. The swamp-side dope ring also smuggles aliens, uses a seaplane, and hires Seminole Indians with aquaplanes to ferry them about. However, the hiring of minorities derives from no liberal motive; they kill the guides after each run. When the gang rapes an Indian woman, she wanders off into the swamp to stare into the sun until she becomes blind. But the Indians rally to save the lady and put down the gang.

Steve Cochran plays dope runner and murderer Joe Sante in Roger Corman's *I Mobster* (1959), and Cliff Robertson tears his way through drug-dealing mobsters in Sam Fuller's *Underworld USA* (1961). *Breakfast at Tiffany's* (1961), based on Truman Capote's novel and starring Audrey Hepburn as Holly Golightly is one of director

One of *The Hooked Generation* (1969) gets his fix. Filled with senseless violence, it was one of many cheap exploitation films of the late 1960s that tried to turn a quick dollar by adding dope to the plot.

Blake Edwards's few critical successes. Holly visits a jailed mobster and innocently conveys directions for his narcotics ring. One critic denounced the film because it seemed to him that the film took the view that "purveyors of narcotics are good fellows deserving of nothing harsher than genial satire," but Capote treats most things that way.

"Hopheads begging, borrowing, stealing to buy a few cc's of delirium" pontificates Burl Ives in *Let No Man Write My Epitaph* (1960). A tale of dope dealing and slum life in Chicago in the early 1950s it follows young Nick (James Darren) as he struggles with his ghetto surroundings and hooker-addict mother (Shelly Winters). Ella Fitzgerald plays another addict who needs a fix so bad that "Judge" (Burl Ives) gives her his last bill t score. Ricardo Montalban is a slick pusher, with a flower shop front for his gambling and dope operations, who gets Shelly hooked so she'll keep his bed warm. "I haven't felt this good since I was a kid" she opines after a fix. Soon Nicky finds out about the little white packets (he thought she was drunk) and Ricardo locks him up with the intention of starting him on heroin. Ives comes to the rescue and mama takes the cure. Although the dialogue sags in places, on the whole this is a tolerable film.

Unfortunately, the same cannot be said for *High Powered Rifle* (1960) or *Dangerous Charter* (1962). The former involves a $250,000 heroin deal, and the latter a $500,000 deal, a yacht full of dope, and a trip from La Paz, Mexico, to Santa Catalina Island off the California coast (very convenient since much of the film was shot there). *Too Young, Too Immoral* (1962) is another loser, notable only for an appearance by Taylor Mead. As in *The Lineup* and other films, a cripple heads a narcotics ring. He has stashed some heroin underwater but when young Tony retrieves it, he turns it over to the narcs because the cripple had his brother killed. Negligible films admittedly, but they are the life's blood of late-night television.

With Yves Montand, Bradford Dillman, Lee Remick, and Odetta, Faulkner's powerful novel *Sanctuary* should have made a first-rate film, but a sloppy production and script resulted in its being little better than the expurgated version done some thirty years earlier as *The Story of Temple*

Drake. Odetta is a junkie and Montand is the Candyman—her pusher. She tells Temple (Lee Remick) that "he'll have you crawlin' on all fours and howlin' like a dog." but she has a fling anyway. Pursued by narcs, Candyman pretends to die in a crash and Temple settles for a demure existence as Dillman's wife. While touring a state narcotics ward she meets Nancy (Odetta) again and takes her as a servant. Candyman shows up several years later with his little white packets and, seeing Temple about to run off with him, Nancy kills the baby to prevent its growing up with his terrible influence.

New York City has the heaviest heroin scene in the United States and many films dealing with junk and junkies have been shot there. Shirley Clarke's *The Cool World* (1964) was quite authentic in its depiction of black gangs in the Harlem ghetto. Duke is only fourteen years old, but he deals dope to get the money for his first gun, and the gangleader Blood is hopelessly addicted. Actual ghetto dwellers played these roles and they are usually convincing. The same is true for Jeronimo Melendez's *Heroina* (1965), filmed in Spanish Harlem. In Spanish with English subtitles, the film tells how ghetto life drives young Puerto Rican Chico to drug use and peddling. However, the film ends on an optimistic note when his father faces his own guilt and aids his son. *The Pusher* was filmed in the same year in Manhattan and also used the framework of the Puerto Rican community to depict the addict's plight, but it was made by outsiders and lacks the punch of *Heroina*. It begins with a dead teenager and a smashed hypodermic needle in a Harlem basement and proceeds to show the cops' efforts to get the dealer. One cop finds that his daughter is addicted and forces her to kick "cold turkey." The film is a sincere and unpretentious effort, but nothing original.

Novel plot elements, such as heroin-addicted narc dogs and the use of Geiger counters to follow radioactive dope, were about all *The Poppy Is Also a Flower* (1966) had to offer. The film is discussed in the opium section. *The Money Trap* (1966) does not have the saving graces of color and Middle Eastern scenery, but Joseph Cotten as a drug-dealing doctor, Glenn Ford and Ricardo Montalban as crooked cops who rob his safe of two bags of heroin, and Rita Hayworth (who plays an addict in *The Poppy Is Also a Flower*) can inspire a modicum of interest. With Warren Beatty as a gambler forced to aid in the nabbing of a drug smuggler and Susannah York as his lady, *Kaleidoscope* (1966) should have been notable, but it is just dull. Another heroin-smuggling doctor (he brings it from Baja in toys) is featured in *Warning Shot* (1967). David Janssen in a cop who gets in trouble when he accidentally kills the doctor with his warning shot, and then proves that he was part of a heroin ring. The moral seems to be that it's all right for a cop to murder a complete stranger if the stranger is a possible criminal—a scene acted out all too often in real life.

The Canadians entered the drug derby in *Affair with a Killer* (1967). A dreary, low-budget melodrama, the film reveals heroin smuggling in collage paintings by a couple who are living off a naive Canadian businessman. United States and Canadian narcs are alerted when a nun hit by a truck on the docks is found to have a purse full of heroin. From this point, the film is routine except for the scene in which a dealer reads a narc's lips with a magnifying glass in the bottom of a milk bottle.

A blind Audrey Hepburn inadvertently comes into possession of a doll full of heroin belonging to psychopathic killer Alan Arkin in the gripping suspense film *Wait until Dark* (1967). The film is good, but the dope is only incidental, as it is in the not-so-good *The Hell with Heroes* (1968), in which yet another post-World War II American pilot (Rod Taylor) gets victimized by smugglers who add dope to his cargo and report him to American counterintelligence.

Telly Savalas (Kojak of the television series) is a Mexican poppy grower and heroin smuggler battling narc David McCallum in *Sol Madrid* (1968). The solid cast does well with the routine script. A novel bit is the smuggling device—a "pig" used to clean out oil pipelines running across the border. Sol deals thirty-eight kilos of heroin for some $3,000,000 for resale in the United States for $25 million but he is later cornered at his Mexican villa with fifty-five kilos. George Sanders is also a Mexican drug pusher in *The Candy Man* (1969), but he quickly decides that kidnapping is more lucrative and the film has little to do with drugs.

Mexico continued to be the source of celluloid heroin in *Easy Rider* (1969) and *The Hellcats* (1969). The substance smuggled across the Mexican border and sniffed by Phil Spector at the start of *Easy Rider* is never made clear in the film, but Fonda said in an interview that it was "junk." A female motorcycle gang smuggles dope from Mexico in the headlights of their bikes in *The Hellcats*, a sleazy quickie that may have camp value in another fifty years. This is also the only hope for *Girl in Gold Boots* (1968), a partly musical melodrama in which hoods rip off the county jail for $100,000 worth of drugs.

The Hooked Generation (1968) however is so crude that it probably has little future even in the camp category. The general theme is reminiscent of *Okefenokee*, made ten years earlier, with a vicious gang smuggling narcotics from Cuba and raping Seminole Indians. After killing the Cubans and a few of the coast guard, they are run down by the FBI before they can sell the dope. What else could be expected from a gang with members named Acid and Dum Dum?

Heroin in the Seventies

Use of psychoactive drugs attained epidemic proportions in the 1970s and the rapid spread of heroin addiction was alarming. A torrent of films concerned with smuggling, dealing, and addiction appeared in the first few years of the decade. Foreign films, drug abuse films, and films concentrating on the addicts are dealt with in later sections. Here we discuss those films centering on the drug trade.

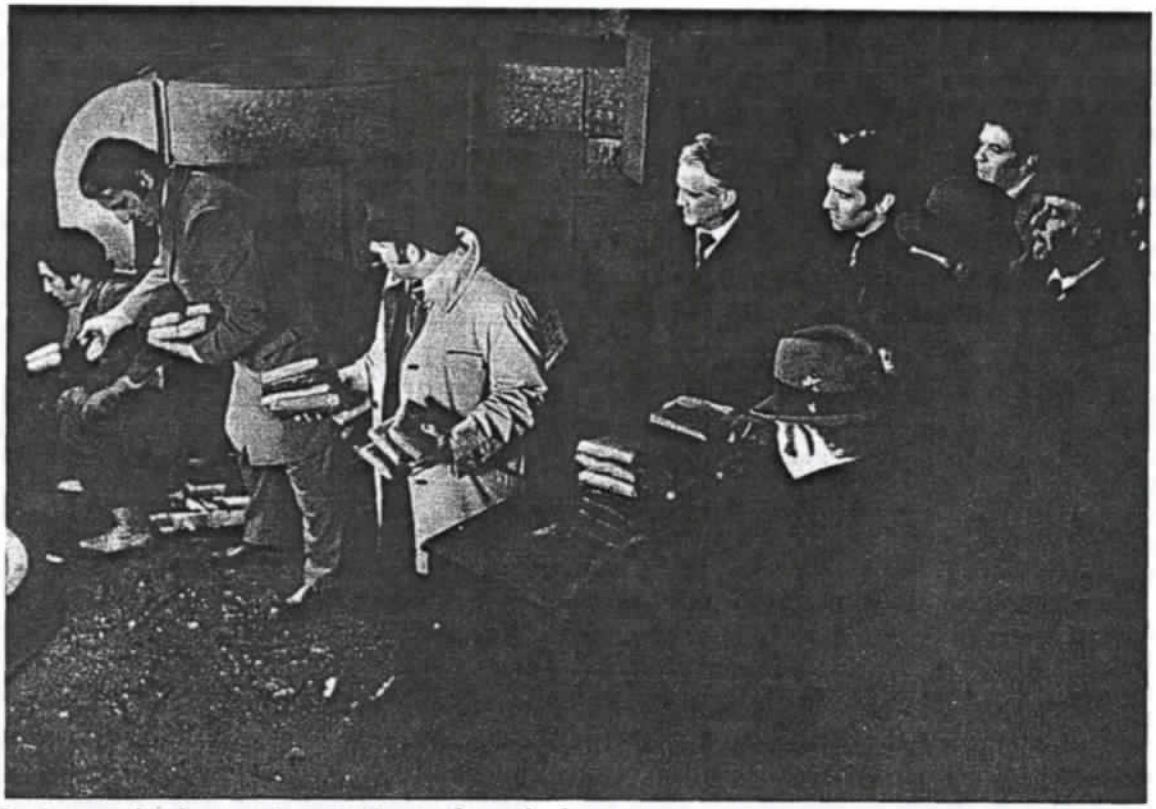
The most bizarre of these films is undoubtedly *Simon, King of the Witches* (1971), a weird mixture of black magic and narcotics. Andrew Prine stars as the warlock, who uses his powers to foil an unscrupulous narc trying to frame him on a heroin rap. Simon uses his magic mirror to kill the narc and discovers that commissioner Davies runs the city's narcotics racket. When his addict girl friend dies, Simon helps the cops bust pushers and is murdered with his ceremonial dagger by panicked addicts. *Clay Pigeon* (1971) also revolves about the big-city heroin racket and is similarly rambling and cluttered. Despite the good cast headed by Telly Savalas as a tough Los Angeles narc, the story of a disenchanted Vietnam veteran wandering around Los Angeles in search of a nasty drug pusher just does not come off. If these two films had been combined, they might have had something.

The year 1971 also marked the appearance of *The French Connection*, the most critically and commercially successful narcotics film to date. Excellent editing, screenplay, directing, and acting (Gene Hackman) provided Oscars in all these categories and a thoroughly engrossing film. The plot is quite simple—one of the film's strong points. The French are smuggling 120 pounds of heroin from Marseilles to New York in a Lincon Continental and the New York narcs, headed by "Popeye" Doyle (Hackman), are trying to stop them. Based on a real case that occurred in 1961, when officers Eddie Egan and Sonny Grosso (both have bit parts in the film) busted 120 pounds of heroin (much of it subsequently stolen from the New York Police Department's evidence vault), the film's many tidbits of big-city life are well done, but could have been as unexciting as they have been in the countless other pictures shot in New York. However, the breakneck pace of the film is sustained, and though the violence, sadism, racism, and bleakness of big-city life are repellent, no one can say he was bored.

Hackman's portrayal of the frustrated cop passing from dedication to almost psychopathic preoccupation with his quarry is the core of the film. Questions of realism aside, it is certainly one of the most gripping portraits of a crime buster on film. The second most striking feature of the movie is the fantastic car chase in which Hackman's would-be assassin attempts to escape on the elevated train. This scene is unquestionably the best ever done in film. The cops find the heroin in the car and the French mastermind Charnier (Fernando Rey) escapes, but such is the tremendous thrust of the film that these are almost irrelevant details. There is much that could be criticized (e.g., the Mafia is never mentioned; a near psychotic cop doing stunts like the car chase would be unlikely to remain on the case) but to what purpose? It is incontestably the best of its genre.

Also appearing in 1971 were *Dusty and Sweets McGee* and *The Panic in Needle Park*. Dealing was incidental to both these films, which concentrated on the lives of the addicts, and they will be discussed later. The focus in *McQ* (1974) was again on narcs and pushers, this time showcasing John Wayne as a cop pursuing heroin-dealing cops. The film begins as the Mafia rips off a large heroin seizure from the state narcotics office, only to find that it is sugar. After much smashing of cars and bodies he gets his man, and in a remarkable display of doublethink so typical of those who create and enforce the drug laws he remarks to fellow cops: "Lousy damn junk. There's a bar over there, let's get a drink."

Two television movies detailing the pursuit of pushers by narcs were released in 1975. *Crossfire* and *Strike Force* both vainly attempted to generate interest in their plots with the drug angle, but it has been done so many times before, since, and better. Canada has been a favored site for smuggling dope into the United States since the last century and several films surfaced (in addition to the previously mentioned *Affair with a Killer*) which made use of this fact. *The Heat Wave Lasted Four Days* (1974) was of Canadian origin. An adventuresome chap brings in a couple shipments of heroin from France, sells one in the United States and decides to double-cross the Mafia. Everything is cool (or as cool as it can be when one has crossed the mob) until a newsman

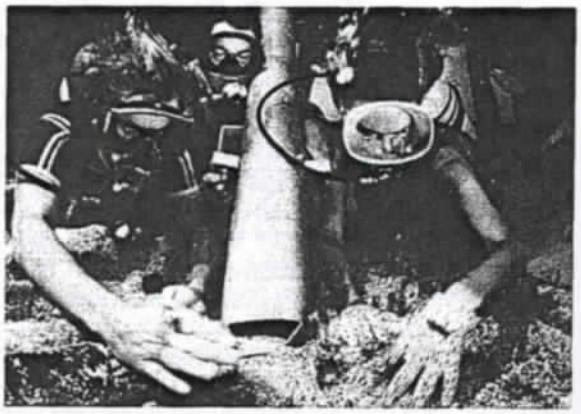


Heroin smugglers have great expectations as they unload the stash from a dismantled car in *The French Connection* (1971). Good production values and a great chase scene made it the biggest box office hit in the history of drug films.

gets his picture. Thereafter it gets confusing with various parties blackmailing others and bodies falling by the way. The newsman winds up being nabbed by customs with a film can full of flour—we never learn who ended up with the heroin.

The Deadly Game (1976), the second of the television Serpico movies, involves some unlikely dope dealing. One dealer is borrowing five grand from a loan shark to buy a kilo of heroin in Toronto. Later, three kilos of heroin are being bought for twenty grand in order to trade them for ten pounds of "Bolivian flake" (cocaine) which is supposed to fetch fifty g's on the west coast. All these prices are much too low, but perhaps the script had been sitting around quite a while.

Joe Baker plays a Los Angeles cop after a narcotics ring in the 1975 television movie *Mitchell* and Robert Mitchum stars in the international drug smuggling adventure *The Amsterdam Kill* (1978). *Who'll Stop the Rain?* (1978) is yet another story of a Vietnam veteran involved in heroin smuggling with the modern twist of portraying the narcs as the villains. Narcs and drug rings also feature in *Scorchy* (1976) and *Exit the Dragon, Enter the Tiger* (1977). An underwater



Nick Nolte and Jacqueline Bisset harvest an underwater drug cache in *The Deep* (1977).

A black heroin dealer manages boxers as a front but the cops get his tire full of smack anyway in *Hammer* (1972).

stash of morphine ampuls is the focus of attention in *The Deep* (1977).

Black Narcs and White Smack

Since control of the narcotics traffic in the ghetto gradually shifted into black hands, black narcs became commonplace and it was inevitable that blacks should be featured as the stars of heroin films. Sidney Poitier, repeating his successful role as detective Virgil Tibbs from *In the Heat of the Night* stars in *They Call Me Mr. Tibbs* (1970). A weak sequel, the latter film concerns the investigation of the murder of a prostitute whose landlord runs a narcotics ring. Poitier repeated the role again the next year in *The Organization*, in which the unlikely plot concerns a motley group of hippies, Chinese women, and so on who decide to fight the drug traffic on their own. The group seizes $4 million in heroin from the mob and uses it as a lever to enlist Tibbs's aid. The mob merely makes a coded call to Turkey to increase opium production and sends over a few men to help. After a narc commits suicide, the mob kills some vigilantes and Tibbs tracks down some high-level dealers. Before he can move on them, the group is killed by snipers and the heroin traffic continues as before.

Shaft (1971) was the most successful of the black narc films. Richard Roundtree stars as a detective who is hired to find the kidnapped daughter of a black Harlem narcotics czar who had been giving the Mafia too much competition. The film often rings false, but it made great box office and the imitations came fast and sloppy. *Top of the Heap* (1972) gave us Christopher St. John as a pusher-basher with an addict girl friend. *Black Gunn* (1972) featured former football star Jim Brown after a mob of black dope dealers who killed his brother, whereas *Gordon's War* (1973) shifts the job to veteran Ossie Davis who is mad because he returns to find his wife hooked on drugs. Godfrey Cambridge and Raymond St. Jacques repeated their roles as Harlem cops in *Cotton Comes to Harlem* in another 1972 entry *Come Back, Charleston Blue*. This weak sequel has the duo foiling the attempt of a black to take over the dope racket from the Mafia. The film's writer must have foreseen the dismal product—the dope is transported in turkeys. When his daughter dies of an overdose in *Hit* (1973), a black narc (Billy Dee Williams) does not mess with the small fry. He goes to Marseilles to attack the white scourge at its source in this surprisingly good effort. It's certainly more interesting then *Shaft* or *French Connection II*.

With the mania for women's lib, black power, and the martial arts, it was also inevitable that we should be treated to a series of black female narcs serving up karate chops in all directions. *Coffy* (1973), *Foxy Brown* (1974), *Cleopatra Jones* (1973), *Get Christie Love* (1974, a television movie), and *Report to the Commissioner* (1973) have enough similarities that one could almost splice scenes from one film into any of the others. *Honky* (1972) had a novel twist—the lady is a pusher rather than a narc. The field of black drug films was already getting so cluttered that in the same year there appeared a jumble of sex, dope, and violence about a black male heroin dealer who managed boxers for a front (*Hammer*).

Odds and Ends

The nasty white powder turns up in bit parts in many recent films. The best known of these is *The Godfather* (1972). Marlon Brando, as the Mafia kingpin, is shot because he regards the narcotics trade as "a dirty business" and refuses to finance it. Charles Bronson has a trying time with this same organization after busting a drug dealer in *Stone Killer* (1973), and Serpico is shot during a narcotics bust in *Serpico* (1973). Drugs are no problem for crooked narc Murphy in *Dealing* (1972); he just sells them to his favorite pusher. A male smuggler accompanying *The Romantic Englishwoman* (1975) has a different kind of problem; he hides his dope in a rainpipe just before a storm. The corrupt army sergeant in *Dollars* (1971) has

no problems dealing, but his safe-deposit box full of cash is ripped off by Warren Beatty.

Prime Cut (1972) returns to the hoary theme of drugs and white slavery, with Lee Marvin as the cop wading through ankle-deep blood and bad script to stop it. Eddie Egan, the cop whose career formed the basis for *The French Connection* also has a cameo role in this film. Master thief Sean Connery runs into problems in *The Anderson Tapes* (1971) when narcs tap his phone because his young assistant was once busted for dope. The television movie *Incident on a Dark Street* (1973) concentrates on the good-guy lawyers who defend people who are busted for drugs. In the highly forgettable *Private Duty Nurses* (1972) a pusher whose client dies of an overdose makes a foray into the hospital to eliminate evidence. *Murder or Mercy* (1974) is a made-for-television medical melodrama in which a doctor euthanizes his cancer-riddled wife with morphine.

Morphine also was a focus of interest in Luis Buñuel's remarkable *Exterminating Angel* (Mexican, 1962), in which a cancer victim uses morphine until it is stolen by an incestuous brother and sister. Morphine proved the downfall of Donovan's brain after a vengeful housemaid pours it in the nutrient solution in *The Lady and the Monster* (1944). The drug even pops up in *Abominable Snowman* (1957). It is used to keep an injured man quiet.

In *Sweet Smell of Success* (1957) Burt Lancaster is a power-hungry columnist who has an assistant (Tony Curtis) plant dope on a decent young jazz guitarist because his sister wants to marry the lad (he fails and young love triumphs). A narcotics smuggling ring in the Philippines is the center of attention in the American-Filipino production *The Secret of the Sacred Forest* (1970). Then there is the candidate for the most bizarre film in which heroin has figured—Argentina's *Placer Sangriento* (1967), shown in the United States as *The Deadly Organ*. The following account from an Argentine film catalog tells the story, except for the detail that the heroin acts as an aphrodisiac, leading the women to gratify the masked man's desires before their untimely expirations.

> Producer Orestes Trucco and director Emilio Vieyra have specialised lately in pictures intended for a market very peculiar in its social and psychological shades. Their lurid stories are seasoned by exciting women, sinister men, detectives, sex and some bits of truculence. They are usually released first in the United States, then in Argentina. Another of its common ingredients is stripper Gloria Prat in the leading character and in generous anatomic displays. In this case the episodes take place at the beautiful Uruguayan sea resort of Punta Ballena, near Punta del Este, where a sinister person, whose face is hidden with a horrible mask, lures women with a strange melody, injects them with *heroin* and then kills them nailing the hypodermic needle into their breasts. The disappearance of one of the victims alerts police, an inspector and a detective in particular, who discover revealing details while investigating among some suspects. They finally decide to use a girl who seemingly resists the criminal's spell and with her help they unmask the pathological killer.

Tracking down drug smugglers in *Flying Squad* (1940), one of three British films based on the Edgar Wallace novel.

The London Connection

The traffic in narcotics has always been just as intriguing to British filmmakers as to their American counterparts. Curiously, the frequency of appearance of drug themes in British sound films parallels closely that in American productions, with a few made during the early 1930s and then almost none until the late 1940s. It is hard to believe that this was the result of specifically American influence, and it seems likely that the Depression, the tensions leading to World War II, and the war and its aftermath were responsible for this phenomenon. This leads to second thoughts about the role of official censorship in the United States (H. J. Anslinger and the Motion

Picture Production Code) in eliminating drug references.

The simple plot of Edgar Wallace's *The Flying Squad* (girl unmasks her employer as the drug smuggler who killed her brother) was made the basis for films of that title in 1929, 1932, and 1940 (this last with Jack Hawkins). Another drug ring filled the arms of addicts in *After Many Years* (1930), and Otto Kruger portrayed a doctor who moonlighted as a blackmailer and morphia dealer in *Living Dangerously* (1936). With the sole exception of the remake of *The Flying Squad* (1940), no drug film appeared in England until 1947 when *They Made Me a Fugitive* was released. Released in the United States as *I Became a Criminal*, it tells the story of a crook who is framed by Soho drug peddlers and breaks out of jail to avenge himself on them. The next year the propagandistic British-French *Account Settled*, a silent drama of a French drug smuggler's elimination, was released.

Home to Danger, the story of a drug dealer who engages in sundry naughty acts like trying to kill his dead partner's daughter, appeared in 1951, and Britain has produced at least one drug film in every year since. *Judgement Deferred* (1952) repeated the theme of *They Made Me a Fugitive* in tedious fashion, but *The Broken Horseshoe* (1953) put together a reasonably good cast, script, and director (Martyn Webster) to generate a tolerable nares-chase-dope-ring melodrama. *Malaga* (1954), shown in the United States as *Fire Over Africa*, starred Maureen O'Hara as an American narc working in Tangier, but even her beautiful red hair is not enough to distract us from the dreary plot. However, one might be driven to distraction if forced to watch *Late Night Final* (1954) all the way through. Probably a rewrite of the classic cocaine smuggling film *Down River*, this film follows the adventures of a drug smuggler who is disguised as a cripple.

In British films one often finds amateurs, rather than narcs, who destroy drug rings. Thus we see in this role a female psychiatrist (*The Brain Machine*, 1955), a junkman and his grandson (*The Heart Within*, 1957) a bus driver (*Johnny, You're Wanted*, 1956), a reporter (*Assignment Redhead*, 1957), a reporter's brother (*Undercover Girl*, 1958), a lawyer (*Feet of Clay*, 1960), a soldier of fortune (*Port of Revenge*, 1961), and a singer teamed up with a United States army deserter (*Subway in the Sky*, 1959).

Professional narcs took over in *Forbidden Cargo* (1954) and in *Pickup Alley* (1957). In the former a customs agent pursues French drug smugglers in a coastal town in a tolerably interesting comedy-melodrama. *Pickup Alley* finds narc Victor Mature chasing around Europe after Trevor Howard, Anita Ekberg, and seventy kilos of smack. Mature is weary of the narc job: "Same filthy thing day in and day out," but he is assigned to help Interpol, so he goes to Naples to try to find the $3 million in heroin. Tracing the dope to the Rio Allegro, the narcs spend four days tearing the ship apart but cannot find the stash. When the ship gets to London, Howard cuts the back of a refrigerator open to remove his dope but soon after that Mature shoots him down. The editing and dialogue are not bad but the plot is occasionally hazy. The film is satisfactory entertainment, especially the scenes with Bonar Colleano as the informant.

Booby Trap also appeared in 1957 and was a cinematic rarity—a comedy involving a drug smuggler. The title refers to a time bomb pen that is carried around by a dealer in illicit drugs. However, the next British drug film was deadly serious. Based on an old Edgar Wallace novel, *The Devil's Daffodil* (1961) was also filmed in a German version (*Das Geheimnis der Gelben Narzissen*). Horror star Christopher Lee plays Chinese detective Ling Chu, helping Scotland Yard in defeating a dope ring that is smuggling heroin from Hong Kong in the stems of artificial daffodils. The film sustains interest, but only barely. The same is true for *Girl in the Headlines* (1963), released in the United States as *The Model Murder Case*, in which a London police inspector cracks a narcotics gang while tracking down a murderer.

The next few years brought some drug melodramas that only desperation could force anyone to watch. *Incident at Midnight* (1963) starred Anton Diffring as an ex-Nazi drug trafficker in yet another Edgar Wallace drug tale. Anton and his pals knock over a drug warehouse but soon run afoul of a female narc. The rest of the action takes place in a drugstore where addicts get their heroin prescriptions filled. There are lots of customers with sunglasses, though it is late at night, and one doctor-turned-junker comments: "So many women wear them now to conceal the condition of their eyes." *Mozambique* (1965) had another down-and-out American pilot getting involved with smugglers, but all the dope smuggling seems to have occurred before the film begins. *Death Is a Woman* (1966), often shown in the United States as *Love Is a Woman*, follows a gang on Malta who conceal their heroin underwater. Undercover narcs follow the trail of dope and murder to an unscrupulous woman who has been

eliminating her partners. At the bottom of the barrel we find evangelist Billy Graham as a preacher converting junkies to Jesus in *Two a Penny* (1967), which is even worse than Pat Boone in *The Cross and the Switchblade*.

The Strange Affair (1968) is an apt description of the film, though the title refers to the main character Peter Strange (Michael York). Peter fails his exam in philosophy and becomes a London narc. He tries to help his superior nail a former cop, Quince, who is now dealing drugs, but it all goes awry and Peter winds up in jail for planting drugs on Quince. Susan George as Fred, Peter's wild hippie girl friend, provides some scene-stealing diversion along the way.

The scenery steals the show in *Puppet on a Chain* (1970), the only heroin movie with a speedboat chase. An American narc helps police annoy heroin dealers in Amsterdam. The chief's grown daughter babbles like a child and carries around dolls. "She was introduced to heroin when sixteen and was soon taking five grains a day—then she overdosed and needed an oxygen tent. Now she has a mental age of four or five." But it later happens that the kid's just faking and she's transporting heroin in her dolls. The gang ships the dope to the Netherlands in dolls, Bibles, and clock pendulums en route to the United States. In an apparent swipe at the lenient drug policies of the Netherlands, the chief shows the narc a room full of young people smoking hash and remarks: "In a year, three of ten will be dead." One might say the same of this sort of drug film.

Albert Finney does a good job as an amateur detective who stumbles on a London bookstore used for heroin smuggling and gun running in *Gumshoe* (1971).

The Continental Connection

In Europe, as in the United States and Britain, the period from the mid-1930s to the early 1950s had very few films with drug themes. Germany's *Schlussakkord* (1936), in which Charlotte Garvenberg plays a conductor's wife who commits suicide with morphine, is one of the few. In 1953 Italy produced two films about narcotics—*Three Forbidden Stories* and *The Island Monster* (*Il Mostro Dell'Isole*), the latter starring Boris Karloff as the head of a drug ring. A narcotics dealer was among the personnel in the French-Italian *Palace of Nudes* (1954).

The old reliable dope and white slavery theme is squeezed again in *The House on the Waterfront* (1955, French), originally titled *Port de Désir*. Monsieur Black scuttles a ship along with one of his girls when he discovers that its cargo of drugs is under suspicion. One critic summed it up as "an errant bit of melodramatic flapdoodle." A drug-addicted prostitute assists Interpol in cornering white slavers in *La Prostitution* (1959), shown in Britain as *The White Slavers*. West Germany's *Kiss the Dead* (1958) again linked narcotics and white slavers and in *Operation Hong Kong* (1964) the dope was smuggled by airplanes.

American expatriate Eddie Constantine and Juliette Greco headed the cast of the French *Man and Child* (1957), a story of a dope ring that dabbles in kidnapping. Eddie starred also as the skipper of a dope-laden luxury liner in *Dishonorable Discharge* (1958), a French version of Hemingway's *To Have and Have Not*, and as an Interpol narc working in Paris in the Italian *Destination Fury* (1964). Another Italian company emitted its own secret-agent-gets-the-goods-on-dope-smugglers film the same year with *None But the Lonely Spy*.

The comic French-Italian *Riff Raff Girls* (1959, *Du Rififi Chez les Femmes*) employed a waterfront dope racket as a leitmotif. Postwar French drug traffic is thematic to *Disorder and the Night* (1958, French), *Incident in Saigon* (1960, French), *Trapped in Tangiers* (1960, Italian), *Blood and Black Lace* (1964, French-Italian-W. German) *La Horse* (1969, French), and *Symphony for a Massacre* (1963, French). *Symphony for a Massacre*, a slick crime drama directed by Jacques Deray (*Borsalino*), is about a half-million-dollar narcotic deal that goes awry as a result of double-crossing. *L'Abominable Homme des Douanes* (1962, French), based on Clarence Neff's novel, has a nifty twist—a customs man gets involved with the dope smugglers. The French-Italian *Le Corniaud* (*The Sucker*, 1965) is a comedy about a nice-but-dumb lad who drives a Cadillac from Naples to Bordeaux unaware that it has solid gold bumpers and a heroin stash. The Italian-French production *Cold Sweat* (1971) starred James Mason as the head of a gang that attempts to blackmail Charles Bronson into smuggling heroin from Marseilles. Finally, there is the Italian *Morire Gratis* (1968) about a young sculptor who is "impotent, alcoholic, and drugged" and who smuggles heroin from Rome to Paris inside a statue, only to be murdered by the gang on arrival.

Italy and Spain collaborated on *Web of Violence* (1966) and *The Narco Men* (1968). Based on the Sergio Donati novel *The Other Side of the*

Moon, Web of Violence is an exercise in tedium with narcotics emerging only at the end. The flashy credits are the only thing of interest and viewers are likely to echo the sentiments of the character who remarks at the finish: "I wish I could feel some satisfaction from all this." Tom Tryon is an ex-Interpol agent on the track of Italian heroin in *The Narco Men*. The syndicate has promised to cut him in if he can help recover the stolen heroin, but when he finally gets it, his hippie girl friend is killed and he decides to turn it over to Interpol. The film is sleazy gangster pulp with Mediterranean scenery as its only saving virtue.

A record company executive doubles as a heroin dealer in *Detective Belli* (1969, Italian), and Italy's most recent smackfest *Blood, Sweat and Fear* (1975) casts Lee J. Cobb as an industrialist under suspicion for dope dealing. In the latter film, Clint Eastwood look-alike and act-alike Franco Gasparri is the smooth but violent narc. He stops an ambulance and exposes the old heroin-in-oxygen-bottle trick. In between smashing evil dopers, he has the kindness and patience to wean a pretty young woman from heroin. Unfortunately, what little charm the film may have possessed is buried under the sloppy editing and dubbing. Ben Gazzara is an American narc infiltrating a drug ring in *Sicilian Connection* (1975, Italian). The 1972 French film *Dirty Money* is a well-done tale of bank robbery and drug traffic.

Just for novelty, several films are set in Turkey. The FBI finds a double for a drug chieftain in the cornball European collaboration *From Istanbul—Orders to Kill* (1965). In the West German *There Is Still Room in Hell* (1961), American smugglers go looking for Ismail, a Turkish dealer who double-crossed them. Everyone gets his due as smugglers, dealers, and double-crossers pump lead into one another. Another West German entry varies the theme slightly. Kai Fischer plays Olga, an addict singer at a cabaret that fronts for a narcotics-massage-espionage operation, in *$100 a Night* (*Mädchen für die Mambo Bar*, 1968). *The Cop* (1970, French-Italian) also revolves around the action at a nightclub serving as a front for a drug operation.

Alienated youth indulging in narcotics dealing and dabbling are the subject of *The Deserter* (Denmark, 1971) and *More* (Luxembourg, 1969). Ex-Nazi Wolf sells dope from his Mediterranean hotel and eventually involves the young hero and heroine in *More*, of which more is said in the discussion of cinematic portraits of addiction. A Greek heroin smuggler is incidental to the plot of *For Your Eyes Only* (1981).

The Tokyo Connection

A small underworld of drug users existed in prewar Japan, but most of the narcotics traffic involved smuggling heroin, morphine, and cocaine from Japan to the United States and Asia. As usual, war and its aftermath resulted in a considerable increase in narcotics use. Also, the extremely rapid Westernization of Japan after World War II was inevitably attended with a dramatic rise in alcoholism, drug abuse, and ulcers. It was not long before drug addicts and the narcotics traffic became frequent in Japanese films.

One of renowned director Kenji Mizoguchi's early films *Women of the Night* (1948) is a story of street life in postwar Japan. The film centers about two sisters, one a taxi dancer and the other the mistress of a drug smuggler. An unusual film combining antidrug and antiatom bomb propaganda in a science fiction setting is *The H Man* (1958). One of many science fiction films of director Inoshiro Honda, the central character of the film is a deadly manlike being made of water, which evolved as a result of H-bomb tests. The creature hides in the Tokyo sewers where a narcotics dealer keeps his heroin supply. The dealer and his stash are incinerated when the sewers are flooded with flaming gasoline to exterminate the H Man.

In 1963, a Japanese documentary *Women, Oh! Women* displayed night life in the big city, part of which involved the addicts' sordid scenes. In the same year, *The Weed of Crime* (*Anokugai no Kiba*) was released. Since this is the only film in this section that has been dubbed in English and made available for American television, the plot

The Tokyo connection—Japanese gangsters dealing dope in *Weed of Crime* (1963).

The familiar theme of prostitutes enslaved by drugs in the 1966 Japanese film *Hentai* (*Abnormal*).

details given by a Japanese film catalog are presented in order to give some idea of the frantic and brutal atmosphere of the low-budget Japanese crime flick.

A government narcotics investigator, Natsuo Kizaki, arrives at Takatsu City disguised as a hoodlum. His mission: to crush, through securing unshakable evidence, two underground rings thriving on gambling, and narcotics traffic. But Kizaki has a secondary, more personal task to perform: to find his younger brother Yuji, an addict who is believed to be living in Takatsu.

One of the two gangster organizations is headed by Tsuda, who smuggles dope from Hong Kong, and the other by Hariya, engaged in distribution.

Iwama and Jiro, both Tsuda's men, disappear after cheating Hariya out of 30 million yen. Hariya immediately believes the deal was engineered by Tsuda himself, but he cannot prove it unless he catches either Jiro or Iwama.

Meanwhile, Kizaki, using fake narcotics as his passport, joins Hariya's gang calling himself Ken. Iwama's girl friend is immediately attracted by him and confides her desire to break away from the gang and make a fresh start in life.

Eventually, Hariya's men catch Jiro, who under brutal torture, confesses he plotted and executed the fraud.

Kizaki, then, finds his brother, who is working for Tsuda in a gamblers' den. The detective casually invites his brother to a game, but they cannot escape Tsuda's suspicious eyes, and he seizes the sweetheart of the brother and forces her to reveal Kizaki's identity.

Meanwhile Jiro kills Iwama when he tries to escape with the 30 million and Tsuda kills Jiro.

When the two gangs meet for a showdown, Kizaki and the police are ready for them.

Three opium smuggling films then appeared, which have already been mentioned (*Kenshin*, 1962, *Gang vs. Gang*, 1962, and *Operation Mad Dog*, 1964). Akira Kurosawa's *High and Low*

(1962), starring Toshiro Mifune is undoubtedly the highest-quality film discussed in this section. The story concerns a kidnapping and two of the villains are later murdered with narcotics overdoses by a hospital intern. The film has nothing more to do with drugs, but it is a fine, nonsamurai role for Mifune.

Pale Flower (1964), a story of intergang rivalry, has an addict and a chippie (occasional user) among its protagonists. Corrupt officials are involved with smugglers in two other "flower films"—*Kill the Night Rose* (1966, *Yoru no Bara o Kese*) and *The Scarlet Rose* (1964). A liberal politician is the head of a dope ring in the former and a jazz pianist turned narc falls for a beautiful singer and joins the gang in the latter. Another turncoat narc arranges for the escape of a dope gang in *Red Handkerchief* (1964).

The Japanese temporarily took over much of the Chinese opium trade and the production of morphine and heroin as a result of the Sino-Japanese War. Only one film (*Operation Mad Dog*, (1964) seems to have taken this as a theme, perhaps because it would require dealing with atrocities that are better forgotten. The parallels presented by the later American occupation of Vietnam and the drug traffic there are obvious, and the latter situation has also been ignored by filmmakers. *The Red Angel* (1966) was set in Tientsin in 1939, but the only drug connection of the film is a morphine-addicted military doctor, and its main focus is on a frequent Japanese approach to erotism: black humor, sadomasochism, and blood. Most of these films exploit these erotic elements to some degree along with the drugs and violence. *The Love Robots* (1965) are young women who are abducted and conditioned by drugs and hypnotism. This film and *Hentai* (1966), sometimes shown as *Abnormal*, have played on foreign sex-exploitation circuits. The narcotics gang in *Hentai* abducts, rapes, tortures, addicts, and prostitutes young women, and its leader eventually finds that his daughter is one of the victims.

Narcs were kept busy pursuing dope gangs in *Rub Out the Past* (*Nippon Ankokugai, 1966*), *A Man from Abashiri Jail* (*Abashiri Bangaichi Hokkai-hen*, 1966), *An Invitation to Jail* (*Kangoku eno Shotai*, 1967), with help from the FBI, *Diamond of the Andes* (*Sekido o Kokeru Otoko*, 1968), this time in Rio de Janeiro!, *The Second Bullet* (*Nihatsume wa Jigoku-iki Daze*, 1965?), *Harbor Light, Yokohama* (1968), and in *Resurrection of the Beast* (*Yaju no Fukkatsu*, 1969).

Popular Japanese television star Shinichi Chiba cracks the drug syndicate in *A Kamikaze Cop* (*Yakuga Deka*, 1970). This film is one of the few to explore the delicate subject of the connections between Japanese and American drug traffickers. The president of a pharmaceutical company trades in narcotics to establish his business in *City of Beasts* (*Yaju Toshi*, 1970) and the daughter of a drug-company president is kidnapped by a gang of women in order to ransom her for 200 million yen worth of drugs in *Queen Bee Strikes Again* (1971). Sad tales of girls going astray are also thematic in *Tokyo Bad Girls* (1970). The girls leave the reformatory to join a gang dealing narcotics and they soon return to the slammer. A woman gets into difficulties when she steals dope from a hospital in *She Beasts' Warm Bodies* (1972). *The Underground Syndicate* (1970) presents an interesting, if unbelievable, variation—a man tries to trade money for narcotics in order to get money to help Tokyo streetwalkers! *Tiger Force* (1975) is about morphine smugglers in Manila. Morphine and money change hands in the first few minutes and it is nonstop grade-D karate and machine-gun action thereafter.

Narcotics appear incidentally in such flaccid efforts as *Appointment with Danger* (1970s, they cause amnesia), *Heat Wave Island* (1969, a woman uses them as a murder weapon), *A Lone Assassin* (1972, a man finds that his sister is a drug addict), and *Human Target* (1971, a drug smuggler hires a killer).

Clearly, Japanese drug films show a singular lack of inventiveness, competence, and taste. Since the Japanese produce many extremely fine films, this is probably the result of the exploitative, low-budget nature of these efforts. Drugs are a huge problem in Japan and undoubtedly some Japanese films will deal with this area in a more sophisticated way. Also, there are the effects of underground Japanese filmmakers to be considered, but information on them is difficult to obtain. Meanwhile, *Attack of the Mushroom People* (1963) remains the most entertaining drug-related Japanese film.

The Genital Connection

During the 1960s, pornographic films grew into a major industry in the Western world. Exploitation is the name of the game and such elements as homosexuality, sadomasochism, perversion, and drugs are routinely included. Films containing scenes of marijuana and LSD use are discussed

elsewhere. The films included here are mostly low-budget independent productions, but many films discussed in other sections are just as sleazy and exploitative.

In these films, as in life, heroin is frequently associated with prostitution. A racketeer seduces a young woman into prostitution and drug addiction in episode three of *The Devil and the Ten Commandments* (1962, French-Italian). A vice lord lures women to Caracas, drugs them, and forces them into prostitution in the Argentinean-Venezuelan film *The Pink Pussy* (1966) also shown as *Where Sin Lives*, and *Acosada*. *Wild, Wild Girl* (1965) follows a woman as she slides from virtue to prostitution to heroin to the railroad tracks, and *Animal Love* (1969) shows young Mara as she experiences extramarital love, marijuana, orgies with dope addicts, and finally, happy love with her husband on a leopardskin coat.

Olga Petroff lures young women fresh from prison to her dungeon in New York's Chinatown where she conditions them for seventy-two hours until they are addicted and ready to become prostitutes in *White Slaves of Chinatown* (1964), also shown as *Slaves of Chinatown* and *White Slaves*. *Olga's Girls* (1964), probably the same as *Olga's House of Shame* and a sequel to the previous film, has nearly the same plot, except that instead of "the mob" supplying the dope and backing the operation, it is the Communists. "Mama Lupo" forces women into prostitution via heroin in *Invitation to Ruin* (1968). A new twist is provided by *The Master Beater* (1969) in which Hawk induces men to sell their wives into prostitution for a bag of dope, after which he indulges his sadism by inflicting pain and death. This remarkable chunk of celluloid is also known as *The Dirty Hawk* and *Hot Sex Tramp*.

Ginger (1971) features a female undercover agent who infiltrates a gang dealing in drugs and prostitution. But, she is unmasked and forced into addiction. *Hip, Hot and 21* (1967) has the usual gang of addicts and prostitutes, but bisexual, drug-dealing prostitutes are added for spice. *The Filth Shop* (1969) is unusual in that it is a pornographic film that exposes the pornography business. A syndicate is shown drugging women in order to use them in pornography.

The novelty of showing a prostitute getting hooked on dope supplied by a customer is the only interesting aspect of *Villa-Vennely: Home of Copenhagen Call Girls* (1964), unless the sound track by such famous groups as The Sharks and The Weedons is found appealing. Some films show the drug use as primary and the prostitution as a consequence of a costly drug habit. *To Turn a Trick* (1967), *Spiked Heels and Black Nylons* (1967), and *The Evil Pleasure* (1966) dwell on this theme. The latter, also known as *Pornografi*, depicts San Francisco's Haight-Ashbury district as the home of lesbians, shoe fetishists, addicted prostitutes, pornographers, freaked-out hippies, sadists, and masochists—just about every type that might have anything to do with sexuality. Another variation is presented in *Franchesca's Sexual Whirlpool* (1967)—she prostitutes herself to keep her man in heroin. Franchesca eventually gets disgusted and leaves, possibly before the last of the suckers who paid to see this mess.

Other weird angles are presented by such epics as *Walk the Walk* (1970) and *An Angle of Love* (1968). The former, another bizarre piece from celluloid junkman Kroger Babb, exhibits a black theology student's struggles with dope (he loses and commits suicide). Gloria, a "virgin tease," is raped by an addict and later gets revenge when she kills him as she climaxes in *An Angle of Love*. Shown also as *An Angel of Love*, the film would have made even de Sade envious. In another strange film, addict Rita gets annoyed by Johnny and she and Johnny's lady slip him LSD and help him to fall out a window in *The Filthy Five* (1968). Carla permits the attentions of a Yugoslavian pharmacist to get morphine for an injured friend in *The Sex of Angels* (1968, Italian-W. German).

Acid and heroin also play a duet in *Mr. Mari's Girls* (1967)—addict Stella's response to acid is an erotic dance. A Hollywood producer doubles as a drug pusher and procurer in *Peddlers of Sin* (*Peddlers of Evil*, 1966), but the racketeers in *Prowl Girls* (1968) only use heroin as a murder weapon. The erotic maneuverings in *The Initiation* (1968) are quelled by the bust of a Vietnam veteran junkie, and sheer boredom brings down the curtain on pushers and prostitutes alike in *Don't Just Lay There* (1970). A medical facade for dope use by the doctor and "patients" is present in *Let's Play Doctor* (1964).

One of the newer trends in the sexual cinema appears in *Hang Loose* (1970), with its male addict hustler, and masculine addiction again surfaces in *Satan in High Heels* (1962) and *The Student Nurses* (1970).

The accent is on the heroin trade in such offerings as *Sign of Aquarius* (1970), in which the mob tries to obliterate a hippie who refuses to push dope, *The Kill* (1968), which concerns assorted sleazy hustlers competing for a $1 million heroin

A prostitute gets hooked on her customers' dope in *Villa Vennely* (1964).

delivery, and *Satan's Bed* (1965). The latter follows sadistic punks Dip, Snake, and Angel on their spree of heroin-inspired violence. When their pusher gives up dealing to marry Ito (played by Japanese singer and wife of John Lennon, Yoko Ono), they kidnap and rape her to preserve their connection. Another famous face appears in a third-rate heroin opera *The Naked Zoo* (1970). Rita Hayworth plays Mrs. Golden, the wife of a millionaire who becomes entangled with a young Miami artist who eliminates her blackmail threats with an overdose of heroin. A Florida heroin dealer posing as an art collecter tries to overdose a narc in *Franchette: Les Intrigues* (1969).

A degenerate bunch charters a yacht and becomes embroiled in orgies, murders, and heroin smuggling in another Sam Lake trashy film *Scorpio '70* (*Black Revenge*, 1970). Eddie Stud persuades Fanny Bang to bring in a million-dollars' worth of heroin from Mexico in *The Hot Bed* (1965). The seaways are getting crowded as Rich brings in a ship full of heroin in *Weekend with the Babysitter* (1970). Poor Rich gets ripped off by a motorcycle gang and winds up without heroin, women, or song. Russ Tamblyn (*High School Confidential*) and horror star Lon Chaney, Jr., took another and perhaps final step down the ladder with *The Female Bunch* (1972). A lurid, softcore, sadomasochistic film about a female gang that smuggles heroin from Mexico, it features ("stars" is definitely inapplicable) Tamblyn as a hippie and Chaney as the only male on an all-female ranch. As difficult as it may be, *The Jesus Trip* (1971) manages to be even sleazier than the preceding by dragging a nun into drugs, sex, and violence. The drugs are stashed in the handlebars, and when the bikers are pursued by an Arizona state trooper (played by Billy Green Bush), they kidnap a nun. But the gang is really innocent and they are also pursued by a helicopter belonging to the gang that stashed the heroin in the bikes. The whole mob winds up in a church where the "good" gang destroys the heroin to demonstrate their innocence, but "Bush" rounds out the plot by shooting a couple anyway.

Most of these films have nothing to say that has not been said much better in more expensive pro-

ductions, but the amateurs (sometimes including real-life prostitutes and junkies and their associates) involved in these films sometimes give them a poignancy that usually escapes the slicker productions. When a few decades have passed they may be valued not for the stories they intended to tell but for the insights they provide into the psyches of the people who made them. These are often more visible in the cheap exploitation flicks where artistic pretensions and elaborate production do not obscure the human elements.

8 Hopheads

Early Shots

In previous sections we have examined films that concentrated on the manufacture, smuggling, and selling of narcotics. It is time to turn our attention to the rich and varied film literature on the addicts themselves. As has been mentioned, the arrival of censorship in the 1930s, along with the Depression and the approach of war, largely eliminated the detailed cinematic examination of drug addiction that was often seen in silent films. However, a few films of this period depicted addiction minus the graphic details included in such classics as *The Devil's Needle* (1916) or *The Pace That Kills* (1928).

Boris Karloff appeared in several of these films with a dope angle. He has a cameo role near the beginning of *The Mad Genius* (1931), which stars John Barrymore as Tsarakov, the mad ballet master. Luis Alberni plays Tsarakov's drug-crazed assistant who steals dope from Tsarakov's room. Just what Tsarakov was doing with the dope is never clear, but presumably he also used it. Alberni is transformed into a violent maniac by this drug, a rare response to narcotics, but one that still persists in the public mind. A careful viewing of Karloff's classic role in *Frankenstein* (1931) may lead to the conviction that the monster's murderous rampage was the result of narcotics withdrawal. Dr. Frankenstein sedates the monster with injections of one-half-grain solution and later writes in his diary that the monster requires more and more of the drug and seems to be developing a resistance. Morphine or heroin injections are quite compatible with these data.

John Barrymore as Tsarakov, the mad ballet master, has his drugs stolen by a dope fiend who becomes violent after using them in *The Mad Genius* (1931).

Windy City junkers shared the spotlight with crime in *Discarded Lovers* (1932), a story of old Chicago. One of the endless series of films about Sherlock Holmes, *The Adventure of the Missing Rembrandt* (1932) revolves around a drug-addicted artist who turns to thievery and blackmail. Although the first filming of Faulkner's *Sanctuary* seems to have omitted the dope motif (*The Story of Temple Drake*, 1933), several other films of that year were less inhibited. "You're Getting to Be a Habit with Me" was a

Was the monster's rampage due to narcotics withdrawal? Here Boris Karloff eagerly reaches for his drugged drink. In *Frankenstein* (1931) Dr. Frankenstein sedates the monster with injections, and notes the need for increasing doses.

smashing number in Busby Berkeley's definitive musical *Forty-second Street* (1933). "I become addicted to your charms as you sink into my arms—you're getting to be a habit with me" run the lyrics. Ronald Coleman starred as a pill-popping English politico in *The Masquerader* (1933).

The drug-addicted veteran who picked up the habit as a result of war wounds first became a commonplace after the American Civil War, the first major conflict in which there was a widespread use of morphine injections. Veteran junkies have appeared in many films, and *Heroes for Sale* (1933) was probably the first sound film to explore the subject. Richard Barthelmess stars as a down-and-out war veteran struggling with his morphine habit, the result of treatment by German doctors. Soon he gets religion and a cure and spends the rest of the film grappling with Loretta Young, Ward Bond, the Depression and a mediocre script.

Dope played a minor role in half a dozen subsequent melodramas. A drug-addicted doctor blackmails a student in *Bedside* (1934); a gentleman dabbles in dope and murder in *Murder by an Aristocrat* (1936) and a doctor euthanizes a friend with morphine in *The Crime of Dr. Forbes* (1936). Grace Moore helped to lighten the Depression blues that year with a good rendition of the classic dope song "Minnie the Moocher" in *For You Alone*. Dwain Esper (*Marijuana—Weed with Roots in Hell*) produced a story of a morphine-addicted doctor: *Narcotic* (1937). Another doctor who could not resist sampling his wares stumbled through several scenes of *Bowery at Midnight* (1942). The down-and-out doctor assists Bela Lugosi in his experiments with zombies, with frequent hits from his little bottles of

medicine. A woman who fills his prescriptions for him remarks, "That stuff is slow death!" He counters, "No it isn't—I'm a doctor—I know . . . It's good for me!" But the good doctor has our sympathies—taking care of a basement full of zombies might require something strong to sooth the nerves. There are a couple of references to Lauren Bacall's addict sister in the Bogart-Bacall classic *The Big Sleep* (1946).

Wild Weed (1949), *High School Confidential* (1958), and *Maryjane* (1968) have been described in the section on marijuana films since that is their primary focus, but they deserve mention here as pot-leads-to-heroin propaganda efforts. In the former, the cops show star Lila Leeds a mangy-looking female with badly scarred arms with the clear implication that this is the inevitable result of smoking pot. Nearly a decade later, *High School Confidential* (1958) and *The Cool and the Crazy* (1958) presented the same improbable thesis as an accepted fact. In the former film, Tony tells Joan that messing with the weed leads to the hard stuff and soon he's scoring heroin from the same gang that supplies marijuana to the kids. The supposed association of grass and heroin was also played up in B. C. Price's amateur *One Way Ticket to Hell* (1955). Although nearly twenty years passed between *Wild Weed* (1949) and *Maryjane* (1968), the latter still links pot and heroin, with the school's pot peddler getting ahold of Fabian's girl friend via the needle. The implication clearly was that if she did not "dig" Fabian she must have been onto something pretty good. Vincent Price was an addict in *The Tomb of Ligeia* (1965).

Dopers in Depth

None of the foregoing films presented any insight into addiction, or any detailed portrayal of the addict's personality, presumably because of the official ban on such treatments. As detailed in the section on censorship, Otto Preminger defied the censors in 1955 and released a film version of Nelson Algren's novel *The Man with the Golden Arm*, starring Frank Sinatra as struggling musician Frankie Machine. Frankie's habit leads to six months in the pen, but the day he's out the pushers come around and soon, buying the nickel ($5) bags, Frankie is hooked again. "The monkey is never dead, dealer—he never dies—he just hides in a corner waiting his turn," insists Frankie's pusher (Darren McGavin). Though it created quite a sensation, the film actually has few graphic details (one shot of a hypodermic needle and a packet of powder and a little moaning and writhing when Frankie needs a fix), and it seems quite pale beside later efforts.

Such efforts were not long in coming. In 1957, two films about junkies who picked up the habit when they were soldiers appeared. Both *Monkey on My Bank* and *A Hatful of Rain* provided their male leads (Cameron Mitchell as boxer Barney Ross in the former and Don Murray in the latter) with enough opportunities for writhing, screaming, and emoting to satisfy even the most jaded filmgoer. Murray's performance is especially convincing. His shot "straightens" him in just a couple of minutes after he scores from a hardhearted dealer, "Mother" (Henry Silva). It is almost painful to watch as Murray bares his emotions and inability to deal with them. Susan Hayward also gave a powerful performance as a prostitute-addict with an addict husband in *I Want to Live* (1958). Based on the true story of San Francisco prostitute Barbara Graham, the film played down the role of drug addiction and winds up indicting capital punishment more than heroin.

Addicts began popping up in films with amazing regularity. *Wild Youth* (1960) and *Date Bait* (1960) capitalized on the high school dope scene, without providing either insight into addiction or passable entertainment. The second filming of Faulkner's *Sanctuary* (1961) was much more explicit about the dope and sex angles, but the uneven script led to the film's being only moderately effective. Singer Odetta as the junkie Nancy is good but her role is a small one. Dan Dailey has a minor role as a publicist with a demanding habit in Hollywood's embarrassingly poor memorial to a great writer in Hemingway's *Adventures of a Young Man* (1962). Addicts immersed in crime were featured in *Too Young, Too Immoral* (1962) in which women support their habits by prostitution; *Four for the Morgue* (1962), in which the addict-thief commits suicide; *Police Nurse* (1963), with an addicted doctor who sells black-market babies, and *Cairo* (1963) in which a junkie is one of George Sanders's gang of jewel thieves. Even *Panic in the Year Zero* (1962), a story of nuclear war, includes gangs of rampaging dope fiends in its science fiction setting.

Several powerful and convincing cinematic portraits of addiction emerged in the next few years. Katharine Hepburn gave one of the most devastating portrayals of addiction in the history of film in *Long Day's Journey into Night* (1962). A faithful and somewhat stagey adaptation of Eugene O'Neill's autobiographical play about a

turn-of-the-century family whose mother is a morphine addict, the film provides one of the rare opportunities for Hepburn to display the full range of her stunning acting talents. This is not to belittle the superb performances of Ralph Richardson as the alcoholic father and Dean Stockwell and Jason Robards, Jr., as the sons. She begins taking the medicine from a quack doctor for pain. "The medicine is for the rheumatism in my hands. I have to take it because there is no other that can stop the pain—all the pain—in my hands." After a good jolt of her medicine she becomes dreamy and happy. "You go back until you're beyond its reach. I never understood anything about it except that one day long ago I could no longer call my soul my own." But when she runs out of medicine she quickly gets edgy and resentful. "I know what doctors are—they're all alike—anything to keep you coming to them." She fidgets and frets about the house until her prescription is refilled; then she is mellow as can be—unless she has taken too much and falls asleep.

Independent filmmaker Shirley Clarke was the director and driving force behind two films concerned with addiction. *The Connection* (1962) closely followed Jack Gelber's play about eight addicts sitting in a Manhattan loft waiting for their pusher. The film encountered legal problems because the addicts followed common usage and referred to heroin as "shit," but the film survived and was reasonably successful. *New York Times* critic Arthur Knight epitomized the favorable commentary:

> I found it fascinating as an exhibit of bravura film-making . . . it does not compromise or sensationalize. The four-letter words are there when they have to be there, when the characters would use them naturally . . . Mrs. Clarke has done an extraordinary job of cinematizing the original material. Holding to

Junkies for Jesus, Irving Yeaworth's *Way Out* (1966) starred ex-addicts and suggested that Christianity was the only way out.

Yielding to temptation in spite of the group therapy in *Synanon* (1965).

> the single setting of the play, her picture becomes a documentary-life investigation of the flat and its inhabitants. As in Antonioni's films, the camera insists that we look . . .

However, many others found the film dull and pointless and one's response to the film will vary depending on one's familiarity with and interest in addiction.

There was more critical agreement on the success of Clarke's next effort. *The Cool World* (1964), produced by famed documentary filmmaker Frederick Wiseman and with a cast drawn almost entirely from the junior high schools of Harlem, is a remarkable semidocumentary look at misery, despair, and violence of ghetto life. Much of the action centers around a gang of young blacks whose teenage leader Blood is already an addict. Although only fourteen years old, another gang member, Duke, is selling dope to buy a gun. The youth and inexperience of the cast gives the film an impact seldom attained in exposés of slum life and the generative factors in addiction.

The next year two more examinations of the twilight world of New York junkies appeared. Both *The Pusher* and *Heroina* were sincere attempts to detail the etiologic factors in addiction by examining the lives of individual addicts. *Heroina* was the more convincing of the two, but neither film attracted as much attention as had Clarke's films. *Satan's Bed* was also released in 1965 and dealt with New York junkies, but provided mayhem rather than insight.

Synanon (1965), set in the famous rehabilitation center of that name in Santa Monica, California, manages to convey some realistic addict profiles in spite of the stereotypical script. A fine cast, headed by Edmund O'Brien as Synanon founder Charles Dederich, show the relationship of the Synanon games (brutally honest group encounter sessions) to rehabilitation, but the film gets sidetracked into a routine romantic melodrama between two of the residents.

A different solution to the problem of addiction was posed by *Way Out* (1966). Produced and directed by Irvin Yeaworth, better known for his work on science fiction films (*The Blob*), it features a cast of former addicts. The film has some graphic and convincing scenes of the addicts' lives in New York's Spanish Harlem, but it jumps from scene to scene and fails to give a coherent or revealing portrait of the addict. Christ is proposed as the "way out" and each addict gives a religious testimonial at the end of the film.

Conrad Rooks's *Chappaqua* (1967), described in detail in the section dealing with LSD, departed radically from tradition in viewing the addictive process and withdrawal from the inside of the addict's head. Cocteau had undoubtedly incorporated his withdrawal nightmares in *Blood of a Poet* almost forty years earlier, but Rooks employed his psychedelic experiences and modern cinematographic techniques to produce a dazzling display of psychedelic imagery and drug-distorted stream of consciousness. Probably no other major film has succeeded half as well in taking us inside the drug-altered consciousness, and the film is a "must" for anyone who wishes to understand this subject. Of course, many of the underground or experimental films have achieved this effect on a less grandiose scale, and it is characteristic that all these innovations have been acomplished outside of the commercial film industry.

Perhaps Rooks's film was responsible for the psychedelic trip sequence experienced by Stella Stevens after she is forcibly injected with heroin in *Sol Madrid* (1968). However, colored visions and perceptual distortions are not responses to opiate use and this film has nothing further to offer on the topic of addiction. In contrast, *Sweet Love, Bitter* (1967, rereleased as *It Won't Rub Off Baby!*), loosely based on the life of jazz saxophonist Charlie Parker, provided a detailed look at the oppressive white society that drove him to a heroin death. This film, in which Dick Gregory gave a good performance as the struggling black musician, is one of the relatively few films (Shirley Clarke's two are among the others) to concern itself with the black addict. A significant portion of the addicts in the United States belong

to minority groups, but the addict films produced by Hollywood have almost always portrayed white drug users, usually with middle-class backgrounds. Both *Walk the Walk* (1970) and the documentary *Skezag* (1971) were independently produced, hard-hitting portraits of black addicts. Vietnam veteran Wayne Shirley shoots smack, hustles around New York, and literally wastes away before the camera over a period of several months in *Skezag*. It is one of the most convincing and powerful encounters with addiction in the cinema.

An almost unique in-depth look at the black female addict is provided by *Lady Sings the Blues* (1972). Based loosely on the life of blues singer Billie Holliday, the film follows her singing career and lifelong addiction. Diana Ross as Billie manages to penetrate the Hollywood schmaltz with a superb job of singing and acting.

The remaining addict films of the 1970s focused on those addicts with white, middle-class backgrounds. Comedian and social satirist Lenny Bruce had a long and losing battle with heroin and the four films on his career have necessarily dealt with this subject. The two documentaries *Lenny Bruce* (1967) and *Lenny Bruce Without Tears* (1972) are mostly footage of his performances and contain little material on addiction, but the two fictionalized treatments *Dirtymouth* (1970) and *Lenny* (1975) are more revealing. Paul Morrissey's *Trash* (1970), like its predecessors *Flesh* and *Chelsea Girls*, contains an assortment of uninteresting dope fiends, some of them acting and some merely being themselves. The film is continually parodying people and films, including itself, and it is difficult to decide whether it says anything of value about addiction (or anything else for that matter).

Clay Pigeon (1971) followed a Vietnam veteran's journey through dope but failed to add anything new, unlike *Born to Win* (1971), which attempted to treat addiction in a comic setting. Although George Segal gives a fine performance as a manic New York junkie with "Born to Win" tattooed on his arm, and there are some funny scenes, most people found it to be just another dull drug film that failed to provide any insights on addiction. The interminable scramble for Segal's daily dope and the gradual moral degeneration occupy much of the film, but one keeps wondering about the junkie's past and what is really going on in that troubled mind. At the end he is still on dope and we are left with the impression that there is no way out.

Joe Dallesandro cooks up a shot in the Warhol/Morrisey *Trash* (1970)—another of their honest and boring looks at life.

Pam's long sleeves hide signs of a $150-a-day heroin habit in *Dusty and Sweets McGee* (1971), a look at the Los Angeles heroin scene.

There is also no way out but death or jail for the addict-lovers in *The Panic in Needle Park* (1971). Kitty Winn and Al Pacino were generally acclaimed for their performances as the Romeo and Juliet of the New York heroin ghetto. Critic John Mahoney summed up the plot nicely:

> Needle Park is a wedge of cement created at the intersection of Amsterdam Ave. and Broad-

way in Manhattan, a row of benches for the derelict and the idle, a hard drug stock exchange for pushers, pimps, prostitutes and purchasers. The panic is on. Heroin is in short supply. The price and the risk are up. As desperation grows, friend betrays friend to the narcs, violence and victimization increase. There is less and less that the addict would not inhumanly do to survive, no alliance beyond breaking or exploiting, the first loyalty to the habit.

Small-town girl Kitty takes up with Needle Park regular Al and soon they are both thieving, shooting, hustling, and deceiving one another and themselves for their daily dope. Heroin is god and Kitty is coerced into setting up Al for the narcs, but when he is released from prison she is waiting for him. There is more understanding of the opiate addict's character in this film than there is in *Born to Win*, but one still has the uneasy feeling that neither the origins of their problems nor their final resolutions are apparent. Yes, the big city is shown as hostile, dirty, plastic, and alien, but millions live there and only a small percentage get hooked on junk—why Kitty and Al? *Panic* only presents a slice of their lives, but within its limits it is a very powerful film. We see graphic details of scoring, whoring, stealing, and dealing, but it is Pacino's role as the all-American boy whose hustle happens to be heroin that really captivates us and carries the film.

Floyd Mutrux's *Dusty and Sweets McGee* (1971) was a semidocumentary attempt to expose the Los Angeles heroin scene. Gaining authenticity from its cast of ex-addicts and chippies, it often hits harder than *Panic* or *Born*. It has a plot, but most of its punch derives from the real-life stories and interviews on which it is based. There are graphic scenes of injections of heroin in the arms, mouth, and so on along with overdoses and murders, and the well-off teenage junkie-lovers commit suicide together at the end. Mutrux clearly intended to make an antidrug film and he commented of the ending that it was "so ugly it has got to turn the kids around." Unfortunately, the glamorous life-style of many of the junkies, along with the brilliant color photography and thumping rock-music sound track led many critics to view it as more colorful than cautionary and it also seems to have failed to add anything to our understanding of the genesis of the addictive personality. *Cue*'s Donald J. Mayerson summed up the majority of critical opinion when he called it "a pathetic freak show . . . unable to add or say

A demonstration of bad technique from *Way Out* (1966), an independently produced film about junkies which presented Jesus as a "way out."

anything significantly new about the problem of heroin addiction among the young." One review was titled "Junk Glamorized."

Jennifer on My Mind was the fourth of the young-lovers-on-junk films to appear in 1971, though this time it is only the woman who was hooked. Erich Segal scripted and apparently attempted to parody his *Love Story*, which led one critic to term this film *Drug Story* ("Love means never having to ask for a fix"). Critics were nearly unanimous in condemning the film as "banal," "naive," "silly," and "tripe," and Judith Crist remarked: "Let's call this thing Segal's revenge on the Yalies who turned on him for confessing he cried while writing *Love Story*."

While television movies are generally rather low-budget, superficial affairs, *Go Ask Alice* (1973) revealed more about the genesis of addiction than any of the other drug films of the era. Based on the diary of a young girl who became a hooker and hooked at fifteen, the film shows the pressures of adolescence coupled with unsympathetic parents and an indifferent, often hostile society, combining to create intolerable pressures. More details are given in the section on LSD films.

Another revealing look at the origins of heroin dependence was Martha Coolidge's documentary on her brother *David: Off and On* (1972). It deals with rare sensitivity and understanding with the addiction of an upper-middle-class man.

Finally, mention should be made of Gene Hackman's convincing portrayal of addiction in the otherwise pale *French Connection II* (1975), and *Pure Shit* (1977), a compilation of junkie experiences compressed into forty-eight hours.

Electronic Monster **(1959) was one of the more unusual "addict films" with its surrealistic sets, bizarre dancing, and brainwashing by Nazi doctors.** ***Zex*** **was the original title.**

American Flyers Rushing Past

In addition to the films that focus on addiction and the narcotics traffic, many modern American productions include addicts as minor characters. Simone Signoret is good as the drug-laden countess in *Ship of Fools* (1965) and Wally Cox is also believable as a doped-up ship's doctor in *Morituri* (1965). When Captain Yul Brynner takes away his morphine stock Cox whines "No! No!—I'll die without it—They told me it would only be a two-day voyage." Julie Harris is a fading gin-mill singer easing the pain with dope in Paul Newman's Bogart takeoff *Harper* (1966). Rita Hayworth is grand as a spaced-out addict in the United Nations-Xerox-sponsored antiopium crusade *The Poppy Is Also a Flower* (1966), though the doping dogs trained to locate the stuff often steal the scenes.

Woody Allen gets in a good crack in *What's Up, Tiger Lily?* (1966). Sheperd Wong protects his egg salad recipe with his life because "he's hooked—he's got a chicken on his back." In one of the many tragicomic flashes in *Catch-22* (1970), a junkie leaves a note "morphine."

Cops and junkies wander in and out of the plots of *Tony Rome* (1967), *Klute* (1971), *Cisco Pike* (1972), and *The Marcus-Nelson Murders* (1973). The latter, the television pilot for the "Kojak" series, features ex-evangelist Marjoe Gortner as a hophead. A junkie son of Ma Barker (Shelly Winters) is among the gratuitous bits of degradation and violence in *Bloody Mama* (1970). Just for a twist, *Simon, King of the Witches* (1971) pits a warlock against the needle fraternity, who are characterized as rampaging madmen. A weird woman begs a fix from her Latin lover to the accompaniment of strumming guitars in the motorcycle melodrama *The Hellcats* (1969). Jacqueline Bisset is a hooked hooker in National General's negligible fluff *The Grasshopper* (1970). Other sex and junk exploiters of the next few years in-

cluded *The Hard Road* (1970), *The Happiness Cage* (1972), *Fleshpot on 42nd Street* (1972), and Wes Craven's terrible *Last House on the Left* (1972).

Youthful drug dabblers entered the fracas in *Alice's Restaurant* (1969), in which young Shelly overdoses, and in *Ice* (1970) in which a radical uses narcotics to cope with his antiestablishment feelings. Richard Boone tracks down the villains who got his daughter on dope in *Kona Coast* (1968), and Pat Boone fights demon heroin with the Holy Ghost in *The Cross and the Switchblade* (1970). Alcohol and unwed sex provide the heavy vibrations in *The Young Runaways* (1968), though the only drug reference in this pabulum is "if Curly wasn't drinking he'd probably be on dope," which is probably true.

Janice Rule is one of the *Doctor's Wives* (1972) who slakes her lust and eases her migraine by dipping into hubby's morphine supply, but in *The Carey Treatment* (1972) it is the nurse who is making away with the hospital's narcotics stash. James Coburn catches the nurse and forces her through withdrawal in order to make her confess to the abortions she performed for drug money.

Recently, addicts have popped up in some unexpected places: an addicted lesbian housekeeper in a story of an old film star (*The Legend of Lylah Clare*, 1968); a female member of a kidnapping gang that includes Richard Boone and Marlon Brando (Rita Moreno in *The Night of the Following Day*, 1969); a junkie hired by a snakeskin dealer to dispose of an Indian who trains rattlesnakes (*Stanley*, 1972); a late nineteenth-century Mexican cowboy who pops heroin tablets for toothache (*Bite the Bullet*, 1975). Barbara Carrera (Chiquita Banana of the television ads) becomes a junkie in the course of her rapid aging in the television movie *Embryo* (1976).

Addicts and pushers are now appearing in so many films that it seems pointless to recount them all, but just for the record, some recent American films of this genre include *Sparkle* (1976), *Slow Dancing in the Big City* (1978), *Straight Time* (1978), *Aaron Loves Angela* (1977), *A Hero Ain't Nothin' but a Sandwich* (1978), *Taxi Driver* (1977), and *The Rose* (1980).

Cold Turkey—English Style

In addition to those British films concerned with the narcotics trade, addicts have figured in a variety of postwar flicks. *Night Crossing* (1957) was an odd effort in which a Hungarian knife thrower kills his drug-addicted partner. Michael Redgrave gives a fine portrayal of a young surgeon who takes the blame for a Polish addict when a patient dies of neglect in *Behind the Mask* (1958). Bette Davis gives a baroque but intriguing performance as Alec Guiness's morphine-addicted invalid mother in *The Scapegoat* (1959). To *The Electronic Monster* (originally shown as *Zex*) (1958) belongs the distinction of being the most bizarre of the British addict films. Ex-Nazi doctors are operating a French clinic for addicts, and though they do cure the addiction as promised—"We will give you dreams—soothing dreams"—they do so by a brainwashing technique that makes slaves out of the patients. Junkies are given a sedative and a weird metal helmet before being placed in a glass case and slid unconscious into a morgue drawer. Tapes play through the helmet that result in experiencing off-key organ music and strangely costumed dancers. Both patients and staff seem to be having a great time, but unfortunately this "electronic hypnosis" electrolyzes brain cells and stiffs with fried brains spoil neighborhood picnics and lead to exposure of the scheme.

Edgar Allan Poe enjoys his first cinematic high in over forty years in *The Tell-Tale Heart* (1960), but even this is merely anticipatory. Poe dreams he is a drug-addicted cripple but wakes to discover the dream beginning in real life. Some addicts are shown lining up at midnight for their legal, government-supplied heroin, and others are shown scoring illegally in Soho in the 1964 documentary *London in the Raw*. Evangelist Billy Graham reforms dopers in *Two a Penny* (1967). Laurence Harvey plays a double agent whose London contact Pavel is a drug fiend in *A Dandy in Aspic* (1968). One twin son is an invalid junkie and the other is an insane murderer in *Crescendo* (1969), and David Hemmings overcomes his addiction but goes insane trying to solve his aunt's murder in *Fragment of Fear* (1970). One of the patients in *Asylum* (1972) does him one better, managing to be a doper and a "loonie" at the same time.

In the Continental Vein

Postwar European films have included incidental addicts in many films and some have taken addiction as their central theme. Eleanora Rossi Drago was convincing as an addict whose attempt to kick the habit ends in tragedy in one of *Three Forbidden Stories* (1952, Italian). Her portrayal

was sufficient to get the film banned in the United States. Another beautiful addict is featured in the French picture *Night Affair* (*Le Désordre et la Nuit*, 1958), and this one succeeds in blackmailing a female pharmacist into supplying her with morphine and in making a police inspector (Jean Gabin) fall in love with her. The pretty and adventuresome lass occupying center stage in the 1962 Swedish offering *Just Once More* makes one of many mistakes by living with a drug-dealing addict named Natan.

In contrast to American movies, European productions seem to contain mostly female addicts. Even the fabulous Jeanne Moreau takes refuge in narcotics in Louis Malle's *Le Feu Follet* (*The Fire Within*, 1963). Another French film from 1958, *La Prostitution*, returns to the hoary theme of white slavery rings which ensnare naive girls with dope. Shown in America as *Prostitution*, the film was rereleased with added sex scenes in 1968 as *To Be a Woman*. Drug addicts who sell their children into prostitution or slavery to buy dope were shown in the Italian documentary *I Tabu* (1962). One of the numerous *Mondo Cane* imitators, the English version, *Taboos of the World*, was narrated by Vincent Price. *Sweden—Heaven and Hell* (1968) is also an Italian documentary dwelling upon drug addiction.

Addicts have continued to appear frequently in Italian films. such as *The Hired Killer* (Italian-French, 1966), *Fräulein Doktor* (Italian-Yugoslav, 1968), *Camille 2,000* (Italian-U.S., 1969), and *Blood, Sweat and Fear* (1975). *Fräulein Doktor* stars Suzy Kendall and is based on the World War I exploits of Anna Marie Lesser, the German spy and morphine addict. *Camille 2,000* is a modern version of Dumas's novel with Danielle Gaubert as the junkie mistress of a rich and aging patron. *Blood, Sweat and Fear* deals with the heroin trade and has been mentioned in that section, as has *Morire Gratis*. Finally, we may mention here *The Girl of Tin* (1970) in which "Dr. Smack" dominates the world with robotlike slaves.

Relatively few European films have been primarily concerned with heroin addiction. The French have given us *La Horse* (1969) and *Les Chemins de Katmandou* (1970), the Danish *Threesome* (1969) and *Narco* (1971), the Germans *Release* (1972), and the Luxembourgians *More*

A pregnant moment as Bela Lugosi (*right*) waits for his zombie potion to take effect. *White Zombie* (1932) is one of many films featuring potions which help evildoers to control people's minds.

(1969). Whereas *Narco* explores the world of Copenhagen addicts in detail, *Threesome* is basically a sex film about a woman who becomes entangled with an addict. *La Horse* accents the heroin trade, and *Les Chemins de Katmandou*, directed by André Cayatte, was criticized for being romantic and unrealistic. Perhaps some of the criticism was the result of the film's ending with the suicide of the British heroine. Several other addict films (e.g., *More*, *Dusty and Sweets McGee*) have had suicidal endings and have met with similar criticisms.

Release was an antiheroin film of the Vienna Filmkollective that included Timothy Leary in its cast and was documentary in style. *More* was also an antiheroin tract that followed the downward spiral of Stefan and Estelle to heroin and death. It should have been a smash hit with its story of tragic love, chic clothes, chic locations (Ibiza and Paris), kinky sex, abundant drug use, beautiful photography, and hip jargon, but there was no depth to the rather unappetizing characters and most critics found the film an aimless exploitation of sex and drugs.

9 The Opium War

As we have seen, opium often appeared in silent films, usually in the form of an opium smoker who was incidental to the plot. In contrast, by the time the talkies arrived censorship was powerful and casual opium smoking was seldom portrayed in films, and then only as a sign of degradation. The pursuit and punishment of opium smugglers has, however, remained a continuing source of filmic inspiration.

One of comedian Harold Lloyd's later films *Welcome Danger* (1929) used opium smuggling as its main theme. The classic scientific documentary *Dream Flower* appeared the next year. In 1932, Boris Karloff starred in *The Mask of Fu Manchu*, which showed opium smoking and the preparation of a serum that turned people into zombies. Myrna Loy also played in this rare film, which has recently been rereleased. In the same year Bela Lugosi appeared in *Chandu the Magician* (1932), which contains a drug reference in its title, *Chandu* being the Indian name for prepared opium. At the time, Lugosi was Karloff's only serious rival for the leading male horror star (both had their first big role in 1931, Lugosi as Dracula and Karloff as Frankenstein's monster).

James Cagney gave a spirited version of the classic opium song "Shanghai Lil" in *Footlight Parade* (1933), and Cab Calloway's rendition of "Reefer Man" in *International House* (1933) contains the lyrics "kickin' the gong around in old Chinatown"—a euphemism for opium smoking. This same film has one scene in which Lugosi stands in front of the Lotus Garden Hotel where a Chinese smoker is nodding. *The Masquerader* (1933) had Ronald Coleman substituting in Parliament for his drug-addicted look-alike. Opium smugglers and smokers figured in three more films in 1935. Claude Rains gives a fine performance as the choirmaster who smokes opium

Bela Lugosi pauses in front of a nodding opium smoker in a scene from *International House* (1933).

Boris Karloff schemes to kill all white men and mate with white women in *The Mask of Fu Manchu* (1932). Most films have shown Sax Rohmer's character as an opium smoker or smuggler, and in this one Fu's headquarters are located behind an opium den.

and commits murders by night in Dickens's unfinished novel *The Mystery of Edwin Drood*. The movie does not seem to contain any actual smoking scene, however. The British comedy *The Camels Are Coming* (1934) concerned drug smugglers. *Cairo Road* (1950) starred Laurence Harvey in an apparent remake of *The Camels Are Coming*. Both *Secrets of Chinatown* (1935) and *Charlie Chan in Shanghai* (1935) concerned detectives on the trail of opium smugglers. In the latter, the ninth Charlie Chan film, G-men somehow become involved in helping to crack the ring operating from Shanghai.

The 1936 British remake of Griffith's silent classic *Broken Blossoms* again featured the opium-smoking Chinese. The soporific properties of the poppy were used by the Wicked Witch of the West in *The Wizard of Oz* (1939): "And now my beauties, something with poison in it soothing to the mind. . . . Poppies, poppies will put them to sleep." In the next scene, Dorothy, Toto, and the Cowardly Lion get weary and fall asleep in a poppy field, though they seem to be the orange California species rather than the red or white opium-producing kinds. Everything is soon put right when the good witch awakens the trio with a snowfall. The black musical remake *The Wiz* (1978) substituted opium dens for poppy fields.

Somerset Maugham's novel *The Letter* was filmed in 1929 and 1940, both times with Herbert Marshall and in 1940 with Bette Davis in the cast. It has one brief scene in an opium den and one degenerate even has the gall to blow some of the magic smoke in Davis's face. Von Sternberg's *Shanghai Gesture* (1941) also had a brief opium den scene, and in the same year Germany produced *La Guerre de l'Opium*, a propaganda film showing the imposition of opium on India and China by the British. Ramon Peon of Mexico's Churubasco studios wrote and directed another antidrug piece *Opio* in 1949. But the premier opium film of the decade was an American film of 1948, *To the Ends of the Earth*.

As mentioned in the discussion on censorship, *To the Ends of the Earth* was the first major Hollywood production to deal openly with drugs since the early 1930s, and it was only possible because H. J. Anslinger, chief of the Federal Bureau of Narcotics, was supporting its production as a propaganda piece. As the film gets under way, Dick Powell is chasing a Japanese ship suspected of illegal activities. We are shown just how rotten these types can be when they dump hundreds of shackled coolies overboard as they escape into safe waters. Powell is soon in Shanghai traveling around with sweet little Chinese girl Shu-Peng and her governess Signe Hasso. He then appears in Egypt, crawling around on his belly on a rose farm. In between the rows of roses the fiends have been growing poppies, using the Chinese coolies as laborers. Next, Powell and Egyptian narcs are X-raying camels in the desert to detect narcotics in their stomachs. Narcotics have often been smuggled into Egypt in camels' stomachs and in modern times X-rays have been used to examine them, but growing poppies with Chinese coolies is incredible. Egypt was probably pulled into this film because the Anslinger mentality has also prevailed there for decades.

Powell, who has been told that one Gene Hawks is masterminding this nefarious scheme,

follows the drugs to Cuba, with Hasso and Shu-Peng trailing along. Next the boat heads for New York with the dope, refined into heroin somewhere along the trail. Just before entering the harbor the dope is dumped overboard with the garbage. The buoyant, watertight packages of heroin are tied to weights with dissolving string. This is not as farfetched as it seems—very similar schemes have long been used by smugglers. Of course, the coast guard pounces on the bad guys when they come to get the packages, but lo and behold, Gene Hawks turns out to be none other than sweet little Shu-Peng. Eagle-eye Powell saw through her sweetness long ago and the jig is up—cut to the United Nations and another Anslinger blurb for international narcotics control.

Although the Japanese were involved in the opium trade for a time during the late 1930s when they controlled parts of northern China, the main sources of opium after World War II were Turkey and adjacent areas and Southeast Asia. Presumably, nobody wanted to offend the real culprits, and the Japanese were safely subjugated or dead. In any event, it is doubtful that the film had much impact and its main significance is that it opened the door for other drug melodramas.

The next appearance of the black smoke was in the British Sherlock Holmes feature *The Man with the Twisted Lip* (1951) in which the famed sleuth (played by John Longden) tracks a missing husband to a Wapping opium den. *Smiley* (1957) is an extremely simple-minded Australian film with little to commend it, but it does have a unique plot. A young lad is involved in smuggling opium to Australian aborigines. *Scarlet Doll* (1958) is a Chinese film produced in Hong Kong having opium smuggling as its theme. Evidently the film was well done since we are told, "In Taiwan it broke all box office records for Mandarin pictures." In spite of its subject, the film is touted as "a down-to-earth Chinese drama lauding such time-honored virtues of old China as loyalty to friendship, fortitude and righteousness." The plot summary follows:

> A caravan of covered wagons is rolling along in China's wild North, with a shipment of opium, led by Tiao the third and his son Buffalo. Accompanying them is Tiao's beautiful niece, Scarlet Doll, whom the dope trafficker has pledged to the underworld King Lee the fifth. Tiao has persuaded Lung the first—ex-underworld boss—to escort the caravan through a region held by another brigand leader, Chou the seventh—a former lieutenant of Lung.
>
> Scarlet Doll falls in love with Lung's handsome son Lungko and Buffalo is jealous. He tries to provoke Lungko into a fight which is interrupted by shots as the caravan is attacked by the bandits. It barricades itself inside a dilapidated temple. The attack is called off when the leader, Chou the seventh, learns the caravan is under the protection of his former chief.
>
> Scarlet Doll reveals the secret of the opium smuggling to Lungko and urges him to inform the authorities. There is again battle between the government troops and the caravan and the Tiaos and their gang are killed or arrested and the caravan resumes the journey under the escort of the troops. Scarlet Doll, Lungo and his wounded father return to their house which is now their home.

Strangely enough, the United States also made an opium-smuggling film in Hong Kong in 1958. *Hong Kong Affair* featured Louis Jourdan as an attorney smuggling opium disguised as tea. Vincent Price turned up in another Albert Zugsmith cheapie *Confessions of an Opium Eater* (*Souls for Sale*, 1962). The only opium sequence in the film involves Price in a slow motion paranoid fantasy. The title was taken from De Quincey's classic *Confessions of an English Opium-Eater*, the most widely read and influential personal account of drug experience ever written. The film has nothing to do with De Quincey, and perhaps its only value is that it points to the remarkable absence of any cinematic treatment of his writings.

Japan made several entries in the opium-film war in 1962. *Kenshin* (*Her Devotion*) tells the story of a woman trying to prove her husband innocent of opium dealing. *Gang vs. Gang* is a typical Japanese cops and robbers clunker.

> After coming out of prison, Mizuhara is in danger of being killed by Komori, in whose place he had been serving a five years' sentence.
>
> When Mizuhara injures Komori, Namikawa, Komori's henchman, kills his boss. Mizuhara is rescued by Kanaya and Yuri, and meets Yanagizawa, who specializes in extorting money from gangsters.
>
> Yanagizawa proposes to smash the Komori gang which deals in opium and is now taken over by Namikawa, by way of hampering a deal which Yanagizawa intends to make with a drug company.
>
> Mizuhara detects the sales routes of Namikawa's opium in several bars and nightclubs. Finally he locates the opium refinery in a factory, where he is surrounded by

Namikawa's men, but fires at the refining machine to cause an explosion.

From Otokodani, a traitor to Namikawa, Mizuhara finds that the opium is kept at a villa in Hakone. He and Yanagizawa succeed in getting the opium out of the villa in an empty propane gas container. They are pursued by Namikawa and a fierce gun fight takes place on a steep mountain path.

Japan's next opium epic *Operation Mad Dog* (1964) told of the Japanese involvement with opium as a result of their takeover of north China during World War II.

Boris Karloff is addicted to opium mixed with laughing gas, and Christopher Lee is his supplier in return for fake death certificates. An unlikely scenario, to be sure, but it provides the basic plot for *Corridors of Blood* (1962). Karloff plays an early nineteenth-century doctor experimenting with anesthetics. He comes upon a gas that makes him laugh while rendering him insensitive to pain, but his first operative attempt leads to ridicule when the patient awakes and flees screaming. He increases the anesthesia of the gas by adding tincture of opium, but he gets hooked on it and his surgical abilities begin to fail. There are several droll scenes of Karloff nodding out while laughing. Eventually he begins stealing drugs from the hospital and comes to a bad end, but the final scene shows his son successfully administering surgical anesthesia.

Several other British opium films appeared about this time, all of them Fu Manchu stories starring Christopher Lee. In *Terror of the Tongs* (1961) Lee tells his assassins, "You have smoked deeply of the pipe of dreams and your body has been purged of all earthly desire." The Red Dragon Tong is shipping Red Chinese opium all over the world from its headquarters in Hong Kong. The ending is less than credible—an Englishman is the head of the opium and white slavery gang that is busted up by a lone seaman. Peter Welbeck exhibited some originality in his script for *The Face of Fu Manchu* (1965). Fu kidnaps a German biochemist whom he forces to distill a poison from the seeds of the Tibetan Blackhill poppy. Fu is not missing a bet this time—he's enlisted the aid of Burmese Dacoits, the Grand Lama of Tibet, and the goddess Kali. A single molecule of the "catalysator" from the poppy can coagulate all the albumin in a human body, but only when it is below its freezing point. Fu goes to northern Tibet to gather a large supply of the seeds, with the help of the Grand Lama's monks, but archfoe Nayland Smith arrives in time to plant nitro in the chests and boom—no Fu, no Lama, and poppy seeds blown all the way to Katmandu.

A 1968 British-German follow-up, *The Castle of Fu Manchu* takes an idea from Vonnegut's *Cat's Cradle* and does one better than the preceding film. This time Fu is going to paralyze the world with an opium derivative that catalyzes the formation of ice from water. To this end, he seizes the governor's palace at Istanbul in order to obtain its vast stores of opium. Troublemakers are paralyzed for a while with small doses of the crystals, but as usual Fu is defeated, and as always, he is certain to rise again.

Fu's penchant for the opium pipe was probably also featured in some earlier film versions of Rohmer's novels, such as *The Mysterious Dr. Fu Manchu* (1929), *The Return of Dr. Fu Manchu* (1930), *Daughter of the Dragon* (1931), *Drums of Fu Manchu* (1940), and *El Otro Fu Manchu* (1945).

Another British film *The Best House in London* (1969) dealt with opium, though the house in question was a brothel rather than an opium den. George Sanders stars as a British lord who sponsors an official brothel in London, but when he goes to India to look after his opium plantation he is shot. His niece (Joanna Pettet) inherits both but is kidnapped by a Chinese who, annoyed by the sale of Indian opium in China, threatens mayhem unless she turns over the deed to the plantation.

The Viscount (1966) is Edmund O'Brien, who plays Ricco Barone—ex-New Jersey ganglord whose $2 million in cash and $7 million in opium are heisted by bank robbers. Kerwin Matthews investigates with the aid of American and French narcs who arrange for the two gangs to eliminate each other. A couple of years before there appeared a justifiably forgotten film *Moro Witch Doctor* (1964). This U.S.-Philippine chaff features Jock Mahoney as a CIA agent sent to the Philippines to investigate the deaths of two Americans. He uncovers opium and gun smuggling but no witch doctor. Perhaps this film was intended as a threat to the Communist rebels who have been so persistent in that country.

Beginning in 1964 the Italians were involved in half a dozen opium films. After the tremendous success of the first "shockumentary" *Mondo Cane* in 1963, numerous others followed. Two of these, *Mondo Balordo* (1964) and *Wild, Wild World* (1965), showed the inside of opium dens. In 1967, the Italians made a spoof of their own documentaries with *The Wild Eye*. In one sequence opium addicts are shown undergoing cures by being

beaten with huge paddles. *The Orientals* (1968?), also used fictional settings, though with a serious rather than a comic intent. As a Chinese addict convulses with need, his wife becomes a prostitute to get him his opium, but when she hands him his pipe he throws it away and embraces her. Even Gillo Pontecorvo's powerful Italian-Algerian production *Battle of Algiers* (1966) had an opium scene. Ali La Pointe slaps an addict who is rolling opium cigarettes in the Casbah—with his dazed, lifeless eyes and idle visage, the man is no use to the revolution.

Italy's most detailed opium film appeared in 1968. Produced with Spanish help, *The Cobra* asks us to believe that America's youth are being corrupted by opium smuggled into the United States by the Communist Chinese. After Chinese planes parachute the stuff into the Middle East, the opium is pumped 300 miles to the waiting tankers through oil pipelines. To lend credence to this amazing plot we have Dana Andrews as a United States Secret Service agent, but our faith is shaken when he makes such statements as, "One hundred and fifty pounds of pure opium has a market value of 100 million dollars," and "Uncle Sam never pays hush money." He insists that there are 200,000 addicts in New York alone and that the Chinese opium plantations are part of their pattern for world conquest. Therefore, his agents have "carte blanche—the threat is so great all rules are off," because opium causes "absolute submission—obliteration of the will."

Incredulous of the plot, and with no acting or directing to intrigue us, we are thankful for some beautiful scenery in Lebanon and Jordan to distract us. The whole enterprise is summed up wonderfully by narcs attempting to find the smuggling route. "We seem to be getting closer and closer to nowhere . . . I know it sounds crazy, but that's the way it is."

In contrast to *The Cobra, The Poppy Is Also a Flower* (1966) was lavishly produced. It was one of the Telsun productions aimed at building support for the United Nations. Consequently many stars performed for a token payment of $1 and the profits were supposed to go to UNESCO. Even Princess Grace of Monaco appeared in a prologue to appeal for the international control of narcotics, and the epilogue thanks the Shah and government of Iran, where much of the film was shot. Based on Ian Fleming's last (unfinished) James Bond novel and directed by Terence Young, who had directed several of the James Bond films, the film had a fantastic cast including Stephen Boyd, Trevor Howard, Omar Sharif, Jack Hawkins, Senta Berger, Rita Hayworth, Yul Brynner, Eli Wallach, Marcello Mastroianni, and others. Unfortunately, the acting, directing, and dialogue were often feeble and most of the time viewers find themselves longing for one of the real Bond flicks.

After narc Boyd is snuffed, a radioactive tracer is added to Iranian opium so that it may be safely followed. We are told that 200 pounds of "white" coming from a ton of raw opium is worth $10 million, but there is some confusion when a narc later remarks that it goes out refined as cocaine or heroin. Cocaine comes not from Europe but from South America, a fact well known to even fledgling narcs. The drug is traced to Naples and retired American gangster "Happy" Locarno (Eli Wallach) who protests his innocence to narc E. G. Marshall, and they have the following memorable exchange: "Laxatives—maybe you need some, huh." "I'll take off my dark glasses if you'll take off your dark glasses." (When once seen on television, the movie was interrupted at this point for a Kaopectate ad.)

The trail then leads to the yacht of playboy Marco (Gilbert Roland) and his junkie wife (Rita Hayworth) who carries around a purse full of heroin and chirps, "Alcohol doesn't agree with me." With the help of some fancy footwork by judo whiz E. G. Marshall, a French cop who is constantly taking hits from his nasal inhaler, and some heroin-addicted dogs, the villains and the dope are cornered in an exciting climax aboard a French train. The film ends with a final plea for placing opium production under United Nations control. Not a fully successful film, but at least it is watchable.

Two more opium-poppy-versus-American-narc films appeared in 1973. *Live and Let Die* cast Roger Moore in the role of James Bond and Yaphet Kotto as a Caribbean dictator whose island had been converted to a poppy plantation. Kotto is giving away two tons of heroin "with a street value of over one billion dollars" to double the number of addicts in the United States. When this is accomplished, he plans to start selling the heroin at high prices through Mr. Big in Harlem. Not even Paul McCartney's sound track can save this loser. The second film *Cleopatra Jones* starred Tamara Dobson as a black CIA narc who orders the napalming of Turkish opium fields because her soul sisters and brothers back home are hooked. This angers "Mommy" (Shelly Winters) who heads the international dope ring from Los Angeles and she plants dope in Tammy's favorite halfway house for addicts. From there on its the usual cops and robbers stuff. Mainland China

filmed *Tse Hsu* (*The Opium War*) in about 1972. The film shows nineteenth-century Chinese attempts to oust British opium traders (played by Chinese).

The Miao hill people of Thailand produce much of the world's opium, and in 1975 the Thai government collaborated in the production of *Golden Triangle*, "filmed with the unstinted support and cooperation of the Thai Drugs and Narcotics Department . . . where men fight and die to protect their forbidden treasure . . . the poppies." Produced on location by Thai filmmakers and actors, this promised to be the first thoroughly authentic film on opium production and smuggling. Anthropologist W. Geddes previously made a beautiful film on the Miao—*Miao Year* (1968).

Opium has been incidentally included in a number of recent films. Woody Allen's rewrite of Ian Fleming's *Casino Royale* (1967) had Mata Bond lisping, between drags on her hookah, "Have some tea—it's made from poppy seeds: two cups of this and you're stoned out of your mind." In *Krakatoa, East of Java* (1969), retitled *Volcano* because few people realized it was about a volcanic eruption and Krakatoa is west of Java, Brian Keith is addicted to laudanum and eventually begins hallucinating and raving. The soft-core success *Emmanuelle* (1974?) has Mario and Emmanuelle smoking opium in a Bangkok den. Even Westerns are including an occasional pipe in their scenarios. *Doc* (1971) depicts Doc Halliday (Stacy Keach) as a lover of Chinese flophouses and opium dens and Julie Christie is an opium-smoking prostitute in *McCabe and Mrs. Miller* (1971). Gene Hackman seeks surcease of sorrow with laudanum in *Bite the Bullet* (1975) and John Wayne plays an aging cowboy using laudanum for cancer in *The Shootist* (1976). Brooke Shields lights a pipe for a friend in *Pretty Baby* (1978).

Julie Christie loads her opium pipe in *McCabe and Mrs. Miller* (1971). Recent films no longer exclude drugs, even when set in a turn-of-the-century mining town.

Cocteau

One cannot discuss the subject of opium and the cinema without some mention of Jean Cocteau. An amazing talent, Cocteau has been praised for his work as poet, novelist, playwright, filmmaker, scenarist, essayist, and painter, but he regarded himself primarily as a poet who expressed himself in any available medium. In his early life Cocteau was addicted to opium and he went through a cure in 1929 that he described in *Opium: Diary of a Cure*, first published in French in 1930. In that year he and Buñel were separately commissioned by the Viscount de Noailles to do a film. Buñel eventually produced *The Golden Age* and Cocteau *The Blood of a Poet*, both completed in 1930, but not shown until the following year.

Cocteau subsequently made *Beauty and the Beast* (1946), *The Eagle Has Two Heads* (1947), *The Storm Within* (*Les Parents Terribles*)(1948), *Orpheus* (1950), and *The Testament of Orpheus* (1959). He also worked as scriptwriter on *La Comédie du Bonheur* (1939), *Le Baron Fantôme* (1943), *L'Éternal Retour* (1943), *Les Dames du Bois de Boulogne* (1944), *Ruy Blas* (1947), *Noces de Sable* (1949), *Les Enfants Terribles* (1950), *8 X 8* (1956), in which he also did direction and appeared in the cast, *A l'Aube d' un Monde* (1957), an outline of atomic energy research in France, *La Princesse de Clèves* (1960), and two films completed by others after his death in 1963, *Thomas l'Imposteur* and *Egypte, O Egypte*. Cocteau also conceived the short film *Rhythm of Africa*, which presented the native arts of the Chad. Cocteau's writings have been treated in film by a number of other countries such as the Spanish-French *La Corona Negra* (1950).

The extent to which Cocteau's films were influenced by his drug experiences is certainly debatable, but just as those experienced with LSD and marijuana can often clearly recognize the influence of these drugs in films, users of opiates or those very familiar with the writings of addicts can empathize strongly with Cocteau's imagery. The bizarre and discordant images and dialogue and the dreamlike or hypnotic quality of both individual vignettes and entire films lend themselves well to interpretation as opium reveries and the terrifying hallucinations and dreams of withdrawal. Such an overwhelming experience as opium withdrawal could hardly fail to be of great import in Cocteau's film begun only months later, and a reading of *Opium* in conjunction with viewing *The Blood of a Poet* will probably reinforce this view. Furthermore, Cocteau returned to the themes and imagery of his early efforts throughout his career.

In any event, more has been written about Cocteau than about any other filmmaker, so let us be content with some brief examples of the imagery in his first film *The Blood of a Poet* (1930) and one of his last *The Testament of Orpheus* (1959).

The Blood of a Poet consists of four episodes: 1. "The Wounded Hand; or, the Scars of the Poet"; 2. "Do Walls Have Ears?"; 3. "The Snowball Fight;" 4. "The Profanation of the Host." Cocteau has said of the poet (the central character):

> the poet's solitude is so great, he so lives what he creates, that the mouth of one of his creations lives in his hand like a wound, and that he loves this mouth, that he loves himself, in short, that he wakes up in the morning with this mouth against him like a pick-up, that he tries to get rid of it, and that he gets rid of it on a dead statue—and that this statue begins to live—and that it takes revenge, and that it sets him off upon awful adventures. I can tell you that the snow ball fight is the poet's childhood, and that when he plays the game of cards with his glory, with his Destiny, he cheats by taking from his childhood that which he should draw from within himself.

The following extracts from the end of the screenplay give some idea of Cocteau's imagery.

> Profile shot of the table. The poet is lying there, with his face, invisible, turned towards the pedestal. One of his hands hangs down. The young woman stands up. She is wearing black gloves that reach the point where the statue's arms were broken off. She throws down her cards, and they scatter. At that moment her eyes become motionless, drawn in black on her eyelids.
>
> The author's voice: *"Having achieved her purpose, the woman became a statue once more, or, in other words, an inhuman object with black gloves in contrast to the snow upon which her steps no longer leave a trace."*
>
> The camera moves in closer up to the woman-statue and the Louis XV friend. At a signal from her, the taffeta cape leaves the friend's shoulder and covers hers. Walking like a sleepwalker, she goes off towards the entrance to the rue l'Amsterdam. As she passes the trellis wall at the corner of the house with the curved stair-

way, a light metal ball moves slowly through space, from right to left. The woman-statue goes through the arch. The metal ball moves slowly through space from left to right, towards the spot where the student, Dargelos, threw his snowball.

The camera turns to a sumptuous sculptured golden door at the top of a few steps. To the right and the left of the door is the same terra-cotta bust of Diderot.

Solemn music. The two parts of the door open. The woman-statue is standing there. The blind actress (with eyes painted on her eyelids) takes a few careful steps, illuminated by an intense light. She stops at the edge of the first step. Her right hand, in a black glove, holds back the hood of her cape, showing half of her profile which she turns from left to right, as she did at the card table.

This last pantomime is shot from the waist up.

Back view of the woman. She raises her hand. The doormen whistle, calling the cars. Lower down, on the right of the screen, a bull's head appears on the snow. The animal stands at the bottom of the stairs. The woman wraps herself up in her cloak and starts to go down.

The empty staircase.

The bull, led by the woman on its right. They appear to be walking only because the camera is retreating.

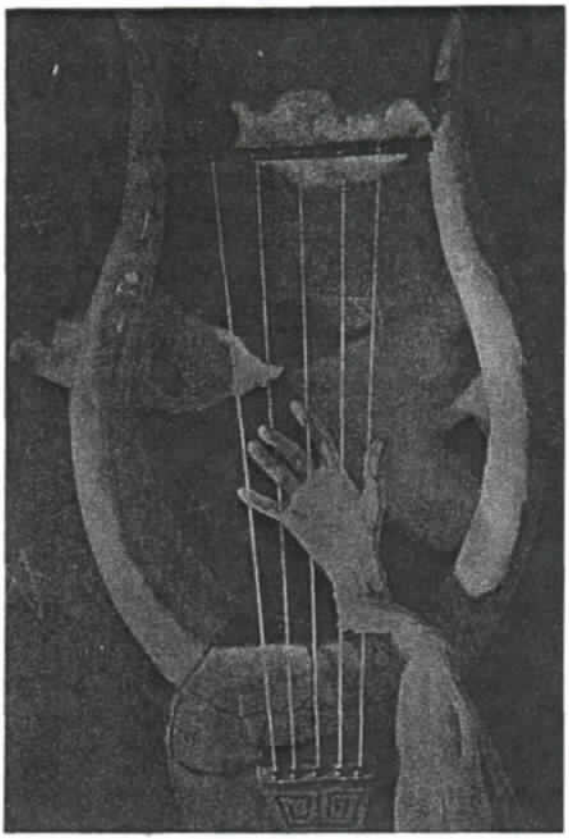
Another shot of the bull and the woman, lower down on the screen. Four pieces of a torn, dismembered map of Europe are stuck on the bull's cloak with cow-dung.

The empty screen on a black background. Whirling dust silvers the screen. The bull's horns appear on the bottom of the screen. Sound of a gong. The horns rise up the screen. They are a lyre.

The camera draws back. The bull and Europe have disappeared. Two stagehands are there, one standing on the other's shoulders, draped like the woman. The one on top is holding, in place of his face, a slate with a profile drawn in chalk on it.

The one underneath is holding the lyre and a globe of the world. This false woman, blending with the black background, except for the profile and the accessories, recedes into the phosphorescent night. She becomes smaller and smaller.

The mortal tedium of immortality. Two stills from Cocteau's *Blood of a Poet* (1930). One of the first classics of the avant-garde cinema, it was profoundly influenced by Cocteau's opium experiences.



The author's voice: *"The road . . . "*

Fade-out. A close-up of the woman-statue's face, lying down. It is the actress's real face, but re-drawn in outline on her white skin in the author's style. Outline drawing of the hair on her bald head. Eyes closed.

The authors voice: " . . . *is long* . . . "

Fade-out. A bird's-eye view of the woman-statue, lying down, an Acropolis of linen, of flowing draperies. The lyre and the globe are beside her.

Close-up of her face. Her mouth, drawn in relief, is half-open. Smoke comes out of it and rises.

Long shot again. The screen slowly darkens. Only the white surfaces, which become hard and stony and still hold the light, remain.

The author's voice: *"The mortal tedium of immortality."*

The Testament of Orpheus is largely an extension and reworking of ideas and images expressed in *Orpheus* and the two should be seen in sequence. The seventy-year-old Cocteau plays the poet who uses a new invention to enter the twentieth-century age of reason, where he searches for his identity. He meets Cegeste, the dead poet from *Orpheus*, who guides him to a huge room where he stands trial. Two other characters from *Orpheus*, the Princess and Heurtebise, condemn him to live. He gives the flower of folly to Minerva, but she kills him with a lance. However, "poets only pretend to die," and he rises to encounter Oedipus and the Sphinx. After being deprived of his identity card, he realizes he is not part of this world and vanishes.

Cocteau has said of this film:

> *The Testament of Orpheus* is simply a machine for creating meanings. The film offers the viewer hieroglyphics that he can interpret as he pleases so as to quench his inquisitive thirst for Cartesianism. . . . This film has nothing to do with dreams except that it borrows the rigorous illogicality of dreams, their way of giving during the night, a kind of freshness to the falsehoods of the day that is dulled by routine . . . It brings into play a form of logic that reason does not recognize. In short, it is Cartesian by means of anti-Cartesianism. . . . This film may be the first attempt at transmuting words into acts, at organizing these acts instead of organizing the words of a poem, at the syntax of images instead of a story accompanied by words.

With the following segment of the screenplay we terminate our discussion of Cocteau and of opium.

Two scenes from Cocteau's last film, *The Testament of Orpheus* (1959). Minerva and her guards in the underworld (*left*), and the poet Cocteau arisen from death accompanied by the Sphinx (*right*). "Poets only pretend to die."

The Poet leaves the washhouse, looks at his watch and continues on his road that takes him from one underground vault to another, until he reaches a part of the quarry that looks like an Egyptian temple. Suddenly, he finds himself in front of a court-usher in a frockcoat, with a chain around his neck, sitting at a table. His right hand, in a white glove, is putting the receiver back on the telephone.

USHER: If you wouldn't mind waiting for a few minutes, the Minister will see you.

The Poet becomes smaller and smaller, in a kind of huge ghostly waiting room.

COMMENTARY: I waited and waited, and waited.

The camera goes several times from the Poet, who is waiting, to the usher.

USHER: In a few minutes, the President will see you.

COMMENTARY: I waited, and still waited!

USHER: If you would be so kind as to consent to wait for a few minutes, the First Secretary of His Most Serene Highness will see you.

COMMENTARY: The minutes were many and still I waited.

USHER: If you would wait a few minutes, His Majesty will deign to see you.

COMMENTARY *(empty waiting room)*: If one waits long enough, eventually one turns into a waiting room.

The Poet, visible again, leaves the stone he was sitting on and goes to the usher who is standing behind his table.

USHER: Abandon hope all ye who enter here.

POET: I thought as much. Do I have to write my name on the register anyhow?

USHER *(making a sign with his thumb to the emptiness behind him)*: There's no point in that. Go in without knocking.

The Poet sees the usher and the table melt away. He walks towards a huge arcade.

INHUMAN VOICE OF AN AIR HOSTESS: You are requested to fasten your seat belts. No smoking please.

Vous êtes priés d'attacher vos ceintures et d'éteindre vos cigarettes.
Sie werden gebeten, ihre Gürtel festzumachen und nicht zu rauchen.

The Poet arrives at Minerva's chamber. The Hibiscus re-materializes in his hand. We see what he sees.

In the distance on a kind of monumental stage, is Minerva, flanked by her guards, the man-horses.

Minerva, leaning on her spear, is carrying a shield with a Gorgon's head on it, and a helmet with a swan's neck. She is wearing a black, shiny frogman's suit. The Poet goes towards her and offers her the flower. But she turns away.

POET: Lazarus didn't smell too good either. There is even a painting where Martha and Mary are holding their noses with a cloth . . . I'm sorry . . . I . . . I'm sorry. . . .

As soon as he has walked away, Minerva brandishes her spear and throws it. The Poet is walking. The spear sinks into his back, between his shoulders.

Front view. The spear has transfixed the Poet and come out through his chest. He raises his hands to it, and falls to his knees, then lies on his side, murmuring over and over:

How horrible . . . how horrible . . . oh, how horrible. . . .

Minerva and her entourage.

The man-horses come down off the stage.

One of them pulls the spear out of the Poet's body.

They lift up his body and carry him away.

The blood that was under his body and the Hibiscus that had fallen on the ground turn red.

Several of his friends are watching him die.

Sitting amid rubble and barbed wire, as though in the President's box at a bullfight, are Jacqueline Picasso and Lucia Bosé. Standing behind them are Picasso and Luis-Miguel Dominguin.

Perpendicular view of a tombstone that the man-horses lay me down on.

The gypsies gather round it and mourn. (These scenes are all accompanied by the cymbals and drums of the Seville procession.)

Close-up of the Poet's face, with wide-open false eyes. Smoke curls slowly out of his half-open mouth.

COMMENTARY: Pretend you are crying, my friends, since poets only pretend they are dead.

The Poet, without bending his knees, rises upright onto the tombstone.

He leaves the tomb and the gypsies, comes out of the quarry through a huge split in the rocks into the countryside, hesitates for a moment as to which road to take, and appears to answer the call of an almost unbearable ringing sound, like the note "A" from a tuning-fork.

The Sphinx.

The Sphinx, the trunk of its body a woman's, gently waves its long white-feathered wings and slides along a wall over the Valley of Hell. The Poet walks past without seeing it, as he still has artificial eyes.

10 Wild Weed

Assassin of Youth

When sound revolutionized the motion picture industry in 1929, marijuana was just starting to break out of the narrow circles of Mexican laborers, jazz musicians, and ghetto blacks. Hollywood would certainly have exploited such a potentially rich subject if it had not been for the recent arrival of severe censorship, as discussed previously. Nevertheless, the intense, paranoid scrutiny of every foot of film was not fully operational for a few years and some references to drugs managed to slip by. As noted, the classic comedy *International House* (1933) contains a hilarious rendition of *Reefer Man* by Cab Calloway and his Cotton Club Band, some of whom do look as though they have just been visiting that notorious gentleman. "If he trades you dimes for nickels and calls watermelon pickles, then you know your talkin' to the reefer man." In recent years, Calloway wrote a portion of a drug abuse pamphlet in which he denounced all drugs as harmful to musical creativity.

In the bizarre musical-murder mystery *Murder at the Vanities* (1934) Gertrude Michael sings the famous "Sweet Marijuana Brown":

> Boy she's really frantic—the wildest chick in town.
> Sweet Marijuana Brown.
> She blows her gage—flies in a rage.
> Sweet Marijuana Brown.
> In her victory garden, the seeds grow all around.
> She plants, you dig—she's flipped her wig.
> Sweet Marijuana Brown.

The fabulous ultrapsychedelic choreography of famous 1930s musical director Busby Berkeley has led to frequent speculation about his acquaintance with the reefer man. In his *Gold Diggers of 1933* (1933) Ruby Keeler remarks of a zany musical producer—"Say, what's he smoking?" and opines in a song "Every kiss, every hug is like a drug to me." At the beginning of the film, a man throws away his violin case when cops enter the theater, but Prohibition was still in effect and this is probably a reference to booze. In one of the bizarre numbers in the film, Dick Powell pursues Ruby Keeler on roller skates; she in a metal dress and he with a tin snips. He catches her and cuts the dress off! Probably Berkeley's most enchanting film, largely because it is his only one in color, is the remarkable *The Gang's All Here* (1943). Six-foot-tall dancing bananas and disembodied heads floating around combine to make this a prime candidate for Hollywood's most psychedelic visual effort prior to the 1960s.

A Bela Lugosi (Dracula) film of this period, *Night of Terror* (1933), contains a marvelous drug scene. While being guarded by a detective, Lugosi asks "Do you care if I smoke?" "I don't care if you burn" says the cop, who then takes one also, lights up, and takes a few drags. The dick sniffs the air. "Hey, what kind of a cigarette is that?" "It is an *oriental* cigarette." The cop's head immediately wobbles from side to side and he falls asleep. Lugosi flashes his inimitable sardonic grin and strides from the room. The next year Disney released his famous technicolor short *La Cucaracha*, based on the marijuana song.

But the fun was to end very soon. The Federal Bureau of Narcotics had been created in 1932, with the now infamous H. J. Anslinger at its head. Serving as the focal point for the growing alarm about the spread of marijuana use, Anslinger made inflammatory speeches and wrote articles for the popular press that helped create a hysteria about marijuana that resembled the LSD hysteria of the 1960s. In the next few years, as we have seen, the only films to deal with marijuana were several rabidly antidrug tracts, produced independently with Anslinger's blessings.

Assassin of Youth (1935) depicted the rapine and murder committed by drug-crazed youths. A high school girl is introduced to marijuana and is soon engulfed by wild parties, unleashed passions, and the horrors of the criminal underworld. After she is degraded sufficiently, a reporter saves her and smashes the gang of "reefer addicts."

The next year there appeared a classic of misinformation and hysterical propaganda. *Reefer Madness* (1936) opens with Dr. Carroll lecturing the Parent-Teachers Association on the "assassin of youth . . . more dangerous than all other drugs." We are told that educators are helpless because the public is apathetic and the government is helpless because there is no interstate commerce in the drug. One boy "under the influence of the drug killed his entire family with an axe." A seventeen-year-old girl was "taken in a raid in the company of five young men." Then we are presented with the story that happened "right here in this community."

Four city slickers, two men and (by implication) their prostitutes, begin hanging out at a soda fountain frequented by high school students. While a "reefer addict" pounds away at the piano, they entice kids up to their apartment, where they proceed to get them "hooked" on free reefers. Bill smokes his first reefer and within minutes he is seduced by one of the loose women. Bill's innocent girl friend Mary comes looking for him and within minute she is turned on and seduced by one of the pushers. Bill blunders on this scene and has a fight with the pusher who accidentally shoots Mary dead and knocks Bill out cold. Bill's friend Ralph responds to this crisis by chain-smoking reefers for the rest of the film. The amnesiac Bill is framed by the pushers, brought to trial for Mary's slaying and sentenced to death. For those who don't get the point, a cop visualizes a hemp noose on the wall. Asked for evidence of Bill's sanity at the trial, Dr. Carroll cannot lie. "In the middle of a perfectly serious discussion of

Drugs and exposed skin meant the equivalent of an "X" rating for the 1936 *Reefer Madness*—one of the first sound films to expound the idea that marijuana leads to sex, madness, and murder.

Romeo and Juliet he suddenly broke into an hysterical fit of uncontrollable laughter." Bill is clearly a madman. Bill is saved when one of the pushers confesses, but the rest of the degenerates do not fare so well. After chain-smoking reefers for weeks, Ralph flips out, kills one of the pushers, and is sent off to an insane asylum. One of the women is sent up the river, and the other is so shamed by pleading guilty to "fostering moral delinquency" that she leaps out a window.

Clearly, if you smoke a single joint you get speedy, sexy, and wild, though even if you do have fun your amnesia will make it difficult to remember. *Look* magazine drew yet another moral from the story—"Sensual dancing and marijuana smoking make a weakling of Bill." The film both exploited old marijuana myths and helped to create new ones.

Mexico had lived with marijuana without problems ever since the drug arrived with the Spaniards, but in the same year (1936), possibly responding to pressure from the United States government, Mexico produced its own antimarijuana film. *Mariguana—el Monstruo Verde* (*Marijuana—the Green Monster*) was produced by Estudios Mexico and directed by José Bohr. It was subsequently released in the United States.

The Marihuana Tax Stamp Act passed the United States Congress in 1937 and largely terminated marijuana use and films about marijuana until the late 1950s, but independent producer Dwain Esper managed to squeeze in one more wild weed melodrama. *Marijuana: Weed with Roots in Hell* (1937) was released in later

years (with footage of naked bodies in the "art-theater" version) as *The Pusher*.

After the usual prologue on the perils of marijuana, we find Lamont High school students Jimmy and Sally drinking in a local bar ("Beer 5¢"). "Oh Jimmy—you don't love me. I'm off the wall." Evidently, Sally is trying to tell us that she is drunk.

"I know Sally, but I don't mind." "In the old days parents knew what their kids were doing evenings." "If my mother and dad had come to places like this, I wouldn't be here now." The rest of the gang, reportedly including Lucille Ball, is drinking, necking, and fighting, while being looked over by obvious older pusher types.

Cut to party at a beach house the next evening. A young man handing a drink to a young lady says, "Who said it wasn't loaded? This is going to be a slippery drink for sliding girls."

"Is there anything here I haven't tried yet?" Pusher produces joints from false heel. "The funniest cigarettes I ever saw." Puff, puff. "The funniest cigarettes I ever tasted." "Here Burma, try one of these on your algebra."

"What are they?"

"I don't know. We tried Tony's giggle water, let's try his giggle weed." Soon the gang is quite jolly.

"One hot number coming right up."

"One ripe piece coming right down."

One pusher to another with heavy Spanish accent: "This bunch sure uses up the joy weed don't they."

"Well, that's one way of creating business. When they're that age they're not suspicious and easily hooked."

The gang has been having fun for ten minutes now and it is time for the grim reaper. They go swimming (distant shot of nudes cavorting in the surf) and one of them drowns. It seems to be only a couple days later, but Dick comes to see Tony, telling him that he has gotten Burma pregnant and it is Tony's fault for getting him stoned. Tony gives Dick some marijuana to sell and the next day the police kill nineteen-year-old Dick while he's trying to elude the narcs. A desperate Burma goes to Tony who gives her a loaded drink and talks her into giving up her baby and dealing dope. Unknown to Burma he gives the baby to her sister. Cut to montage of dreadful drug headlines, shots, groans, and sirens.

Burma is now Blondie, a hard-hearted heroin dealer giving a woman $5 worth of heroin for her wedding ring. "The way your marijuana customers are hooked on the stronger stuff such as H and C you'll soon be getting rich." Burma is shooting up by now. "Wait, I got to take another pop on this." Burma wants money faster, so she kidnaps her sister's child, but the police come when she's out and take the child and her dope. The distraught Burma does an extra big hit of heroin in her leg and dies. Detectives come in, and as they touch her, joints cascade out of her clothing.

The government shows how to grow marijuana in *Hemp for Victory* (1942).

After this film the lid was clamped on and, with minor exceptions, no drug films were to appear until the late 1940s. There were, however, a few oblique references to drugs in film. In *Flash Gordon's Trip to Mars* (1938), the Emperor Ming silences opposition with the "incense of forgetfulness," and a Marx Brothers film has a scene in which Harpo acts even stranger than usual after rolling and smoking a large cigarette. Then there is the scene in Disney's *Dumbo* (1941) in which the two crows (obvious black stereotypes) sit in the tree smoking as the elephant flies past. Hope and Crosby's *Road to Morocco* (1942) has a passing reference to "reefer," and there is a lovely sequence in the Sherlock Holmes story *Woman in*

Green (1945) in which, as an aid to hypnosis, the woman gives Holmes (Basil Rathbone) "a little materia medica." "*Cannabis japonica*—an oriental soporific . . . within minutes you'll feel yourself growing drowsy." Holmes palms the tablets and instead takes a drug that renders him insensitive to pain. When the captain reports seeing a monster in *The Beast from 20,000 Fathoms* (1953), scripted by Ray Bradbury, a sailor asks "Wonder what he's been smoking?" In *Monster on the Campus* (1958) a college professor is transformed into an ape-man after smoking a pipe full of coelacanth serum, and who knows what else.

One marijuana curio from this period is *Hemp for Victory* (1942). Since the American rope supply from the Philippines was cut off by the Japanese, our government had to hurriedly increase the production of the fiber type of marijuana (hemp). *Hemp for Victory* encourages farmers to plant marijuana and shows details of cultivation and harvesting techniques. There are some truly classic scenes of Kentucky farmers wading around in fields of ten-foot high marijuana.

Two more stills showing marijuana farming from *Hemp for Victory* (1942).

Wild Weed

In 1948, Robert Mitchum, Lila Leeds, and several others were busted in Laurel Canyon for the possession of marijuana. After a short stretch in jail, during which MGM dropped her contract, Leeds emerged to make an outstanding marijuana potboiler. Producer Kroger Babb, fresh from such cinematic epics as the sex hygiene film *Mom and Dad* and odd bits of religious pabulum like *Prince of Peace*, decided to vary his sleazy sex exploitation films by adding drugs and Lila Leeds. *She Shoulda Said No—But She Didn't* (1949) is more generally known by its later title *Wild Weed*.

The film contains the invariable prologue by Babb, who tells us that he will "lift the veil of ignorance from your very eyes. This is the story of tea or tomatoes which millions through ignorance have been induced to smoke." "Tea" was a common 1930s term for marijuana, and tomato cans are used for smuggling marijuana in this film.

> This is the city of Los Angeles—one of the fastest-growing communities in the United States today. A city that still reflects the charm and customs of its native past. A city of culture . . . of advanced liberal education that keeps abreast of each new generation. A city of progress and of tremendous engineering accomplishments. Los Angeles—city of the angels . . . but like any other city it has its back alleys—its world of saints and sinners . . . and the half world of dark shadows some of them dwell in. The darkest of these shadows is marijuana. In every large city there are men like Capt. Hayes, chief of the Narcotic Division. His job is to combat and control this evil menace. His fight a twenty-four-hour one. His weapon simple but effective. Patience and intelligence. Every case history tells the same story—a story that's a tragic pattern of men's and women's lives. . . . Cause—marijuana. This harmless-looking cigarette is cloaked in many innocent disguises. But light the match, inhale the smoke, and it becomes an invitation to your own murder. This killer and the man who sells it has no respect for anybody. His victims are any lost soul. It matters not to whom the soul belongs. The seller's method of operation—simple. Keep the mind from thinking. The mind thinks the world's a real thing, with troubles and problems without the answers . . . but he has the answer . . . escape—sell the dreams people want to dream. Keep them from waking up, because once they do—you're out of business. Of course the rich can afford to pay more for their dreams. It's a profitable game

The reefer man turns on another innocent (Lila Leeds) in *Wild Weed* (1949). This film was the only work available to Leeds when she was released from prison after serving time for two marijuana convictions in 1948.

> and when boredom sets in, heroin, cocaine, opium is always the next step—at higher prices. . . if you live that long. This man has no pride. . . to lay his hands on an extra dollar he'll set this killer loose on anyone—even your kid.

The scene opens at Markey's place where a couple of young kids are "copping their sticks" for the night's festivities. "It's going to cost you five bucks tonight."

"Five bucks!"

"That's right—weekend special—three for five, just for you . . . tell your old man to double your allowance next week." They light up and we are treated to our first theramin music, possibly the first use of this instrument in films. Subsequently, the weird electronic sounds of the theramin accompany every good high. "I'm on a great big purple cloud and it's real cool." "Hey, you look funny—you've got purple hair."

Cut to car full of stoned kids who crash. A woman runs up—"My baby, my baby." She screams when she sees amputated legs.

Cut to cops at the morgue. "Well, the morgue did a big business—three lives. Too bad it wasn't the guy who sold 'em those sticks."

Next we seek Markey peddling his sticks backstage at the local theater. "I'm not in business for love."

"I can pay you next week."

"See me then." But Rita's hot for some dope so she agrees to invite her friend Ann (Lila Leeds) to his place. Ann is working hard as a chorus girl to put her brother through college, but Markey tells her she needs to "learn to relax—let your hair down." "I know a lot of people—the right kind. Might even call me a sort of Santa Claus. I could turn your life into a nice big beautiful sleigh ride. Oh here, try one of mine—go ahead it won't hurt you." Immediately we hear the theramin again. "C'mon you'll love it."

"Well maybe one puff won't hurt me." Puff.

"One is like nothing, beautiful—try another." More theramin, more puffs, more laughs.

All the smokers place the joints inside their cupped hands when puffing—an obvious mistake for the practice of placing it between the fingers and puffing on the cupped hands. Before long Ann is stoned. "My head is so light it feels like it's floating."

"That's because your troubles are all gone. Try another puff—see how pretty the world looks now."

"You're so smart Markey, so smart. Music—somebody play some music—I wanna dance. All that energy beautiful—let's not waste it dancing." Ann and Markey exit to the bedroom.

The next morning Ann's brother makes a surprise visit from college and finds a leftover from the party asleep on the couch. Bob wants to quit college and get a job so Ann accepts Markey's offer of easy money. Cut to scene of Markey dealing, he is paying $25 for each can of "tomatoes." Cut to another pot party with a slow, off-key piano player who is performing "my new concerto." The piano man plays a poor version of "Chopsticks" while going through a long fantasy of himself in the Hollywood Bowl playing Liszt. Another smoker freaks out. "I'm going to die—I know I'm going to die."

"Hey, before you leave this world take a drag—it'll get you there faster." General laughter as panicky guy cuts his hand on window. "The big dope, if he was me he could float through the hole."

Before you can say "reefer addict," Ann and Rita are fired for being stoned on the job. But kindhearted Markey gives Ann a job selling sticks at his parties. "For your pleasure tonight we have a special offering." Theramin music starts. "Some people call it madness, others the Devil. But if it is the Devil he's helped to send my baby brother to college . . . two dollars a stick ladies and gentlemen. One for Markey, one for Annie's brother. . . . Who'll be the first to cut up a touch with me?"

The phrase "cut up a touch" is intriguing and occurs also in *High School Confidential* (1958). Originally this phrase seems to have been used by

opium smokers and referred to the telling of stories of one's latest illegal jobs while lying around smoking opium.

Bob comes back from college, is horrified to find his sister peddling dope, and leaves. The next morning they find him hanging in the garage, quite dead. A very clever way to punish your sister for smoking dope. Ann's old boss Hugo reports Ann and Rita to the narcs who bust them. The cops try to scare her by taking her to see a female addict who has fantastic injection scars all over her arms. Next they go to a psycho ward supposedly filled with addicts but Ann does not crack and is given sixty days in the Los Angeles County jail.

While the narrator emphasizes the brutal, monotonous nature of prison, Ann is haunted by voices calling "kid killer." Eventually she loses control and is sent to the city hospital. Soon she is out and back with Markey. "The only thing I'm interested in from now on is money." Ann helps set up a big drug deal and while they are waiting in a warehouse the cops, tipped off by Ann, come crashing in. Cut to violin music and epilogue, which claims that over seventy-five percent of new marijuana smokers are teenagers, and ensures us that "no one seeing this film could be easily tempted to so wreck their mind and body. . . ."

Be that as it may, appearing in this film did not seem to harm the actors any. Lyle Talbot (a narc), Alan Baxter (Markey) and Jack Elam (a hood) all had distinguished careers as supporting actors. Lila Leeds, however, continued to get busted and dropped completely from view. She is currently living an ascetic existence in Los Angeles and maintains that her life has been transformed by prayer. One thing at least is certain: her beautiful blonde hair has become an unremarkable frizzled brown.

Can you conjure up a picture of Fred MacMurray and Claire Trevor as narcs pursuing a gang smuggling Mexican marijuana to Los Angeles? How about Raymond Burr (Ironside of television's famous series) as one of the gang smuggling hashish? This unlikely combination makes for sometimes farcical melodrama in *Borderline* (1950). B. C. Price's independent 1955 feature *One Way Ticket to Hell* was perhaps the first of the motorcycles-lead-to-grass-which-leads-to-heroin films. It is the old story of the naive high school girl being led to ruin by the evil weed and has been done better many times before and since. *The Tijuana Story* (1957) had a much bigger budget, but no better results. The cast includes Joy Stoner (this *must* be a pseudonym) and James Darren, who is so ashamed of being busted for drugged driving that he drowns himself. Dope dealing plays a role in Orson Welles's triumphant *Touch of Evil* (1958). Papa Grande's nephews turn on whenever the old man is away.

Although it contains stereotypes of drug users, *The Gene Krupa Story* (1959) is basically sympathetic to the marijuana user. It seems to be the first film to treat grass smoking as a relatively minor vice that does not necessarily lead to others. Although obviously miscast, Sal Mineo does a very creditable job as the famous jazz drummer of the 1930s. When offered a reefer near the start of the film, Krupa is told that they are "tea, and I don't mean Oolong." "Oh come off it Jack—you think I need that to get me out there." But weed is everywhere and he can hardly refuse when his classy new lady hands him a reefer. "Be somebody Gino. Put your miseries out to pasture and nobody gets you."

Sounds of rising trumpets as he takes a few hits and shouts—"You hear that, everybody—nobody gets me."

By the middle of the picture he insists—"No, I don't mess with that stuff anymore; I thought I got you off of it too." But soon narcs find thirty-nine and one-half reefers in Krupa's jacket (the film implies that his lady was responsible) and his career is jeopardized. Pleading innocence—"That stuff not only threw my timing off, it made my sticks slippery" does no good. After ninety days in jail and headlines—"Was it drugs that made him tops?"—he has to leave town. "You know what they'd do to me if I gave a job to an addict." It was the late 1930s and Anslinger's pseudoscientific mythology reigned supreme. "If a musician so much as smiles on the bandstand they think he's taking drugs."

So it's out to cheap dives in the boondocks. But the piano player still has dark glasses and offers him a joint with "Get tall—just open up the golden gate," and "Just look at those hands shakin' like they was wavin' goodbye—no wonder you can hardly hold on to those sticks." But times change and Krupa makes a comeback with Tommy Dorsey. In spite of some early heckling—"Hey Krupa—got a reefer?" and "Roll one for me," he pulls it off and is again a star.

High School Confidential

Jerry Lee Lewis is singing "Boppin' at the High School Hop" and the Jerry Lee Lewis Music

Truck rolls by. ("We have no overhead—we don't even have a roof," says the sign). Thus opens Albert Zugsmith's 1958 marijuana-leads-to-heroin exploitation epic *High School Confidential*. Although Zugsmith had produced some classics like *Touch of Evil* and *The Incredible Shrinking Man*, he also was to churn out many sex and drugs exploitation cheapies such as *Violated* and *LSD—I Hate You*. Like his other films this one had some rather bizarre casting—Russ Tamblyn, fresh from his portrayal of the mighty midget in the children's classic *Tom Thumb*, as an undercover narc, and sweater girl Mamie Van Doren as his aunt. The "weedheads" at school are a pretty strange lot as well. J. I., head of the Wheelers and Dealers, and the school's prime pusher, is none other than John Drew Barrymore, and his sycophants include Charlie Chaplin, Jr., and pre-"Bonanza" Michael Landon. A balding Jackie Coogan is Mr. A, the town's heroin dealer, and Lyle Talbot, who also played in *Wild Weed*, has a small role.

Tamblyn plays it tough his first day at the new school. He steals J. I.'s parking place and makes a pass at his girl with, "You got thirty-two teeth buster—you want to try for none? I got news for you man. Before this crummy day's over every crummy stud in this crummy school's gonna know who Tony Baker is."

Russ Tamblyn tries to cool off a "weedhead" in the classic marijuana-exploitation film *High School Confidential* (1958). Marijuana plus pressure from the government leads to heroin.

Tamblyn next cruises over to the principal's office and chats with the prim secretary. "Where's the warden? I'm lookin' to graze on some grass." When the lady takes away his joint he chirps—"Now watch out, that weed's much too strong for you, wouldn't you rather have a cigarette?"

Cut to the classroom where he addresses the pretty teacher "Why don't we cut out and go to your pad and live it up—huh?" When they leave for the principal's office, J. I. takes over the class and gives a hip lecture on Columbus stolen from Lord Buckley—"he swung over to the royal pad to cut up a few touches with the cool chick Queen Isabella. . . ."

The principal finds Tony relaxing in his chair and yells, "Get out of my chair." "O.K. baldy," answers Tony, "you better sit down anyway before you fall down." The principal takes away Tony's knife and reefer and delivers a standard lecture.

Cut to homey scene with Aunt Mamie who tries to seduce him. "Thinking of you Tony up against these young tight sweaters."

Cut to scene of cop lecturing the principal. "Now you can see the difference between a real cigarette and marijuana and there'd be no mistaking the texture or content if you were to handle it. The darker one has been rolled in wheatstraw paper. In most of the reefers a double thickness of paper is used. Now in the language the addicts use among themselves marijuana is referred to as mary jane, pot, weed, or tea—they never say to each other 'let's smoke a marijuana cigarette.' They say 'Let's turn on, or let's blast a joint.' "

But in spite of the fact that joints have been found on the floor of the girl's gym, the teacher (Jan Sterling) refuses to believe that dope is a problem at Santa Bella High. So the cop tells of a school in Indiana where "out of a total enrollment of 1,200 students, 285 were found to be using marijuana or heroin. This dreadful condition was only uncovered through a horrible accident. One student, desperate for money to pay for his habit, sold bennies for quarters and dimes to kids in elementary school. It was the death of a thirteen-year-old who had been addicted to marijuana and then to heroin that exposed the ugly facts. It was too late for forty-one teenagers who were addicted."

Back at the café, Tony is sitting with a girl named Mary Jane while J. I. is being hassled for

some "sticks" by Joan who's "dry" and has "a bad case of the screeming meemies." Tony pulls a knife on J. I. and tells him, "I'll let you be vice president, even treasurer of all the weedheads at school." Eventually Joan pretends to buy a dress at a crooked store so she can score some weed with the kickback.

A girl at the club does a classic takeoff on a beat poem, with jazz interlude everytime she snaps her fingers.

> My old man was a bread stasher all his life. He never got fat—he wound up with a used car, a seventeen-inch screen, and arthritis. Tomorrow is a drag, man, tomorrow is a king-size futz. [She snaps fingers and jazz starts.] They cry, "Put down pot, don't think alot"—for what? Time, how much and what to do with it. Sleep and you might wake up diggin' the whole human race givin' itself three days to get out. Tomorrow is a drag, pop, the future is a flake. [Snap, Jazz.] I had a canary who couldn't sink. I had a cat that let me share my pad with her. I bought a dog that killed the cat that ate the canary. What is truth? [Snap, Jazz.] I had an uncle with an Ivy League heart—he had like with a belt in the back. He had a button-down brain, wind up a belt in the mouth, and a button-down lip. [Snap, Jazz.] We cough blood on this earth. Now there's a race for space; we can cough blood on the moon soon. Tomorrow is dragsville, cats, tomorrow is a king size drag. [Snap, Jazz.] Tool a fast short, swing with a gassy chick, turn on to a thousand joys. Smile on what happened or check what's gonna happen—you'll miss what's happening. Turn your eyes inside and dig the vacuum. Tomorrow, Drag. [Snap, Jazz.]

Tony dances with Joan and sings "La cucaracha, la cucaracha, marijuana por fumar." Cut to a poolside party where Doris is going through withdrawal and Tony is trying to score some weed. "I'm dying to blast but I'm clean."

Joan is shocked to find that Doris has tracks on her arms so Tony sets her on the right path. "Well don't look so surprised. Look, do you want me to spell it out for you? If you flake around with the weed you're going to end up using the hard stuff."

Tony puts down J. I. for not giving the frantic Joan a few sticks of weed; but J. I.'s in it for the money. "I'm all tears—she don't bake, she don't get dusted." Tony tries to score five pounds but all he can get is a couple sticks at a dollar each from the magnetic box under J. I.'s car.

Cut to Joan's home where she and Tony are listening to her parents talk, over cocktails. The police commissioner has called a meeting to put the fear of narcotics into the parents and Joan's father is annoyed. "He's making political hay—impressing the voters with another sensational scandal. God forbid they even use narcotics because he's creating an interest in it," says dad taking another sip on his cocktail.

Joan insists, "Why dad, I haven't even read about it."

Just to make sure all the clichés have been included, the next scene is at a drag race where Tony scores 100 joints from J. I. Tony wants caps of heroin also, so J. I. sets him up with Mr. A. But the cops come, find a hubcap full of grass and bust the whole crowd. The parents hassle the police—"Why don't you go out and hunt real criminals" and Mr. A sends a lawyer to bail out Tony.

Soon Tony is in Mr. A's office, where Doris is being forced to experience withdrawal in order to convert her to prostitution. "I was a little surprised to hear you got busted in Chi for using H."

"I was just joy popping, I'm not a habit man!" protests Tony. "Bix—give everybody a pop and see if the young lady in the next room wants a fix—that is if she's ready to cooperate." Tony fakes it and shoots up in a rubber ball in his elbow. "Man that's a dull needle" he opines while nodding out.

Mr. A is a tough character. "If the kids want it—fine. If they don't, we get the other kids to pass the word around that they're chicken. The more kids they get hooked, the better for business." Tony arranges to buy a half kilo of heroin and sets up a bust.

There are some tense moments as Joan finds Tony's secret tape recorder and informs J. I. while Tony is at the club scoring the heroin from Mr. A. A big fight ensues but the cops arrive and all the bad guys are jailed. A brief epilogue exhorts us to fight this insidious menace and then we are treated to Lewis doing another round of "Boppin' at the High School Hop."

The film is a cheap shot, perpetuating all the old marijuana myths, but in all fairness to Zugsmith we must admit that he was under considerable pressure to do just that. MGM received a directive from Anslinger that the film would be prohibited unless it showed the evil effects of marijuana and Anslinger also succeeded in having a prologue about marijuana dangers tacked on to the film. As Zugsmith said recently—"We tried to make the best, most realistic picture we could—under the circumstances. But the narcotics people raised too much hell. . . . Unfortunately, I didn't have final control."

Zugsmith also talked to narcs and teenagers and attended pot parties with beat poet Larry Lipton in Venice, California. Critics of the time were distinctly unfriendly. "Zugsmith protests it is an exposé of a social evil. This film is itself a social evil. . . . Its purpose seems to be to provide a philosophical rationalization for bop-jabber, juvenile delinquency, and dope addiction. It is this ambivalence toward the evil it professes to expose that makes *High School Confidential* so venal." Venal or not, this film is high camp for contemporary audiences and is again making money for MGM.

The following years were graced with several low-key marijuana melodramas. *Key Witness* (1960) had Johnny Nash and Dennis Hopper as members of a gang headed by a reefer-smoking sharper named "Muggles" (a 1930s term for joints). Leslie Caron, George Peppard, and Roddy (*Planet of the Apes*) McDowall were cornball beat stereotypes in *The Subterraneans* (1960). *Fiend of Dope Island* (1961) had a refreshingly new theme. The fiend (Bruce Bennett) grows marijuana and smuggles arms on his Caribbean island in addition to exploiting natives and charging high prices in his canteen. He receives his due at the end when the sharks enjoy a choice meal of terrestrial mammal.

Other countries began generating their own Reefer Madness films. Azteca Studios of Mexico put together the documentary style *El Mundo de los Drogas* in 1963, and in 1967 Argentina created *Humo de Marijuana*. According to an official book on Argentine cinema:

> This is an approach to the drug addict's world and an account of the struggle against the traffic in narcotics. It shows reality as distorted by the sick minds of people who are marijuana smokers. The efforts of the police repeatedly crash against the wall of silence built by the victims who believe that with it they protect themselves. The cameras explore the secret universe of vice where perverted youths, delinquents, and hopelessly degenerated persons are tied together by the compulsion to take "trips" provided by heroin, opium, morphine and cocaine besides marijuana. . . . Interpol investigates . . . and although sometimes it catches some peddlers, the big bosses of the underworld remain far away from the arm of justice. Lucas Demare, director of some great Argentine pictures, has selected some strange backgrounds hidden in Buenos Aires, from a ghostly marbleworks to the interior of a cruise ship that was almost destroyed by fire years ago, to shoot the chilling sequences of this story.

Another book described the film with less grammar but more humor: "It visualizes the process of deformation of spirit and senses in the criminal zone of stupefaction."

India, in some ways the mother country of marijuana, has included marijuana in many films. *Hare Rama, Hare Krishna* (1970?) tells you everything you always wanted to know about ganja, and *Charas* (1975?) does likewise for hashish. *Dum Maro* (*You Smoke*, 1973?) was India's answer to *Maryjane*, to which we now proceed.

American International Pictures has specialized in producing cheap, lurid versions of literary classics and recent successful films. Consequently, as the popularity of marijuana blossomed in the 1960s it was no surprise to find American International introducing *Maryjane* (1968) into the psychedelic stream. Unfortunately, most of the seamy sensationalism that could have made the film another camp classic is missing and the resulting pap is barely able to maintain the interest of even the stoned-out midnight-movies crowd.

The film begins with a fatal car crash and a graveside sermon—the first of many dull scenes. Fabian stars as a teacher at Oakdale High. For a sleepy suburban town things are really swinging. If you smoke grass you can join the Maryjane Club and get a Maryjane button to wear around school. Besides smoking, you have to do some shoplifting to become a member. Gary smokes his first joint and is picked off the sidewalk by Fabian, who consoles him with, "When I smoked it, I got sick as hell."

Ersatz beatniks Steve Cochran and Mamie Van Doren in *The Beat Generation* (1959), another Albert Zugsmith exploitation epic.

Leigh Taylor-Young and Peter Sellers in *I Love You, Alice B. Toklas* (1968). The story of a lawyer who turns on, tunes in, and drops out, it is one of Sellers's best roles, and one of the few "establishment" films of the 1960s to treat the psychedelic revolution in an intelligent and sympathetic fashion.

Next we are treated to yet another lecture by the town cop, who informs Fabian that there have been three deaths and that drug use spreads like cancer. "First marijuana—then LSD and STP—then heroin and cocaine." The cop says that scientists believe that marijuana does not lead to hard drugs but that statistics show it does.

The chief calls Fabian a dope fiend because he admits to having once smoked it in his student days and because he refuses to spy on his students. The chief soon has his revenge when Fabian is busted for a possession of a can of grass left in his car by a student. Fabian soon discovers that the grass is being distributed at school in ice cream cartons by the Good Humor man, but the biggest surprise is still to come. He finds that he was unable to make time with his pretty colleague Ellie because she was being supplied with marijuana, heroin, and sex by Jordan Bates, head of the Maryjane Club. Jordan soon gets his just deserts from a rival gang to whom he attempts to sell inferior weed instead of "gold." Although the movie includes some believable scenes of the kids smoking, giggling, and making out, and the kids inhale and hold their breath rather than puffing cigarette-style as in earlier films, we are once again presented with the preposterous when the gang assays the dope's quality by smell and taste.

Pallid dialogue, feeble acting, and unbelievability make the film a chore to watch, but there are a few incidental points of interest. Patty (*The Bad Seed*) McCormack is one of the high school gang and Fabian called the chief a son-of-a-bitch on prime time television. The title song includes such immortal lines as "She's not a new girl in town and you knew she'd been around" and "Don't let yourself hit the sky—her high can be goodbye." The characters are mostly 1950s stereotypes, though the stupidity of the officials generally rings true.

Blasts from the Counterculture

Rolling through the 1960s with Jimi Hendrix and Panama red—down with Nixon and up with acid. Call it youth revolution, hippie revolt, counterculture, or whatever, it was happening big. New drugs, new music, new morals, new life-style. Whether for exploitation and quick money or for honest portrayal, drugs and particularly pot became very common, almost mandatory elements of films seeking to appeal to younger audiences.

Of the hundreds of films of the 1960s and 1970s that mention marijuana, several come to mind immediately. *Easy Rider* (1969), with its already classic scene of Jack Nicholson being turned on by Hopper and Fonda while digressing on his theories of Venusian invasion, is discussed elsewhere. The film's casual depiction of pot use led to Fonda's being accused of glamorizing drug taking, but this is only the result of the film's popularity, since many films of the time were similar in presenting casual drug use. *Psych-Out* (1968), for instance, was much more outrageous, as was *More* (1969). *I Love You, Alice B. Toklas* (1968) had Peter Sellers and many others consuming marijuana brownies and LSD with much gusto and no obvious ill effects as did *Alice's Restaurant* (1969). Sellers again smoked "wog hemp" with Ringo Starr in *The Magic Christian* (1970).

Although it contained ample drug use, *The Love Ins* (1967) did not come under fire for permissiveness because it showed a seamy side of the psychedelic revolution. Similarly with *Riot on Sunset Strip* (1967) and *The Hooked Generation* (1968). The gang in the latter film uses marijuana to stone some Cubans in order to murder them and steal their narcotics, hardly typical of flower children. Sonny and Cher's films *Good Times* (1967) and *Chastity* (1969) included grass in the cast, in spite of Sonny's antidrug rap in drug-abuse films. *Chastity* stars Cher as a mixed-up hippie who hitches around, smokes pot, and rips people off. Although a poor film, there is one fine scene in which Cher fleeces a naive lad in a Mexican brothel.

Come Back Baby (1968) was an independent effort about a marijuana dealer who lives in his private world of drugs until an angry friend reports him to the police. *Captain Milkshake* (1970) told the story of a young Marine, back from Vietnam, who gets involved in the counterculture and drug use, even unknowingly smuggling dope from Mexico. *The Babymaker* (1970) includes marijuana as just another aspect of the late 1960s West Coast life-style, as does Agnes Varda's *Lions Love* (1969). *High* (1967), also shown as *In*, was a Canadian film about a young college dropout who wanders around Canada selling grass and preying on homosexuals, and this is the upbeat part of the film. He turns on a pretty librarian and from that time it is all downhill to theft, murder, and prostitution, with nothing likeable about them or the film except one nice psychedelic sequence.

Head (1968), written and produced by Jack Nicholson and Bob Rafelson, was the only team

The law raids a "typical" West Coast drug party in *The Baby Maker* (1970).

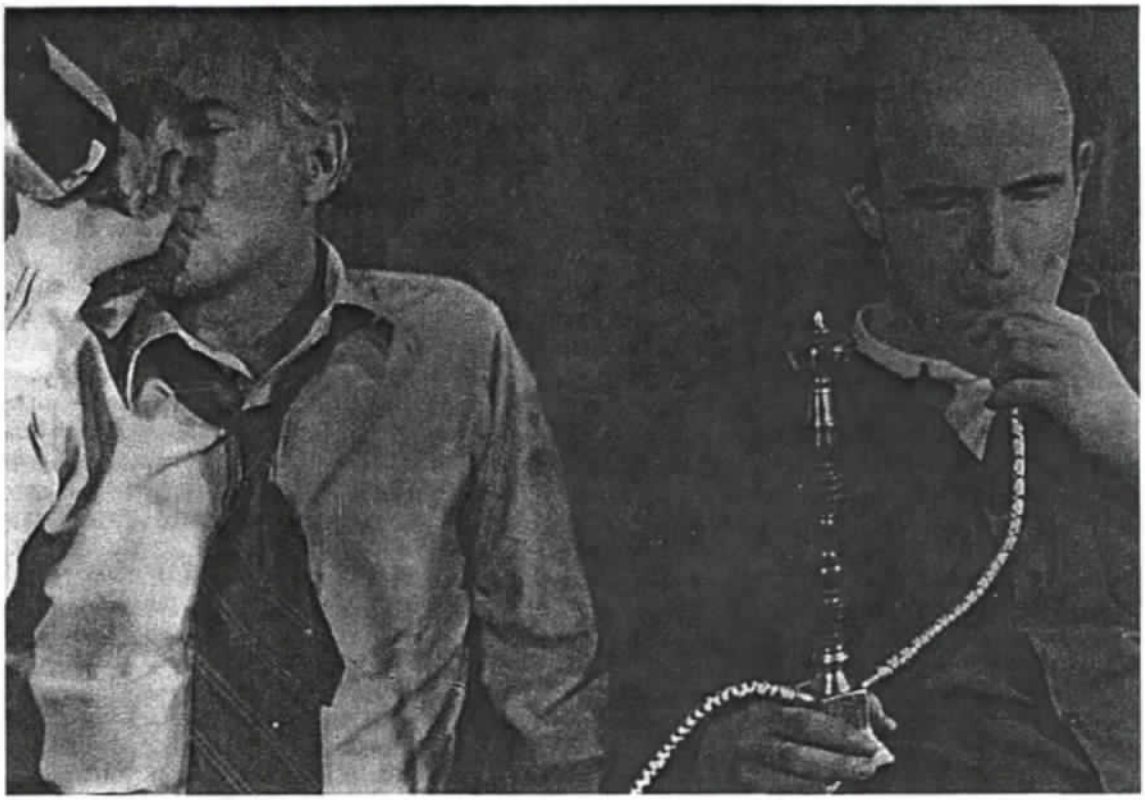
effort by the rock group the Monkees. Though not specifically showing marijuana use (except perhaps in the one scene of monks puffing on nargilehs—"those who know it, use it"), critic Renata Adler correctly perceived that "special effects, perspective, focus, dimension, color, logic, pace . . . are most accessible to marijuana" and "the aesthetic marijuana world is bound to come out in films importantly one way or another . . . this sort of movie may be testing the ground." With footage of Carol Doda, Sonny Liston, Frank Zappa, Ronald Reagan, Bela Lugosi, and Rita Hayworth, and a sequence in which the Monkees are dandruff on Rock Hudson's head, marijuana would seem to provide a reasonable way to relate to the film.

College students were turning on in many films such as *Getting Straight* (1970), Antonioni's flop *Zabriskie Point*, and *The Magic Garden of Stanley Sweetheart*. College dropout Gnossos offends fraternity brothers by lighting up at lunch and later becomes entangled with Cuban marijuana smugglers in *Been Down So Long It Looks Like Up to Me* (1971). Based on Richard Farina's autobiographical novel, the film did not meet with much exuberance among critics. Judith Crist commented: "The anachronisms are outnumbered only by the dreary performances and the re-statements that ours is a rotten, plastic society." *Dusty and Sweets McGee* (1971) is mainly about heroin addiction but junkies will use anything, so marijuana also figures in the film. *A Safe Place* (1971) turns out to be the inside of Tuesday Weld's head and her New York pad where she smokes dope with friends, who include Orson Welles and Jack Nicholson. *Two People* (1973) are Peter Fonda and Lindsay Wagner, more college types who are trying to get away from it all in Morocco. Wagner gets a yen for some kif, but Fonda is crying because he's a Vietnam War deserter and can't help her out.

Dealing, or, the Berkeley to Boston Forty-Brick Lost Bag Blues (1972), based on the novel by Michael (*Andromeda Strain*) Crichton and brother Douglas, had the novelty of drug-dealing students and cops. Peter flies to Berkeley to score some weed and visit Susan (Barbara Hershey). Susan later flies to Boston with forty kilos and is

Donald Sutherland and Jane Fonda after smoking dope in *Klute* (1971).

Observing the rites of adolescence in the 1960s, college students light a joint in *The Magic Garden of Stanley Sweetheart* (1970).



A disgruntled Joe tries grass at a hippie party, but it doesn't mellow him out—he soon commits a violent murder in *Joe* (1970)—a portrait of lower-class alienation.

busted, but the cop takes half the stash to sell and is eventually forced to release her. Some straight critics objected to the matter-of-fact and even romantic attitude toward drug dealing but marijuana smokers usually liked it. Everyone seemed to agree that the choice of Robert Lyons as the "doped up, monosyllabic, mush-for-mind hero" was unfortunate.

Rock stars and drug dealing were the main themes of *The Harder They Come* (1973) and *Cisco Pike* (1972). The former film has heavy political overtones but the latter has only a crooked cop (Gene Hackman). Singer Kris Kristofferson stars as Cisco, an ex-dealer musician being pressured into dealing 100 kilos of grass for crooked narc Hackman. The actors are generally a little too old and straight but there are some good characterizations of hip types. This sort of film dates rapidly (they sell twenty-five kg for $3,750) and it is already, as critic Stephen Farber has said, ". . . an elegy on the very recent past."

The Japanese as usual outdo everybody with *Mako, the Bad Girl* (1971). A gang of marijuana dealers fights a gang of pimps, while a gang of girls fights them both. Other recent foreign films relevant to the drug scene include *Obsessions* (1970) from the Netherlands, *Il Était une Fois un Flic* (1972) from France, *Morire Gratis* (1968) from Italy, *Vivre à la Folie* (1967) from Sweden, and Britain's *Performance* (1970).

Young people doing drugs while wandering around are followed in *Maybe I'll Come Home in the Spring* (1970), *Children of the Lotus Eaters* (1970), and *In Search of America* (1970). These barely tolerable television movies emphasize the family's efforts to cope with their kids' aimlessness and drug use. Likewise with *The People Next Door* (1970), who find their daughter being turned on by the principal's model son, and William Shatner whose daughter Alice runs through every drug available en route to a fatal overdose in *Go Ask Alice* (1973). The last film is remarkable especially for a television movie in that it is fairly interesting and believable, perhaps because it is based on a true story. The film begins with the Jefferson Airplane's song "White Rabbit" ("One pill makes you larger, one pill makes you small, the ones that mother gives you don't do anything at all; ask Alice when she's ten feet tall "). Alice has the cosmic heavies on her first trip. "It was so ugly I wanted to die . . . then everything became new and beautiful . . . my mind seemed to possess the wisdom and knowledge of the ages . . . for the first time I felt beautiful and free." She then falls in with the college crowd (she's in high school) and is soon smoking, dropping, snorting, and sleeping around with wild abandon.

Just as in *High School Confidential*, the parents do not realize what is happening. "Can you believe it—stoned out of our minds and my parents don't know the difference." Alice is one of those with emotional problems for which dope is a panacea and she is soon continually stoned on ups, downs, tranquilizers stolen from her mother, and anything else available. "Sometimes I wonder what it's like without dope—just feeling things straight." Running away to the big city, she becomes a teenage hooker, living on speed and heroin. She gets sick and goes home but it's the same old problem plus the straight-hip division in school and pressure to be a doper. While she is baby sitting, she accidentally takes acid and flips out. Thinking she's been buried alive, Alice tries to scratch her way out of a closet and winds up in the hospital with hallucinations of bugs crawling on her. The film ends here with the epilogue that the real Alice died of an overdose at the age of seventeen.

One fault of *Go Ask Alice* and many similar films is that it tends to portray drugs as the villains rather than the personal problems resulting from the indifference of parents and the hostility and crudity of society.

Tippy Walker plays a similar young girl gone astray through multiple drug use in *Jennifer On My Mind* (1971), with a dreadful script by Erich (*Love Story*) Segal and the less said the better. Barbara Hershey (who also smoked in *Dealing* and *The Baby Maker*) and adolescent friends spend the summer goofing off and experimenting with pot in *Last Summer* (1969), and Michael Sarrazin gets involved in the campus drug scene in the film version of Ken Kesey's novel *Sometimes a Great Notion* (1972). *Sharks* (1975) opens with a scene of kids getting loaded on the beach, but this is the high point of the film. *Making It* (1971) has a unique angle. Kristopher Tabori seduces an innocent high school girl by feeding her a curry with marijuana seasoning.

The animated *Fritz the Cat* (1972), based on R. Crumb's comic strip, depicts Fritz and his lady as marijuana-smoking college students at the start. George Leonard, who created the rock-and-roll group Sha Na Na, produced the weird and wonderful (always weird, sometimes wonderful) silent comedy *The Evil Weed* (1972). Dope figures in many (or all, depending on your viewpoint) of George's adventures. *Joe* (1970) may be regarded as the generation gap and drugs as seen

from the viewpoint of some sick, violent rednecks. In *Chappaqua* (1967), marijuana is included in Conrad Rooks's psychedelic roulette.

It was bound to happen, and in 1970 the first hip vampire appeared, in *Guess What Happened to Count Dracula*. Not only is Dracula a guru, but Angelica's friends bring him on a blind date to her marijuana orgy, where he takes long drags off her neck instead of her weed. But all's well that ends well as Angelica drains her former lover of blood and lives happily ever after with Dracula and his hippie band. *The Deathmaster* (1972) also features a guru-vampire with a faithful hippie band.

Woodstock Nation and the Hippie Revolt

Many documentaries dealing with the youth culture of the late 1960s and early 1970s included scenes of marijuana smoking. Among these are *Mondo Teeno* (*Teenage Rebellion*) (1967), *Mondo Mod* (1967), *Mondo Hollywood* (1967), *The Hippie Revolt* (1967), *Revolution* (1968), and *Last Summer Won't Happen* (1969). *Shangri-la* (1968?) documented the hip scene in India, including the famous Goa beach area, where young people from around the world congregate, go nude, use drugs, and catch hepatitis. The Italian *Witchcraft '70* (*Angeli Bianchi . . . Angeli Neri*, 1969) also had some puffers.

Some of the documentaries were concerned largely with the folk-rock music scene. D. Pennebaker's *Don't Look Back* (1967) focused on Bob Dylan, with Joan Baez and Donovan also present, and *You Are What You Eat* (1968) had a variety of musicians of the mid 1960s along with be-ins, bubble gum, surfing, and acne. Michael Wadleigh's *Woodstock* (1970) is the most successful of all rock documentaries and will probably always retain that status. In addition to being the largest rock concert ever and having numerous superstars, Woodstock captured the hip-drug-flower-child-rock-and-roll scene in full blossom—at the peak of its optimism and success. The Woodstock scene is still with us, but it has spread out, transformed, and merged with the rest of society, not, as is often said, because of its failure, but its success. Little old ladies, cops, and legislators often smoke dope, drop acid, and watch folk-rock shows complete with countercultural comics on late night television shows. There is also an immense impetus behind the movements to clean up the environment, stop waste, stop discrimination, and find a more cooperative, spiritual, and enlightened way to live. This was precisely the direction in which most of the Woodstock Nation wanted to go.

The year 1970 was a banner year for "rock-docts" including two films starring the Rolling Stones. *Gimme Shelter* was David Maysle's powerful and terrifying film of the Altamont concert in which "their satanic majesties request" for policing by the Hell's Angels resulted in a murder and lots of bad vibrations. French filmmaker Godard used the Stones as background for his study of revolution in *Sympathy for the Devil*. Also appearing in 1970 was *Groupies*, an in-depth look at those young boys and girls who live for their big moments with rock stars.

Mad Dogs and Englishmen (1971) starred Joe Cocker and Leon Russell, and *Celebration at Big Sur* (1971) featured numerous stars. One critic cautioned parents about the latter film because it "seems to condone marijuana smoking" but by this time some parents were probably happy if their kids were doing nothing worse. *Medicine Ball Caravan* (1971) was largely a flop both in film and album form but it is full of insane moments, as when a family of ex-Green Beret speed freaks hallucinate their way through the Colorado mountains dressed as cavemen.

From this time on practically every major rock group and every major concert became the subject of film coverage and it seems pointless to try to enumerate them all. However, mentions of drugs in a few nonmusical documentaries are relevant. *Marjoe* (1972) used a documentary approach to tell the story of child evangelist Marjoe Gortner, now a hip Hollywood type. Shirley Clarke (*The Cool World*) did a study of a thirty-three-year-old black male prostitute and singer who smoked grass while rapping in *Portrait of Jason* (1967). *Kwaheri* (1964) was a study of Africa, but one scene showed a young girl under the influence of bhang (marijuana) being burned alive as a sacrifice. In 1972, pornography mogul Alex de Renzy produced *Weed*, a PG-rated documentary on marijuana. Although hampered by poor background music, sloppy editing, and boring interviews, the film has some very nice material filmed in Nepal and Mexico. *Acapulco Gold* (1975) was a more successful approach with its scenes of cultivation, harvesting, and smuggling of marijuana in the United States and Mexico, a fine sound track, and even an animated segment. This is not to be confused with the 1977 mishmash of violence and confusion of the same name.

Quick Hits

With marijuana extensively infiltrating the Western hemisphere, it was inevitable that it should become an incidental item in many films. Andy Warhol's ★★★★ (*Four Stars*, 1967), *The Nude Restaurant* (1967), *Bike Boy* (1967), and *Blue Movie* (1969) all featured marijuana as a casual element in the lives of people who were usually more interested in heroin. Earlier, the "Gee Officer Krupke" song in *West Side Story* (1961) contained the lyrics "my grandma pushes tea," and Antonioni's *Blow Up* (1966) shows a London pop crowd so stoned out that they are uninterested in a murder. Later (1971), in *Zabriskie Point*, Antonioni was to depict pot smoking as a casual, any-time-of-the-day thing, and even has his hero turning it down at one point with the quip—"No thanks, I'm on a reality trip."

Kids are also shown casually turning on in *Hallucination Generation* (1966), *Three in the Attic* (1968), *Riot on Sunset Strip* (1967), *The Grasshopper* (1970), *Joe* (1970), and *The Christian Licorice Store* (1972). A room full of Dutch grass and hash smokers appear in *Puppet on a Chain* (1970) with the comment, "In a year three of ten will be dead." Retribution is even swifter for Zalman King when he is suspected of being an informer—after cops raid a jaded pot party in *The Ski Bum* (1971).

Older characters turn on in *Coogan's Bluff* (1968) and in *M☆A☆S☆H* (1970), a comedy about the United States Army in Korea, notable for being the first break for blacklisted writer Ring Lardner, Jr. Housewives take a grass break in place of coffee in *A Session with the Committee* (1969), and Hollywood sophisticates congregate in the bathroom to smoke dope in *The Party* (1968), another bad Peter Sellers-Blake Edwards collaboration. Marlon Brando is a joint-rolling guru in *Candy* (1968), Terry Southern's satire on just about everything, and James Coburn, as an impotent, broken-down Louisiana man, gets consolation from pot in *The Last of the Mobile Hotshots* (1970), based on *The Seven Descents of Myrtle* by Tennessee Williams.

Otto Preminger's LSD fantasy *Skidoo* (1968) has desultory grass scenes and the Kris Kristofferson-Barbra Streisand remake of *A Star Is Born* (1976) casts the story in the modern idiom, complete with weed and coke. Woody Allen gets stoned willy-nilly in *Play It Again, Sam* (1972) when he enters a cab just vacated by heavy smokers. Streisand's first screen trip was in *The Owl and the Pussycat* (1970) where she and

Ewa Aulin's insane adventures in *Candy* (1968) include a visit to a dope-smoking guru (Marlon Brando).

George Segal turn on and tune in to each other. Look for the star of Ivory soap commercials and the hard-core hit *Behind the Green Door*, Marilyn Chambers, in a small part in this film. Chris and friend Lynn smoke a joint in *There's Always Vanilla* (1972), produced by the group who hacked out *Night of the Living Dead* (1968).

Grass helps to fill the void in Stanley's life in *The Magic Garden of Stanley Sweetheart* (1970), and Michael Burns escapes from Sandy Dennis to smoke with his sister in *That Cold Day in the Park* (1969). James Mason's girl friend Moira lights up after going through customs in *Cold Sweat* (1971), and Max Von Sydow takes a toke or two in the film version of Hesse's *Steppenwolf* (1974). *Bob and Carol and Ted and Alice* (1969) mix a little weed with swinging, and Bette Davis and

Parents try pot in Milos Forman's *Taking Off* (1971), a somewhat whimsical look at the generation gap.

Natalie Wood gets stoned with Robert Culp in *Bob and Carol and Ted and Alice* (1969).

A straight businessman (Alan Arkin) is turned on by a hippie friend (Paula Prentiss) in *The Last of the Red Hot Lovers* (1972).

Ernest Borgnine huff and puff as a pair of old-age hippies in *Bunny O'Hare* (1972). "Isn't that illegal?" she says as he lights up after committing a series of bank robberies.

Among other films to take a whimsical look at adult use of marijuana were *Putney Swope* (1969) and *Richard* (1972), both of which showed the president of the United States turning on. *Putney Swope* shows blacks taking over a Madison Avenue advertising agency, changing its name to Truth and Soul, Inc., and putting out a series of outrageous commercials. When they refuse to sell war toys and cigarettes, the joint-puffing midget president orders the blacks eliminated. In *Richard*, Nixon's guardian angel (Mickey Rooney) tells him to smoke weed, after which Nixon imagines himself taunted by the ghost of his youth saying, "Idle hands are the devil's playground."

Milos Forman's *Taking Off* (1971) showed a group of parents turning on in an attempt to understand their offspring. With a hippie psychiatric patient as mentor, some parents loosen up and sing but others are unaffected by the marijuana. Older men get turned on by hip women in *Last of the Red Hot Lovers* (1972), in which Alan Arkin smokes with nutty hillbilly Paula Prentiss, and Jack Lemmon smokes and sleeps with a hippie hitchhiker in *Save the Tiger* (1973). Hitchhiker: "I just happen to have some really great grass."

Lemmon: "We used to call it 'gage'—when I was a kid I was a drummer." He gets loaded and laughs—"You got another joint?" But, he is under great tension and has a paranoid fantasy about Nazis, war, and Moses. "I've got the tablets—the eleven commandments—what's it say—no parking."

Part of Jane Fonda's Academy Award-winning performance in *Klute* (1971) was turning on after turning a trick, and in another scene the cops interrupt a group of kids having a marijuana party on the roof. *The Last Detail* (1974) included a great smoking scene with Jack Nicholson and his fellow sailors. The young prankster in *Travels with My Aunt* (1972), based on the novel by Graham Greene, replaces the ashes in a crematory urn with marijuana and later smokes dope with an American hippie on the Orient Express. Buñuel's surrealistic fantasy *The Discreet Charm of the Bourgeoisie* (1972) has one dinner scene in which marijuana is used and discussed. Although apparently about drug smuggling and political intrigue, this film can be regarded as an extended development of, or satire on, his earlier *The Exterminating Angel*, which also revolves around a dinner scene. Abbie Hoffman, Taylor Mead, and Ultra Violet wend their ways through assorted madness including an ad by the Old Colonial Dope Company in the television satire *Brand X* (1973?). *Groove Tube* (1974) is another TV satire with a marijuana sequence ("Wasted").

Even Westerns are being invaded by the magic herb. The bandit chieftain smokes in the European production *For a Few Dollars More* (1967)—the slow-moving sequel to *A Fistful of Dollars*, which vaulted nonactor Clint Eastwood to stardom. The Missouri Kid (Burgess Meredith) grows grass in his cell in *There Was a Crooked Man* (1970), and Shirley MacLaine does some very suspicious giggling after smoking her hand-rolled cigarettes in *Two Mules for Sister Sara* (1970). Both *The Hunting Party* (1971) and *The Honkers* (1972) had brief joint interludes, and the black sheriff smokes with his prisoner and becomes squeaky-voiced in Mel Brooks's hilarious *Blazing Saddles* (1974).

A variety of 1960s and 1970s films treated marijuana as a source of trouble. A student frames the good doctor for marijuana possession in the 1970 Canadian film *Dr. Frankenstein on Campus*, but Dr. F. injects brain control pellets in another student and sends him off to exterminate the fink. The hero of the wacky *Brewster McCloud* (1970) is saved in the nick of time from a marijuana bust when the narc is killed by poisonous bird droppings. A marijuana bust leads to Geraldine's suicide in *W.U.S.A.* (1970), and to a hippie's incarceration in the 1974 television movie *The Law*. A farmer avoids calling the sheriff because he's growing marijuana and gets eaten in consequence in *The Giant Spider Invasion* (1975).

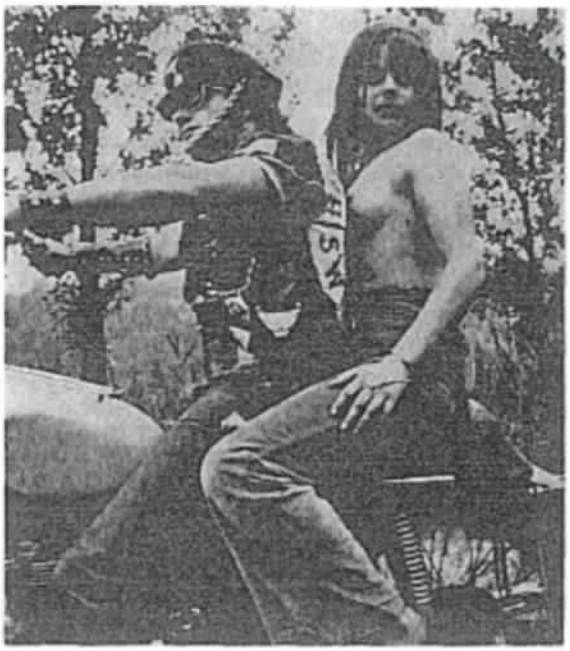
Marijuana proves the undoing of a hospital intern when police searching for stolen morphine find joints instead in *The Carey Treatment* (1972). the 1963 British flick *The Small World of Sammy Lee* (included some incidental drug dealing, and a cop is killed by drug-using hippies who think that he is about to bust them in *Electra Glide in Blue* (1973). An ex-cop trailing rats (the human variety) glides through a brief but pleasant pot scene in *The Falling Man* (1968). *Dirtymouth* (1970) was a fictionalized account of Lenny Bruce and as such had some fleeting reference to marijuana.

The Smugglers (1969) carried pot and other drugs across Alpine borders in this French film, and June Wilkinson mixes with a dope-smuggling gang in *Weed* (1976). Rival syndicates battle for control of marijuana smuggling in Tokyo in *Kamikaze Cop, Marijuana Syndicate* (1970) and again in *Step on the Gas* (1970). Although mari-

juana dealing was almost nonexistent in Japan at the time, the second of these two Japanese films claimed that a small helicopter full of weed was worth 30 million yen (about $500 thousand).

While *OSS 117—Mission for a Killer* (1965, French) did not mention marijuana directly, the villains induced hypnotic trances by exposing victims to the fragrance of dried flowers of an oriental plant. The madman in *They All Died Laughing* (1964, British) disposed of enemies with a drug that (when eaten or smoked) made people laugh before their demise. Dope is part of ghetto life in *The Education of Sonny Carson* (1974) and an easy way to get heroin money in *The Panic in Needle Park* (1971). Even the Steppenwolf gets loaded in the Magic Theater in *Steppenwolf* (1975).

Diane Keaton finds grass and sex a good mix in *Annie Hall* (1978) and in *Looking for Mr. Goodbar* (1977), and Cheech and Chong find that grass and anything else is just fine in *Up in Smoke* (1978). The fraternity boys in *Animal House* (1978) will smoke, eat, or drink anything that gets them off, and weed is likewise incidental to *FM* (1978) and *Defiance* (1976). *The Smugglers* (1978) follows the true-life story of a marijuana plane that crash lands on a Georgia mountain.



I'm a Groupie (1970). Motorcycles, drugs,and loose women—another cheap money-maker for Roger Corman.

Black Leather Jackets and Roach Clips

The seemingly endless stream of sex, sadism, and motorcycle films following in the wake of Brando's classic *The Wild One* (1954), all trying vainly to capture something of the glory of the original, naturally dragged marijuana into the mire. Neither Peter Fonda nor John Cassavetes could save *Wild Angels* (1966) from third-rate status, though the latter's demise with a joint in his lips was a nice touch. Their gang, the Skulls, smokes grass at every opportunity but even such strong medicine cannot cure the plastic acting and leaden dialogue. They turn on a naive woman who puffs and coughs properly, but then she sees distorted faces and sounds as though she had just mainlined a couple of hundred micrograms of Owsley's finest. "See here man—this is the finest blend of Mexican and American grass—guaranteed to bend your brain." Nevertheless, this film still had more class than the following year's *Play Pen Girls*, where the title characters smoke dope and have orgies with a sadistic motorcycle gang.

An Angel helps a lady undress in the motorcycle "epic" *Hell's Angels on Wheels* (1969). Even Jack Nicholson and the real Hell's Angels' spraying deodorizer couldn't save it.

Angels from Hell (1968) was another American International atrocity with a Vietnam War hero uniting all the bikers in California. As we might expect, his reign is brief and his demise is violent. A woman is murdered during a pot and sex orgy and our hero is killed in the ensuing police entanglements. Sound is provided by Lollipop Shoppe and the Peanut Butter Conspiracy. No less than four of these epochal films appeared in 1969. *Hell's Angels on Wheels* seems to have no actual

joints present, but when cops come we hear "get rid of the stuff" and see the gang spraying deodorizer in the air. Dope, rape, and clashes between the Roadrunners and a dune-buggy gang were the "attractions" of *Wild Wheels* (1969), whereas *Free Grass* (*Scream Free*, 1969) relied on gunfights, hippies, and marijuana smuggling. "Mass Confusion" by Davy Jones and the Dolphins was a song in *The Hellcats* (1969), though perhaps they confused the movie title with that of the song in this quickie. The female cycle gang smokes "maryjane," throws a "freak-out, love-in," and smuggles grass from Mexico in their headlights.

The cycle toughs in Roger Corman's 1970 British production *I'm a Groupie* were milder than their American counterparts but still found time for grass and acid, and *Angel Unchained* (1970) had the obligatory marijuana scene. As the first occult biker movie, *Werewolves on Wheels* (1971) could have been much worse than it was, but *Hell's Bloody Devils* (1971) and *Satan's Sadists* (1971) have not been surpassed for grossness and vulgarity, with the possible exception of some of the Japanese cycle-gang flicks. After these epics, even such a loser as *Angels Hard As They Come* (1972) was tolerable. Not so tolerable is the Danish *Ride Hard, Ride Wild* (1970), in which the dope and motorcycles combine with hard-core sex to yield lesbianism, sadism, murder, rape, and dirty tactics at the racetrack.

Hardcore Marijuana

Does pot make you lose your sexual inhibitions? If you have any doubts, *The Sexual Effects of Marijuana* (1975), probably inspired by the book of that name, makes it perfectly clear that it does. Busy pornographic-movie star John (Johnny Wadd) Holmes plays an executive who lights up for the first time with his secretary. In two shakes of a lamb's tail Johnny is giving the secretary more than dictation. But we were prepared for this by the opening scene where a flaccid party is instantly transformed into an orgy by the appearance of a couple of reefers. Much of the sound track is taken up by a narrator who educates us concerning the history of marijuana. We are read excerpts from World War II army studies, the La Guardia report, and United Nations statistics. We even see Jack Ruby assassinating Lee Harvey Oswald with the clear implication that dope and sex would have straightened them both out. Another sequence in this sex marathon shows a man seducing his virgin bride with dope-laced cookies.

Turn On to Love (1969) likewise used marijuana as a sexual turn-on. Marijuana plus Greenwich Village party equals orgy. But this is a classier picture than most of its ilk, with direction by John Avildson (*Joe*), music by the Ins and Outs, and Frank Rogers as Roach. At the end of the film the filmmaker who recently seduced newlywed Janice sends her back to her husband. In spite of much smoking, the characters in *Turn Me On* (1968) never seem to get it together to have an orgy. Joe gives Dandy a spanking when she attempts to rob him, so she takes him home to smoke grass with her gay brother. Joe passes out and is robbed anyway. Later, Joe and others get stoned with topless dancers, but the police raid the place and passion is again frustrated.

Pornography king Russ Meyer made pot a central element of *Cherry, Harry and Raquel* (1969). The title personnel are part of Franklin's Mexico-to-Arizona marijuana-smuggling operation. While Cherry and Raquel smoke and indulge in a lesbian relationship, and rival smuggler Apache fights Harry, we find that it is all just a figment of Raquel's imagination. Well, at least there was an intriguing sound track with "Toys of Our Time" sung by Jack and the Balls. The next year Meyer got Twentieth-Century-Fox to back *Beyond the Valley of the Dolls* (1970), so along with pot, pills, and peyote we get not only every type of sex and mayhem but music by the Sandpipers and the Strawberry Alarm Clock. One of the few elements Meyer has missed is a marijuana-smoking, sex-mad monster and this gap was filled by *The Exotic Ones* (1968). In spite of what its title led patrons to expect, *Animal Love* (1969) had nothing to do with bestiality. A judge has lost interest in his wife, so she smokes weed and goes to orgies with dope addicts, but she learns to turn him on by wearing her leopard-skin coat to bed.

The Grasshopper (1970) had nothing to do with fauna, but merely referred to a young lady (Jacqueline Bisset) who moved around a lot while smoking dope and shooting heroin. Likewise, *The Sporting Club* (1971) had no big game hunters, unless we include drug-using degenerates pursuing loose women in that category. Speaking of loose women, *Orgy Girls '69* (1968) has an ample supply, as does *Prowl Girls* (1968). One segment of the former film has a hippie smoking with a man who tries to extricate her from her bohemian life. We know she's a hippie because the sequence is entitled *The Hippie*. Sally Mae is one of the Prowl Girls who runs away to the East Village with her boyfriend Tarzan after he is expelled from school

life herself. A Swedish sex-ed. teacher shows the school board a childbirth film (forceps delivery) to help them cope with rapes, seductions, pot, and lewd photos at their school in *Teenage Mother* (1968). Students also use the weed in *Campus Confidential* (1968), but they know all about sex, both the hetero and homo varieties. *Free Love Confidential* (1967) and *Suburbia Confidential* (1972?) claimed to give us the inside story of sex and drugs but were pallid and dull, whereas *Acapulco Uncensored* (1968) at least delivered the goods. *Acapulco Uncensored* was a fake documentary of Acapulco's jet set with nude swimming, orgies, and prostitutes who work, we are told, to buy marijuana. *Ganja Express* (1976) is another recent sex and grass exploitation effort.

Good Sex and Bad Vibrations

Many of the sexually oriented films emphasize marijuana as an exploitative tool or at least as one drug associated with criminal elements. In *Gutter Trash* (1969) a marijuana dealer keeps a "sex slave" and one woman sets herself on fire at an orgy. Ed drops out to get stoned and try the hippie life-style in *Down and Dirty* (1969), but when he sees a sadist killed while raping a virgin he realizes that it is all a bad scene. *All the Way Down* (1968) descends to the level of sadomasochistic lesbian stripteasers who mutilate the club owner's woman and have the club owner arrested for marijuana possession. A young girl from Ohio contemplates suicide after being introduced to orgies and lesbianism with the aid of marijuana in *The Hot House* (1970). Grass and sex are the order of the day and even lead some coeds to get involved with a straight lawyer and demon rum in *Love Thy Neighbor and His Wife* (1970).

Left Handed (1973) has the novelty of being a gay hard-core film about a delivery of marijuana to a hippie boutique in New York, though this is the flimsiest of excuses for considerable genital action. Somewhere in the confusion a gay man seduces a straight man after they smoke grass. *Last House on the Left* (1972) has more to do with violence than marijuana since it concerns some women who are merely looking to score some weed but wind up raped, mutilated, and murdered, by an addict and his gang. Death is also the fate of a young man sent to jail for grass in *Chain Gang Woman* (1972). A young woman busted for possession in a tropical country winds up cutting sugar cane and being the subject of a mad doctor's orgasmic experiments in *Sweet Sugar* (1972). A woman attempts to frame a cop for pot smoking and statutory rape by taking pictures of him in flagrante with the baby-sitter in *The Babysitter* (1969).

A young woman attempting to get marijuana legalized is kidnapped by a drug smuggler and is brainwashed into becoming a nymphomaniac by an ex-Nazi in *Baby, Light My Fire* (1970). A baby-sitter turns a filmmaker on to the realities of weed and the hip life-style in *Weekend with the Babysitter* (1970). Women seduce a man for drug money in *Surfside Sex*, which brings to mind Troy Donahue of the old "Surfside Six" in the sex, drugs, and Manson exploitation film *Sweet Savior* (1971). *Psychedelic Sex Kicks* (1967, by Pot Heads Experimental Films), *Smoke and Flesh* (1968), *Love Is a Carousel* (1970), *Moonshiner's Woman* (1968), and *The Hard Road* (1970) all depict marijuana as a seduction tool that leads to trouble. In *Smoke of Evil* (1967) drug use is incidental to sadism, lesbianism, and group gropes, whereas the impotent artist in *Infrasexum* (1969) stays impotent in spite of a psychedelic orgy.

A French teacher uses grass and acid to loosen the inhibitions of schoolgirls in *Alice in Acidland* (1969) and an obscene phone caller is made even more perverse by the same chemicals in *The Animal* (1968). Prostitution was the name of the game in *Like It Is* (*Not My Daughter*, 1970), or so we are told in the ads. Actually, all she does is smoke dope and star in a pornographic film, which causes her father to blow his brains out. Incredibly *Reader's Digest* viewed it as a good anti-drug and sex film and provided reprints of the story to its readers. *Ginger* (1972) is a female undercover cop out to bust a marijuana and prostitution ring. She does not smoke, but she does everything else en route to shooting and castrating the whole rotten gang. Olga Petroff uses marijuana and then heroin to entrap women into white slavery in *White Slaves of Chinatown* (1964).

Information is difficult to obtain on foreign films, but marijuana figures in the French film *Cannabis* (1970?) starring Rolling Stones groupie Jane Birkin and in the British *Groupie Girl* (1970). *The Penthouse* (1967) was another British production in which hoodlums use marijuana prior to sex—"real cigarettes that help people fly." The woman in *1,000 Convicts and a Woman* (1971, British) induces one of the cons to smoke weed, but nobody has to be induced in the orgy scene inserted in the West German *Kama Sutra* (1969).

The whimsical Italian film *Love Factory* (*Bianco, Rosso, Giallo, Rosa*, 1965) had one segment in

Pierre Koralnik's 1969 French film *Cannabis* had little to do with drugs. Rolling Stones groupie Jane Birkin is shown "working" her way through her sixth film in a year.

which a Japanese stripper seduces a man at a marijuana party. When *he* later becomes pregnant, the stripper refuses to believe that the child is hers because of *his* promiscuity! The Japanese as usual outdo everybody in *Good Little Bad Girl* (1970). After smoking grass with members of an underground theater group, a man makes love to every woman he touches. A young Japanese detective raids a pot party but falls in love with one of the women there and uses up the rest of the film and a considerable quantity of drugs and kinky devices trying to overcome her sex problems in *Sex Phobia* (1970). Drugs are associated with perversion, orgies, and death in *We All Go Down* (1969), in which "a mad whirlwind of unrestricted sexual activity and experimentation with drugs ends in violence and death for members of today's generation," and in *The Lovemakers—Carnal Style* (1970). The weed not only involves *Dr. Masher* (1969) with fetishism, lesbianism, exhibitionism, and violence but with voodooism and hippies in his relentless pursuit of virgins.

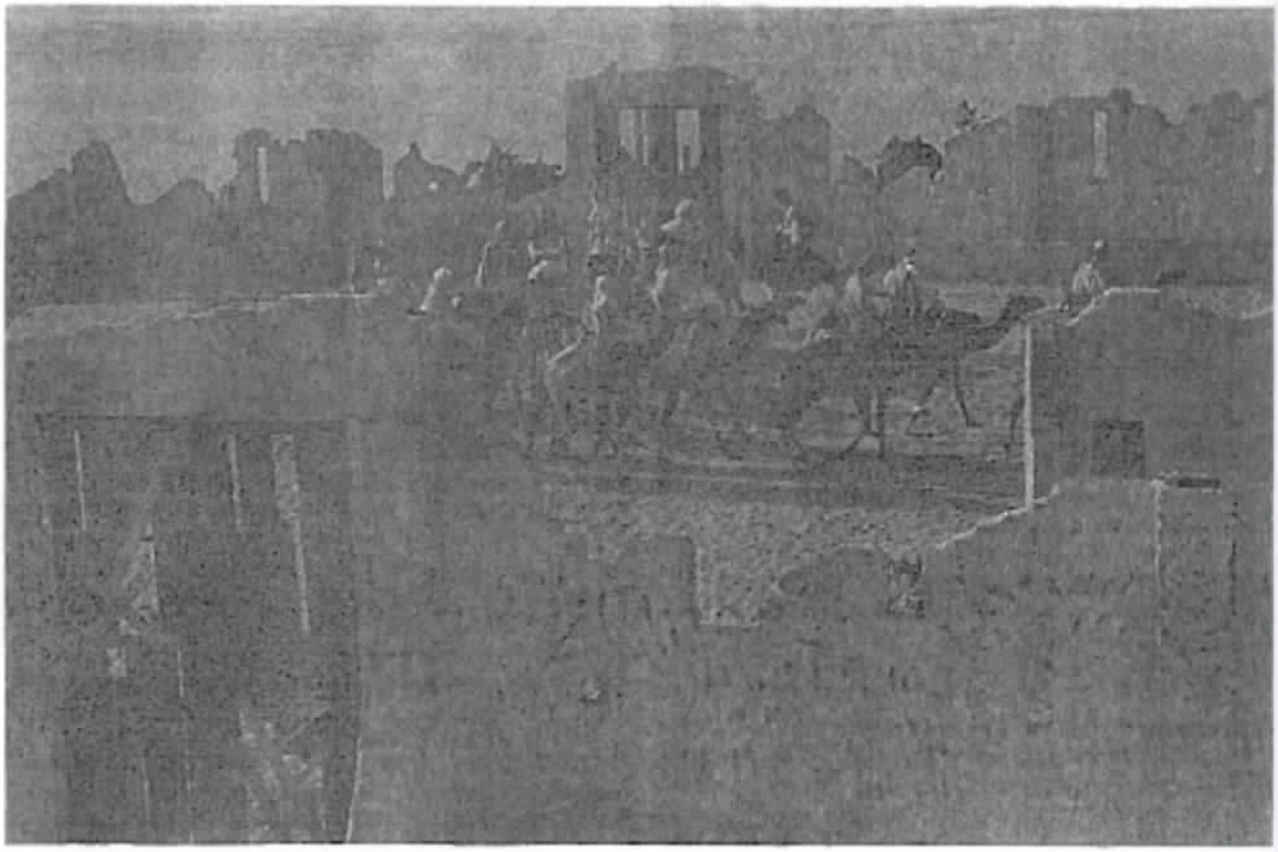
Hashish

Hashish is the most exotic and potent preparation of the hemp plant, and the few films in which it is mentioned deserve specific recognition. The 1934 British comedy *The Camels Are Coming* is one of the earliest talkies to deal with hashish. An English officer pursues dope smugglers bringing hashish and opium into Egypt in this peculiar film. *Cairo Road* (1950) stars Laurence Harvey in an apparent remake of this film. *The Golden Blade* (1953) is a routine costume-epic set in ancient Baghdad. Rock Hudson takes a few puffs on a nargileh and wakes up after a long dream sequence in which he pursues dancers through swaying curtains with the comment, "I don't understand; I drank no wine, I smoked only a little." He later refers again to his having smoked a little kif. *Omar Khayyam* (1957) includes a scene in which an assassin employs a nargileh and takes some sacred vows, probably because of the scriptwriter's acquaintance with the story of Hasan Sabbah, whose followers were supposed to have done likewise. *Wonders of Aladdin* (1961) was another comic costume-epic, this time photographed in Tunisia, with an unlikely cast including Donald O'Connor and Vittorio De Sica. When a man becomes sick an Arab suggests that he should chew hashish to cure his mind and body.

The following year Geraldine Page smokes hash in addition to inhaling oxygen, vodka, and Paul Newman in order to mollify her distress at the eclipse of her film career in Tennessee Williams's *Sweet Bird of Youth* (1962). A hookah also serves to relax Mata Bond in the zany *Casino Royale* (1967) and James Coburn and hippie friends in *The President's Analyst* (1968). High school students belonging to the Maryjane Club use hash to disorient a victim in *Maryjane* (1968), but the high school girl in *The Young Graduates* (1971) knows exactly what is happening as she gets her teacher stoned on hash and seduces him. Marcus gives Jennifer hashish for a birthday present in *Jennifer on My Mind* (1971).

The Egyptian *El Inab El Mur* (*Sour Grapes*, 1965) has a scene in which men sit around a table smoking hashish-stuffed cigarettes, a touchy subject in Egypt where the Anslinger mentality still prevails. It is no surprise to find India producing *Charas* (1975?), but *Haschich* (1967) from France in intriguing. Other European flicks using hash as an incidental plot element were *The Daughter* (*I, a Woman—Part 3*) (1970) in which European hippies smoke at parties, and the 1968 spaghetti space-opera *Mission Star Dust* in which South Africans try to bribe returning astronauts with women and hashish. The pasha who was Fu's agent for Istanbul in the English-German *The Castle of Fu Manchu* (1968) smokes hash and is very slow and stoned throughout.

Bibi Andersson is the hash-smoking wife of Russian official Max von Sydow in *The Kremlin Letter* (1970). However, as has long been the custom



Drug smugglers rendezvous in 1934 British comedy *The Camels Are Coming*.

Geraldine Page and Paul Newman in *Sweet Bird of Youth* (1962), probably the first postwar film to show hashish smoking in a modern setting.

Laurence Harvey fondles confiscated drugs in the British film *Cairo Road* (1950).

in Europe, they smoke hashish in cigarettes with tobacco and not in pipes. Lucky Gary Crosby does get to use his hookah a bit in 1971's Nixon-inspired and Jack (Dragnet) Webb produced *Operation Cobra*, also shown as *O'Hara: U.S. Treasury*. We see hashish production in the Far East proceeding apace behind the opening credits before a quick cut to Greenfalls, Nebraska, where Sheriff David "O'Hara" Janssen has tired of busting local children for a couple of joints and decides to graduate to harder stuff. Going to Washington to join the Customs Bureau he knows he has found nirvana when William Conrad tells him, "We arrested over 7,000 people, we seized over 200 kilograms of hard narcotics, 623 pounds of hashish, 23 tons of marijuana. . . ." In the twinkling of an eye D. J. is on the trail of Harry Fish (Gary Crosby) as he wades across from Mexico with eight soles of hash. Gary barely has time for a couple of good tokes before narcs rip off his stash—"The joint smells like a Turkish playpen." The soles are high-quality smoke, stamped with a gold cobra and laced with cinnamon. "A single one-pound sole will sell for upwards of $1,000 in the U.S."

The next hash-smuggling scam is even more preposterous—twelve soles in the bathroom of a TWA jet via Hong Kong, Los Angeles, and Chicago. D. J. makes lots of quick trips to the john until he finds a woman pregnant with twelve pounds of hash. "Pretty girl wasn't she. Yeah, till she copped that hash." But the "pretty girl" was just getting $200 for picking up some "special tobacco" for a foreign nightclub owner in Chicago, so after intimidation—"fifteen years or $25,000 or both for conspiracy to smuggle hashish"—she agrees to squeal. The plot gets a little hazy because of bad scripting and constant use of beat and underworld lingo of the 1950s and 1960s, as well as numerous incomprehensible abbreviations. Janssen starts driving trucks for the smuggler and his first load is "incense" from New Delhi. "Cannabis indica, man. . . Turkish delight." The hash comes in little incense cones—"Quarter of a million—that's a lot of dark dreams." The shipment includes sitars, of which one narc comments, "All they'll put out is music—if you can call it that." Before you can say "cultural blindfold," D. J. is on the way to New Orleans to pick up $9 million in hash that comes in the form of dinner plates. The narcs are baffled until they happen to drop one on the floor.

Soon the gang is crushing the plates in machines and putting the hash in little baggies labeled with destinations. Sure enough, there's one for Greenfalls, Nebraska. The gang escapes in a Lear jet to a private airfield up north but D. J. follows in a military jet. There follows the most unbelievable scene in a film filled with such scenes. Landing on the same isolated airstrip, Janssen thinks he is going to avert suspicion by telling the smugglers that he has had mechanical trouble! An incredible mishmash, but destined to become a camp classic.

A more recent film is the Swedish *What the Hell, Jack* (1977) with its alienated Stockholm youth who "drink beer, smoke hash, fuck and philosophize, the whole time dreading their future." The American *Midnight Express* (1978), chronicles Billy Hayes's nightmare stay in a Turkish jail after his hash-smuggling attempt goes awry.

11 High Times in Hollywood

After the drug and sex scandals of the 1920s, the movie stars became much more discreet. Only occasionally did the dope habits of our film idols become public knowledge. The first celebrated case since the late 1920s occurred in 1948 when Robert Mitchum, Lila Leeds, and two friends were busted at Leeds's Laurel Canyon house for possession of marijuana. M. Tomkies in his book *The Robert Mitchum Story* describes the bust:

The raid at 8443 Ridpath Drive, was initially staged by Detective Sergeant Alva M. Barr of the Los Angeles police, who was assisted by Sergeant J. B. McKinnon. Cooperating in the case was William Craig, head of the federal narcotics office in Los Angeles.

The police report of the raid stated that Mitchum had been under observation since the previous December, following reports that he had been smoking marijuana. Officers who had

Lila Leeds, star of *Wild Weed* (1949), shown during her second dope bust of 1948 (this one with friends Edward Balchowsky and Nathan Stein) in her Chicago apartment.

Lila Leeds and Robert Mitchum stand by their attorneys after being sentenced 60 days in jail for marijuana possession. Several years later they were declared "not guilty" after a reinvestigation by police.

followed and shadowed him had gained information that had led them to the 31 August rendezvous. They had not necessarily expected Mitchum to appear at the cottage that night. 'We just got a break,' disclosed Barr.

The night of 31 August was warm, and when the two officers arrived to take up their positions, they found that some of the cottage windows had been left open. First they heard Miss Leeds talking over the phone, they reported. Then they overheard her put the phone down and tell her friend, 'The boys are at the bottom of the hills, and they're lost. But they're loaded.'

A few minutes later the officers heard a car stop and then two men walked up the rough steps and path to the door of the cottage. One was Mitchum, alleged Barr, adding that he recognized him 'immediately.' The detectives allowed the two men to enter the house but kept watch. They saw Mitchum and his friend sit down. Mitchum wore a red, black and white lumber jacket and tan slacks. He wore no hat but his hair was awry. The first thing the officers alleged they heard Mitchum say to Lila Leeds was, 'Let's turn these lights down. They hurt my eyes.' The lights were dimmed. Then a girl's voice said, 'Oh, but you've got brown ones and white ones too. I want some of the white ones.'

Barr said he then saw Miss Leeds take some cigarettes from the packet Mitchum offered. She lit one and passed it to Mitchum. Then she took one herself. Miss Leeds' friend said, 'Gee, what will it do to me? And what happens if it knocks me out?'

Mitchum's answer was 'Oh, Daddy,' the detective added.

'We went to a side door,' Barr went on. 'We found the screen door open and we were greeted by two big dogs. We played with them, and the dogs went out. We then tried to get into the kitchen door, which was hooked.' Barr said Miss Leeds' friend evidently mistook their noise for dogs' scratching and opened the door. Barr flashed his badge at the surprised girl and backed her into the front room, where the other three stood.

Both men had cigarettes in their mouths, the report continued. Mitchum's friend laid his down on the couch, and Barr seized it. Mitchum took the cigarette from his mouth, the

end of which was aglow. He then crumpled it and threw it down. Barr said he burned his fingers picking it up, and he then picked up a standard brand cigarette package, which Mitchum tried to brush aside. There were fifteen marijuana cigarettes in it, Barr alleged. Barr put the two partially burned cigarettes into the package then went over to where Miss Leeds stood and took two fresh and two partially burned marijuana cigarettes from her hand. One, said Barr, had lipstick on it. Miss Leeds said, 'I may as well give you the rest of them,' Barr alleged. She then reached into her bathrobe pocket, drew out a packet wrapped in newspaper and put it into Barr's hands. He unwrapped it and found what he said were three marijuana cigarettes and eight benzedrine tablets. The detectives then called headquarters. Policewoman Eleanor Whitney arrived and took the two women into custody. The two officers took Mitchum and his friend into custody. While the men were taken to the County Jail, the women went to Lincoln Heights Jail. All four were booked on felony charges of narcotics possession.

At the moment Mitchum thought it was the end of his career for he gave his occupation as "former actor" and told reporters at the police station "I'm ruined. I'm all washed up in pictures now I guess—this is the living end." The police presented the case as evidence of their all-out war on the rising tide of dope in Hollywood. Tomkies continues:

> The police were proud of their coup. For some months rumors had been circulating that a dope scandal was hovering dangerously over the film colony. Luncheon groups had discussed the growing incidence of drug use quite freely wherever movie people of the day gathered, and clearly the police were expected to make some move to counter increasing public concern. This must have been known by the heads of the studios, yet little was done by the top executives to bring their employed stars under control.
>
> On 2 September Detective Sergeant Alva Barr told newsmen:
>
> 'We are going to clean the dope and the narcotics sellers out of Hollywood. And we don't care *whom* we have to arrest. This raid is only the beginning of the clean up. There is a lot of "stuff" being used in Hollywood. We have, besides Mitchum, a number of other important and prominent Hollywood screen personalities under surveillance, not only actors and actresses but others prominent in pictures.
>
> 'We have been watching Mitchum and Miss Leeds for eight months. We have had others under surveillance for that long, others are facing arrest. Hollywood can let this serve as a warning. Evidence is hard to get, but we're getting it and we are out to get not only the "users" but the "inside ring" who are supplying the big people in Hollywood with marijuana and other narcotics.
>
> 'Many of the big shots—stars and other top names,' continued Barr, 'do not patronize the small street or corner peddlers for fear of a shakedown and other dangers. However, we have reason to believe there is an "inside ring," perhaps of not more than three persons, right inside the film industry, who are supplying a large number of narcotics users. The most prevalent use is of marijuana, but we know that other drugs are being used.' . . .
>
> Some newspapers became quite prim and indignant after the arrest and reminded Hollywood that it was a narcotics sensation that had first threatened the film industry with obliteration back in 1920—when handsome young Wally Reid, a public idol created by *The Birth of a Nation*, ran afoul of the federal authorities.

The legal preliminaries dragged on for months and eventually Mitchum's attorney waived the right to a jury trial and asked for trial on the charge of conspiracy to possess marijuana with the charge of possession to be held in abeyance. The reason for this was that the conspiracy charge carried the possibility of probation and there would also be no cross-examination. On February 9, 1949, Mitchum was sentenced to sixty days in the county jail and two years probation. He actually spent most of his time at the Castaic Honor Farm, where he had a constant stream of visitors, one of whom, Howard Hughes, was soon to be the new owner of Mitchum's contract. Hughes could have canceled Mitchum's contract under the standard morals clause, but either because he liked him or saw him as a good money maker, Hughes not only kept him on but gave Mitchum a loan for his legal fees.

But this was not the end of the case. There were persistent rumors that the bust was a set-up and in late 1949 the district attorney began an investigation of possible extortion in connection with the arrest. There had been some grand jury testimony to the effect that a blackmail gang headed by gambler Mickey Cohen lured wealthy men with "party girls." Leeds testified that vice squad officer Rudy Diaz had tried to get an invitation to her house in the company of one of these women, a few days before the raid. The outcome of the investigation was most remarkable. Tomkies relates it as follows:

ing marijuana the dogs barked and that Evans opened the back door. It was then that the police came in. Among the police raiders who arrived subsequently, she said, she recognized the 'pock-marked Rudy', whom she later identified as Officer Rudy Diaz of the Vice Squad. Leeds told Stanley as she finished giving him evidence: 'I'm not accusing anyone of entrapment or of being a stool pigeon.'

Mitchum himself gave no evidence at this investigation and made no accusations. But some years later, when it was all over, he did express his doubts to writer Bill Davidson:

'I'd still like to know the answers to some pertinent questions. Why were the newspapers tipped off, before I even arrived at the Leeds house, that a big-name movie star was going to be picked up on marijuana charges that night? Why did Robin Ford stop off to make so many phone calls that night? Why didn't the police raid the Leeds house earlier, since they testified they had seen Leeds smoking long before I arrived? Why did Vicki Evans go to the kitchen door just as the police broke in, and why was she the only one of us who never was convicted? Why did a half dozen other movie stars come up to me later and thank me, saying *they* had been invited to a party at that house that night but when they arrived it was already surrounded by police cars, lights flashing, so they took off?'

The result of the District Attorney's investigation were not publicly announced. But on 31 January 1951, the Los Angeles court quietly reviewed Mitchum's marijuana conviction and declared: 'After an exhaustive investigation of the evidence and testimony presented at the trial, the court orders that the verdict of guilty be set aside and that a plea of not guilty be entered and that the information or complaint be dismissed.'

Thus ended the most celebrated drug bust in Hollywood history. Ordinarily, it would have ended a star's career, but Mitchum was lucky. Mitchum is one of the very few stars to comment on his drug use in detail. In his probation report he wrote:

> My first use of marijuana was an isolated instance in 1936 while I was working in Toledo. I had no further contact with it until about 1947, at a time when I was working very hard. During 1947 and 1948, I occasionally used marijuana when in the company of people who used it. I was never a confirmed smoker of marijuana and never purchased marijuana for use by myself. The only explanation I have for the use of marijuana is the fact that when you are in the company of people who use it it was easier to go along with them than not to.
>
> The only effect that I ever noticed from smoking marijuana was a sort of mild sedative, a release of tension when I was overworking. It never made me boisterous or quarrelsome. If anything, it calmed me down and reduced my activity.

In the late 1960s Mitchum remarked, "I've been smoking it since 1945 and it never got to be a habit with me."

Errol Flynn is one of the few other Hollywood stars to recount his experiences with marijuana during this period, though these experiences did not become public knowledge until publication of his autobiography *My Wicked, Wicked Ways* in 1960. In this book Flynn gives the following account of being turned on to marijuana by the famous Mexican painter Diego Rivera.

> He stood in front of a cactus bush, breathed heavily, remarked that some people wanted him to paint still life. The thought of it provoked more Mexican expletives. He was the most explosive personality I had ever encountered.
>
> "You were talking about the glories of colour. I heard you talking about the colour in my pictures, and you are telling me that colour is more important than what one has to say. What the hell do you know about colour?"
>
> I waited. He asked, "Can you get emotion out of colour?"
>
> "Yes."
>
> "More than from music?"
>
> "No."
>
> "Now, Mr. Flynn, I know that you don't know what you're talking about."
>
> "Señor Rivera, isn't it possible that perhaps I could like both?"

He looked at me as if I were some novice in this area—which I certainly was.

"Now, I will show you something. I want to show you how little you know . . . All right?"

"All right."

"You see those little potted cacti? You see this one?"

He pointed to where a lovely Mexican flower had closed itself up like a rose with sunset colours, a delicate pastel shade. "That is how they go to sleep. Amusing, yes?" He said, "Now watch . . ."

He took the cigarette out of my mouth, put it to the flower. Sure as hell, the flower opened. "You see," he remarked, "like women. You have to be tough. Rough. Brutal."

I kept quiet. There was a lot I could still learn about painting, colour, women, and men like Rivera.

"This plant has power," he said. "I have carefully cultivated this myself and I take a great deal of pleasure in seeing it growing alongside that convent you keep staring at."

He seemed to be in a lighter mood as he talked of the plant and he even laughed a bit. He asked, "Have you ever *heard* a painting?"

"Heard *what*?"

"I said, suppose you looked at a painting and *heard* it play a symphony, would you be surprised?"

I didn't follow.

"Suppose you returned to my studio and you stood in front of one of my paintings and you *heard* it, you heard music coming from the canvas . . . ?"

As he talked he moved from one potted plant to the other, fingering them, pressing them fondly, almost caressing them.

He took from a pocket a few sheets of zigzag French paper, the kind of little tissues you use in rolling cigarettes.

"This plant," he explained, "will allow you to do both. After smoking this you will see a painting and you will hear it as well."

It dawned on me that he was rolling in that zigzag paper the "loco weed" referred to in "The Conquest of Mexico," the plant called marijuana in Mexico, ganja in Jamaica, anis abiba in other parts of the world, hashish in the Far East.

As he took a puff he said, "Look, be sure that nobody besides us knows what we are going to do. I will take you up to the storeroom. You will see paintings there I show to nobody else."

He glanced into the interior of the house, then nudged me in the direction of a side door. We went inside, up a stairs. I was a storeroom for his materials, his paints, canvases, frames. He crossed the room to where there were a couple of big pots of turpentine. He pulled out from under or near them a little can.

The lid opened easily.

I peered in. It contained some brown pulpy material that looked the colour of the bottom end of a cigarette holder.

"You can either chew it or smoke it," he said. "This is the same weed the Spanish found here in the fifteenth century. Cortés brought back gold and silver, but he forgot this."

"I will hear the painting?"

"You will hear the colour!"

The idea of having sounds translated into terms of paintings, and paintings translated into terms of music . . . a fascinating idea.

I smoked some of it, ate a little of it.

Diego was talking, observing me. I didn't hear much of what he was saying. I was absorbed, waiting for a reaction.

Suddenly I started to sweat. I could feel my extremities going numb, from the elbow down to the hand, and from the knee down to the foot. Felt a strange sense of touch, yet you wanted to touch things, and if you did there was a numb feeling.

Now I felt paralysed, yet capable of motion.

Over me came the sensation of being suspended in time. All sense of its passage was gone. Everything about me seemed frozen, taut, permanent.

I wasn't certain where we were going, whether among his paintings, or in his garden. Yet we were moving slowly, timelessly. His voice came to me hypnotically. It was getting dark—Mexico—where was I?

I could hear from the convent across the way a girls' choir singing in Latin. Strangely, I could distinguish the peculiar Latin litany. Beyond was the brilliant evening sky, the sun lowering like a great round diver. The pyramids pushed upward into the same red sky. I had the extraordinary feeling that I couldn't cope with this sensation.

Immobile, transfixed, still we were moving, thickly. Once at the studio doorway, looking within, there was a momentary vision: his wife now wore a violently coloured robe off the shoulder, and it swept ankle-length. There was a small red bow at the back of her neck around the fluent length of hair; and then the raven mane dipped downward like a black snake to the cleavage of her buttocks. I stared . . . all was exotic, heightened . . . and Rivera himself stayed close by talking talk that only dimly entered into me.

By now too I lost the sense of balance, which was remarkable for me.

From somewhere came a cry that dinner was ready.

Food! I shouted to the heavens, arms up, singing, imploring, I sip no sup and I crave no cup, while I cry for the love of a ladee!

Rivera was amused at my disabled reactions; he talked on in a Mexicanized English, directing me into a showroom of pictures, his early works, intended, he said, for the Mexican people.

"Here it is quiet," he suggested. "Listen to Mexico. Look at my pictures and listen to Mexico . . ."

Whether it was autosuggestion or not, whether it was the suggestive power of a tremendous personality profoundly affecting a young man so much of his time, or whether it was the marihuana—as some will say it was—I heard these pictures singing: the simple Mexican themes, a woman on a mule moving through a field of cacti, the peasants at their labour, in rhythm: illumination and colour and sound in a symphony I could see, feel and hear—but can never translate into words.

No question about it.

Bizarre, I know . . . but I was there.

Flynn also gives a story about his opium smoking:

If you smoke it a lot you get a dark brown callus behind your ear. He has it behind both ears. That means that he smokes on both elbows.

She looked at me piercingly. "Would you like to smoke?"

I was ruffled—but intrigued.

"You never have?"

"No."

"If you like I'll show you."

Did I dare do this? Was I stepping into something I knew nothing of? Of course I was. But the adventure of it, the thought of a new experience—this I could never resist. I never had.

That night we won at fantan.

After the game, we wound our way through the scent of incense. It appeared that this place was also given over to opium-smoking for private clients. Ting Ling seemed to know a lot about it.

I expected to be led into some kind of dungeon—for I'd heard the term "opium den." On the contrary, we were guided by one of the operators to a semi-private room of reasonably ordinary appearance.

I entered and was confronted with a dark blue haze and a curious odour. There were only two people here. Sure enough they were on their elbows. The blue haze seemed to hang over them.

I sat on a soft mat. Ting Ling sat beside me.

A man entered the room with an orange that was cut in half and a lamp which was half copper, half jade. He scooped out the pulp interior of the orange and bored four little portholes into it. I watched Ting Ling while this operation was being done. Her eyes were wider as she looked at the little lamp.

A tiny flame was put in the empty half-orange skin.

The man also had what looked like a tin of English tobacco.

In Chinese Ting Ling had a long debate with him. I figured she was fixing the price.

Quickly a round wooden pillow was put near me. "Lie on your elbow," she panted. "Lie down. Relax."

Ting Ling arranged the pillow with a little impatient gesture, and I was made more or less comfortable.

She herself sat cross-legged, that blue haze around her, like a goddess, enchanted, distant close, mysterious, all things.

The attendant took out two instruments like crochet needles. He opened the tin box and removed a black treacly substance—opium in the raw.

Ting Ling looked down at it carefully, nodded brightly. "Very good stuff. Very good."

Sitting cross-legged, the attendant cooked this inside the orange and the flame. It bubbled. He mashed it skillfully, delicately, like an artisan.

My eyes followed the work, fascinated.

Here he produced a magnificent instrument. It looked like an early saxophone, but small at each end.

Ting Ling took the freshly prepared pill from the attendant and put it in the end of the piccolo-like instrument, jamming it in.

She inhaled and held.

I counted. It was a long time.

Very slowly she exhaled.

She puffed very strongly, sibilantly inhaling. In a most truly graceful way she lay down beside me.

Silence.

She lay there staring into the ceiling—that lovely neck. beautiful face. Her figure writhed a little beside me on the mat.

After a time she slowly turned to me on her left elbow. "Now, darling"—the first time she had ever called me that—your turn. You see what I do?"

Surprisingly she lapsed into a pidgin English. "You do same. All same."

I grabbed the instrument and drew on it. The taste was unlike any tobacco that I ever had but not unpleasant. Certainly it wasn't burning my throat in any way.

The man prepared another little round black pill, stuck it on the end of the crochet needle and put it inside the orange. I tried to hold it and go through the same motions as Ting Ling had done.

She seemed to be looking at me with a far-away amusement. "Do you feel anything?" she asked.

"No." I didn't, except that I had a feeling I'd like to open the window.

"All right. Finish that one. Then lie down."

Together we lay side by side, both staring at the ceiling.

Suddenly that ceiling seemed to take on a new dimension. I felt Ting Ling's little hand on my right wrist. "How you feel?"

"Fine."

"You take a little bit more."

She said something in a soft tone to the fellow who prepared the smokes. He prepared another little pill.

The half-orange had grown bigger. Somehow, I don't know, but it seemed that it should be hanging from the ceiling like a Chinese lantern and my eyes were glued to it, fascinated.

I took the next *umchuck*, as Ting Ling told me it was pronounced in Macao.

Lying back, I began to feel a sense of panic. The orange in front of me was no longer an orange. It was a big old lantern, but it was now hilariously funny, because it was doing a dance and smiling at me.

Next thing my mind was clear as a crystal and I saw things as I have never seen them in sober perspective.

My life came before me.

It made sense.

There was this beauty beside me, looking into my eyes with what I believed was true tenderness, even passion.

I stroked her.

A lethargy came over me.

My body came out of my body. There I was on the floor, facing Ting Ling. It was extraordinary how my other body—I had two—hovered above me looking down. There was Flynn, four feet over my head, floating, held by invisible strands of I don't know what, a thing ethereal, bodyless, motionless, relaxed, amused by the whole façade and procession of his life.

Here was my love of my life by my side; so now we were three.

I whispered in Ting Ling's ear with what I can only suppose was the most stupid giggle. "Darling, darling, don't I look strange?"

She looked at me.

I said, "No no. Me, up there."

She looked up and a strange smile crossed her lips. She said, "Put your head back. Dream."

I did.

I don't know how long it was I led a completely dual life, the one above me watching everything I did.

I was quite in charge of my limbs. As a matter of fact I seemed to have the strength of four men, let alone two.

When I took Ting Ling to another room I had never known I was capable of such feats.

Today I'm told that the effect of opiates removes sexual desire in the man in inverse ratio to the female, who becomes more excited. Dr. Flynn can tell you that such is not the case.

I made love to Ting Ling in ways and manners that I would never believe myself capable of.

Next day I put it all down to a dream.

Flynn's final tale of drug debauchery concerns a period as a morphine addict, inspired, as so many before and since, by a reading of De Quincey. Though he claims to have been using opium, Syrettes are containers of liquid for injection and he may have been injecting morphine, or swallowing it.

I had just read Thomas De Quincey's *Confessions of an Opium Eater*. I was so impressed with it that I decided I must go through the same thing—subject myself to opium, write about it. I asked a friend if he could get me some opium. He said, "My plane carries a lot of that junk."

He came up with enough to dope half a studio.

I started to take it. Then I tried to write. At first I think I did pretty well. I didn't know my face was growing greyer and greyer by the day. Others noticed my change of complexion. The more I experimented—that's what I called it—the less I wrote. I began to wonder how De Quincey had done it. What I wrote made no sense at all. Maybe this was because I tried to write while taking the stuff. Others wrote afterwards. I didn't tell Freddie about this. I kept the supply of opium syrettes on a window-sill over the bathroom sink.

Each day I worked at the studio. Each evening home for a syrette of opium.

One night I came home, reached into my cache for the daily dose and found nothing. I scrabbled around frantically, wondering if I had, in some stupor, misplaced it.

Freddie opened the door. "What are you looking for?"

"Oh, nothing."

"You stupid son-of-a-bitch. Have you seen yourself lately?"

"What are you talking about?"

"If you want to know where that dope is I'll show you."

He led me into the study, where there was a big fire going in the fireplace. "There they are.

Now, what are you going to make of that?"

"You bastard. You are a guest in my house. Do you mean to say—"

"Sure. I burned all of them!"

I let fly. He caught one right on the nose. I knew just where to tab him. We rolled and rolled around my study. The furniture began to crack up. We almost fell into the fireplace.

"You son-of-a-bitch." I said, "come on outside. I'm not going to soil my place with your blood."

We went outside.

There it was a little better. He would come and try to grab me and I would try to knock him down. If he had got his hands around me he would have finished me, but I was faster.

Finally, we were both lying on the ground, mutually knocked out. He was panting. "I'm not going to get up again." he said.

"Why should I be knocked down by you? If you are stupid enough to go on with this, nobody can stop you."

Freddie snapped me out of it—the hard way, and I dropped the opium before it became a habit. I withdrew in the next few days. I did have something to write about: withdrawal symptoms. These are horrible, and worth writing about. You feel that every single nerve in your body is popping out. There is nothing very new or scientific in pointing that out.

Subsequently I have taken a narcotic now and then, but only on a doctor's advice, administration or prescription.

The only real thing that came of it was my realisation of what a good friend Freddie really was.

Knowledge of the stars' dalliance with drugs had been leaking out and bluenoses and muckrakers were having a field day. A few days before Mitchum's 1948 bust columnist and radio commentator Jimmy Tarantino blustered in a column in *Hollywood Life* entitled "Facts on 'Dreams, Inc.' ":

> The die is cast and a new background of the satanic Hollywood motion picture scene rises to the front. The new prospect is one of a regenerated business cleansed of wickedness as well as the financial and moral structures to which it is now kin.
>
> Jimmy Fidler, fearless as ever, sounded the radio keynote call to arms last Sunday nite against the dope evil in Hollywood studios and all of its attendant degradations. This famous Sunday nite commentator used logic and yet he revealed a sense of impending danger, of alarm and warning to the American public and Federal agencies. It must be stated now, Fidler and myself when speaking of Federal assistance regarding the studio situation do not wish to imply that the F.B.I. directly had any hand in any deal consummated to date. Again do not misunderstand me, the F.B.I. is always interested in the welfare and security of the nation and its citizens.
>
> It must be remembered they often run hand in hand with various Federal agencies that lead in one direction although their theme of investigation is different.
>
> Over twenty million listeners heard Fidler's brave denunciation of the sinful conduct of certain picture executives and certain stars.
>
> A Hollywood tea party loaded with new names and members of "Dreams, Inc.," is now well under way. Oddly enough, most of the citizens here including hundreds of executives, movie stars and entertainers who respect their profession at last are publicly airing the fact that they cannot stand the foul depths to which others have fallen. They are rebelling in a manner never before witnessed in the history of our so-called Hollywood . . .
>
> If certain stars like Miss G., Mr. J. or Mr. R., who often has been identified in dream parties with Miss G., wish to continue as users, let them get out of the movie business. Or let's put them out. The same goes for Mr. F., whom I mentioned last week, who is an executive at the studio long associated with Miss G. and Mr. R.
>
> IS MISS G. ANOTHER HELEN LEE WORTHING? A VERY UNPLEASANT AFFAIR WAS REVEALED THURSDAY AFTERNOON, WITH THE PASSING OF A FORMER BRILLIANT STAGE AND SCREEN BEAUTY, HELEN LEE WORTHING. MISS WORTHING, AT 17 WAS ALSO A WORLD FAMOUS BEAUTY WITH A FORTUNE AND JEWELS GALORE, JUST AS MISS G. IS RATED TODAY. MISS WORTHING BEGAN HER DOWNWARD TREK TO HEARTBREAK, MISERY AND NOW DEATH, AFTER BECOMING A DOPE ADDICT. IN FACT SHE HAS A NARCOTIC ARREST RECORD. DOPE KILLED HER AND IF MISS G'S STUDIO DOESN'T DEMAND A CURE, IT WILL ALSO KILL THE G. GIRL AND OTHER ADDICTS. CLEANUP OF DOPE IN STUDIOS, WE ARE MORE THAN CONVINCED, IS LONG OVERDUE . . .
>
> Once again, is it possible that a studio can have a star in which they have invested at least fourteen million dollars at the present moment (by their own admission) and not notice loss of color, loss of weight, and worse yet an increased facial pallor? To say nothing of obvious neurosis and increased temperament . . .
>
> Our other executive, Mr. M. who is quite a politician on the side, almost had a case of mayhem lodged against him. He thought biting the part of a girls breast was the privilege of a big shot. How far he might have gone that nite, under the influence of narcotics, and not just li-

quor, God only knows. But let me tell you what happened to the girl. In order to ease the pain caused by Mr. M. while in his hungry mood, the girl had to legitimately take dope or possibly go out of her mind. Now here is what happened to the girl, after taking dope for a short period. She liked it. She ended up a confirmed dope addict, a derelict, and a two dollar prostitute who has since been arrested many times. Before that particular evening, she had a pretty big name in motion pictures. You may remember her as Miss N.

Miss G. was undoubtedly Judy Garland, Miss N. was Mary Nolan, to be mentioned later, and Mr. M. was probably Louis B. Mayer. Garland was one of many who got on the "bolts and jolts" kick early in her career, with one of the newly introduced amphetamines to get her up and keep her working for long periods and then some barbiturates to allow her to achieve sleep. In 1964 she told *McCall's* readers about the making of *Babes in Arms* with Mickey Rooney in 1939: "They'd give us pep pills to keep us on our feet long after we were exhausted. Then they'd take us to the studio hospital and knock us cold with sleeping pills. . . . Then after four hours, they'd wake us up and give us the pep pills again, so we could work another 72 hours in a row."

Diana Barrymore was another actress who got started on the ups and downs roller coaster and like Garland continued on it for decades. In her book *Too Much, Too Soon* Barrymore tells how she and her husband used pills: "When the wakefulness was too much to bear, we took pills to sleep, and when we woke, we took pills to stay awake. . . . I put myself to sleep with bluejackets and yellowjackets and every kind of sleeping pill I could persuade doctors to give me. To ensure my supply I went from doctor to doctor. I woke myself with benzedrine, took a morning drink . . . I lay in a nether world of alcohol and nembutal . . . I was taking 5 or 6 seconals at a time. . . The next day I was forced to swallow 2 or 3 Dexedrine tablets to keep from stumbling dazedly about my hotel room." In 1955, she swallowed twenty-seven blues and yellows in a suicide try that closely followed Susan Hayward's. Some time later Barrymore had convulsions as a result of barbiturate withdrawal.

These cases were shocking for their time, but honesty would force anyone to admit that many people were using dope and that only a few of these people happened to be movie stars. The stars, however, are always in the spotlight and everything they do is magnified by the scandalmongers and other parasites. Many people envy their freedom and wealth and are only too happy for an excuse to speak ill of stars. The United States was also reaching the high point of anti-Communist paranoia. Many conservatives and their lunatic-fringe toadies seized the opportunity to combine the new crusades against dope and Communists with the old standby of perverted sexuality into a massive assault on Tinsel Town morals. There were some suggestions that a purge comparable to that occurring in the 1920s was in order. Once again, Jimmy Tarantino's comments in *Hollywood Life* in November 1948 will illustrate.

You may be saying or even asking a friend why don't they do something? You may also be wondering who headed the committee that finally refused to protect the industry from further disgrace? I would suggest at this point that you ask those questions of Dore Schary, production head of M.G.M. I may give you other names whom you may contact in the future. However, Schary and another so-called big shot have been in the know of what's going on. At one time Schary had the gall to publicly announce that no considerable use of narcotics exists in the motion picture industry. This so-called brilliant executive also stated such charges are "shocking, capricious and untrue," end of quote. For Mr. Schary to make that statement right after the Bob Mitchum-Lila Leeds arrest means two things. Either he is protecting dope selling within studio walls or else he is playing a big shot blabber mouth role about a situation much more serious than making budgets on a motion picture.

Schary several days ago made a statement that came back to this reporter which in effect meant that the Federal Narcotic Bureau and this reporter were talking out of our hats. Picture such a responsible person in the industry blabbing off in that manner. Then again it does remind me of the old saying that many brilliant men and women out of work in town should be replacing so called current big-shots.

Schary has had a rather unique career which we will delve into at a later period. In fact, right now we will even skip over his position as the eleventh man of the famous ten, who found a way out during the eleventh hour. Schary and other executives are to be condemned for more than the serious charges that I have been laying at their door for several months. Let's get away from Narcotics and the Sex Perverts for a paragraph and I will tell you what I mean.

In recent months a man named Myron Fagan has been making public lectures as to the large amount of Reds in the industry and has

named about one hundred and his reasons. Dore Schary is one of the important names that Myron Fagan accuses publicly and has printed literature that they are Reds. Just last week the Fagan group published a book that now can be bought for One Dollar called "Moscow Over Hollywood" that is a serious denunciation of the persons named. Now I don't know how right or wrong Fagan is. In fact I honestly would like to believe his charges are without any foundation. But what does Dore Schary and the other hundred accused do to challenge these Fagan statements? Nothing! . . .

It has now reached the point where the executives are in reality the laughing stock of Hollywood. They make statements to deny dope exists and what happens? Bob Mitchum, Lila Leeds and companions are arrested by local and Federal Narcotic Agents. While they keep denying these facts another actress, Helen Lee Worthing, dies as a direct result of being a dope fiend. The Narcotic Bureau announces there will be more arrests and they pay no attention to it. So what happens! Huntz Hall, one of the original Dead End Kids, gets arrested as a peddler of Dope in a surprise move on the actor while he was digging up four cans of Marijuana in the back yard of his home. Then three days later in the face of all this disgrace throughout the nation, former actress Mary Nolan died mysteriously. Miss Nolan, my friends, did not die in any mystery as far as the Narcotic Bureau is concerned. She was a confirmed Dope Addict and has been arrested as such many times in late years. Nolan's record is a long one in the Narcotic Bureau. This poor girl was once a great trouper and a wonderful person. Her downfall began at the hands of an M.G.M. executive and the Dope route. Others have died in the past from Dope and others will die in the future and still the important numbskulls who head the movie industry do nothing . . .

In the past, I have told you of Dope Addicts and serious Sex Perverts. I have told you about Miss C. who may die before the ripe and beautiful age of forty-two as did Mary Nolan. I have told you of Mr. F. at her same studio who is not an actor except behind closed walls. I have told you of Mr. M. and Mr. R. and Mr. B., all of the same studio. My warnings in initial form have included Mr. J., a horrible example of a man who is held up as a bobby sox idol. Mr. J. belongs in San Quentin only for his disrespect along the sex line that he has for children. I know two detectives who spend most of their time trying to corner the Red face fool. Also have you heard of Mr. F., Miss D. and Mr. L., the blighty boy at a very large Valley studio and their escapades? While talking of Valley I would like to advise, at this point, Messrs. Harry and Jack Warner as to amount of damage Gerald L. K. Smith and Myron Fagan are doing to their names. I will have more to say to Warner Bros. in my next column. The R.K.O. studio also has a few personalities who "fly away" and are members of "Dreams, Inc." The three I speak of at R.K.O. really "flip their wings." They refer to their smoking pleasures as "REAL FINE AND MELLOW." The poor kids always think they are on a slow boat to China. How high is the moon? How high can you get? About Paramount well, they get some pretty hot flashes from R.K.O. and M.G.M. to say nothing of Warner Bros. More about Paramount in the future.

Here is in part what the editor of The Tidings Newspaper has to say about the Dope and bad morals of Hollywood Movie Personnel. Before we quote them may I please remind you the Tidings paper is one of the most powerful circulated publications in the Catholic Church. The Motion Picture editor, William H. Mooring, is a brilliant person. Here are quotations from Tidings, "It is up to the leaders of the motion picture industry to tackle the dope situation which is merely one lurid manifestation of moral and social ill-health among Hollywood's highly paid personnel.

Excessive drinking, crooked gambling and open resorting are part of the same ugly pattern. Dope addiction, for the moment, presents the most startling color, that is all. . . .

We could never understand how any person calling himself a Catholic, could publish the cheap, meretricious twaddle which was published by a Catholic filmwriter on the 'love affair" of Rita Hayworth and her Indian prince.

The Catholic Church has a name for such things. Its doesn't beat around the bush. It doesn't call it a 'love affair.' Its language is direct and to the point. And it is not only the language of the Catholic Church, it is the language of God, Himself, and it is language addressed to the whole world through the Jewish people," end of quote from Tidings paper.

There, my readers, is a solemn but serious rundown from an opinion of a powerfully clean mind, The Tidings paper, just like this reporter, warns and advises the movie industry. In most cases, we get insulted with sneak punches. You know, the Louella Parsons type.

While on the subject of Louella Parsons, who in my opinion is Hollywood's No. 1 Pretender of the Truth, her associates and members of the William R. Hearst Syndicate may just as well know, I'm well aware of several of their cowardly, foul accusations and attempts to

smear me. Just don't get caught, is all I can say for now. Mr. Hearst, better known as "Willie The Great Lover," from San Simeon, Calif., and his Mistress Marion Davies, who has been a prisoner of Love for many years, along with America's No. 1 Most Disgraceful columnist, Westbrook Pegler, have all spearheaded a smear campaign against me. . . .

For certain, DOPE addicts, sex perverts and other unnecessary nuisances will soon be faced with startling revelations being prepared against them. This is no game of cowboys and Indians. This game is played for "keeps." Responsible studio big-wigs don't seem to care if Hollywood becomes a heavy "grey" zone of crime through narcotics, etc., etc. But fortunately, that is why federal law enforcement agencies were born . . . born to handle even those who believe they are invincible.

It is pretty well established that a few politicians, possibly more than one well-known columnist, and it is almost definite that certain studio officials are either protecting or running interference for dope addicts, dypsomaniacs, notorious sexual perverts and about a dozen or more dishonest Hollywood doctors. Studio heads have put financial gain far ahead in importance than the future of studio personnel and the industry.

They almost rate as money bloodsuckers. They have done practically nothing to curb narcotics from being used loosely, right within studio walls, by movie personnel.

Only because of the Mitchum-Lila Leeds-Huntz Hall and the many dope ring arrests, etc., has the use of narcotics been reduced about 50 per cent in Hollywood. Even many peddlers are temporarily working at other positions, and I might add, the price of dope around town has almost doubled.

A great job has been done so far in cleaning up much of the use of dope in Hollywood. However, and it is ironic, that records prove that most of the stars, producers, doctors and other lesser lights, mostly responsible for the dope condition, are still at large. Local and Federal Narcotics Agencies are well aware of this existing condition. It has become slightly more difficult for Narcotics men to make arrests. That conclusion is simply due to the fact that after all these arrests and publicity, most addicts that we speak of are very much on guard. They don't take chances in automobiles, public rest rooms, and front room parlors. Even the marijuana parties that were once held at the rate of about 20 a week in Hollywood, have diminished to a sneaky here and there "affair." The public owes a deep debt of gratitude to local and Federal Narcotics Agencies, to say nothing of a few other law enforcement agencies. They are winning an important spotlighted battle and will still earn further victories. The clean up is not over. All the punishment has not yet been dealt. Bigwigs among studio officials have not been thoroughly embarrassed and punished as yet. Serious offenders among stars, producers and doctors, are still to face a final judgment. . . .

You've heard of cycles in the world, like the cycles of war, the cycles of the birth of twins, haven't you? Hollywood is now in a cycle. In 1921 Hollywood saw the famous case of Roscoe "Fatty" Arbuckle, involving the death of a lady named Virginia Rappe, after an orgy affair. That rocked the nation. You recall the unsolved murder involving the film names of Charlie Chaplin, Marion Davies, William Randolph Hearst, which took place on or near a yacht. That also took place in that era. In 1922 the mysterious death of Director William Desmond Taylor took place. It is still unsolved. About that same year via the dope addict route a famous idol named Wallace Reid, died, and of course, a score of lesser scandals were revealed.

Dark orgies, alcoholics and dope addicts were just as common in Hollywood as a sinus condition. Young boys and girls were being misled around the nation because of it all. Hollywood and L.A. during that period witnessed a record breaking flock of prostitutes and their gentlemen friends who arrived for non-movie purposes. Wild gin parties with nude young starlets were just as common as hot dog stands. It involved everybody, executives, producers, directors, actors, actresses, writers, etc. It was an extravagance of mind and physical exposure that was a throwback almost to the Roman days. Money meant nothing and women less during these orgies. Hollywood's morals hit a terrific low. Oddly enough, or just as a reminder, it took quite a number of years before the public was aroused, because it did not have the present day press and radio setup and outlets. So they were in a world practically by themselves.

Then something happened. Ministers, Priests, Rabbis, Club Women and Men, and Reformers got together and organized against this vicious cycle. Which was planting evil roots into the minds and bodies of Mr. and Mrs. America. They condemned the industry. Resolutions attacking Hollywood's sinful life were passed by the leading churches and organizations. Between 1921 and 1924 nearly 130 censorship bills were introduced in about 40 states. many of them passed, most of them are still in existence. Something had to be done, so the heads of the industry of that era got together and decided on a plan.

Something that would keep them in control. The mounting pressure on the executives and producers finally resulted in 1922 in the

organization of the Motion Picture Producers and Distributors of America censorship office. Will Hays, a Republican politician, and a good one, was made president of this censorship office, which has since become widely known as the "Hays Office." He received $150,000 a year, a lot of office space and plenty of personnel to aid him in his clean-up.

Such tirades had their effect. Everyone was very cool for the next few years and there was the disgraceful parade of cinematic notables before the House Un-American Activities Committee. Curiously, though Mitchum, Leeds, Huntz Hall, and others were busted in 1948 and that big drive against Hollywood dopers began, this was the year that Hollywood released its first drug-smuggling melodramas in over a decade. The plots of such government-approved efforts as *Slattery's Hurricane* and *To the Ends of the Earth* have been detailed in other chapters. The dope and sex crusades soon fizzled out, but the anti-Communist forces continued to raise a stink well into the 1960s.

The next big drug scandal occurred in April 1955 when *Dracula* star Bela Lugosi entered the Los Angeles General Hospital seeking a cure for his drug addiction. Though he stated that his addiction was of twenty years' duration, Lugosi's biographer Arthur Lennig and his wife Lillian believe that the habit did not begin until the late 1940s. Lugosi probably began using morphine in about 1948 and he brought back a stock of the new drug methadone from England in 1951. Methadone had been developed by the Germans during World War II as a substitute for morphine. Lugosi may have been America's first methadone addict. He seems to have been in the habit of injecting methadone plus two milliliters of demerol and also taking barbiturates for sleep. He seems to have decreased his use somewhat by 1953, but his fading career and poor health led him to resume heavy use, and by the time he committed himself in 1955 he could hardly find a suitable place on his legs for the injections.

Lugosi went through a typical withdrawal that he later discussed. "I cannot describe the tortures I underwent. My body grew hot, then cold. I tried to eat the bed sheets, my pajamas. My heart beat madly—then it seemed to stop. Every joint in my body ached. . . . I used to take five or six needles a day. And when I took the cure they took it all away from me. . . . It was horrible, horrible." Three months later he was released as cured and he described it as "the greatest thing that ever happened to me." Lugosi returned to making pictures again, but his happiness was short-lived. He died within a year.

During the next decade, only a few stars made dope headlines: Bobby Driscoll, best remembered as the cabin boy playing opposite Robert Newton in *Treasure Island* (1950), overdosed on methedrine, and "Our Gang" member Carl "Alfalfa" Switzer was murdered over a supposed drug deal. But, alcohol and barbiturates continued to take their toll with Marilyn Monroe going this route in 1962 and Alan Ladd in 1964. Cary Grant made news with his mid-1950s LSD trips. He told columnist Sheilah Graham, "It's the only way to find the real truth—you get a new and wonderful conception of nature. You see everything so clearly—it's a marvelous experience." He later enlarged on the mysteries of lysergic acid to a London newspaper, but when a Hollywood columnist repeated it he threatened to sue. Dyan Cannon later cited Grant's LSD sessions at their divorce trial.

Peter Fonda was one of the few others to discourse on LSD. By the late 1960s he had had eleven acid trips and described the first:

> I can only equate it with four years with a good psychiatrist if it could all be done in one session. You see it all at once. You know what it's all about. I witnessed death—I felt and believed I was dying. I experienced panic—this thing called ego death. I burst through the balloon—I was on the other side. It was a helluva trip. . . Part of my gig as an actor is to be able to speak out. When I came back from the trip, in choosing myself, I chose what I was going to be. I chose the personality I wanted, I gave birth to myself. I became my father and my mother. I became a living, breathing organism. I am part of the universe.

Fonda was also arrested for marijuana possession, but he seems to have profited from his drug experiences—he made a fortune from the youth-oriented drug films *Wild Angels*, *The Trip*, and *Easy Rider*. After his trial Fonda commented, "The laws against cannabis I find humorous—just like the official attitude on illegitimate babies."

During the 1970s, arrests of the famous and wealthy for drugs had become so commonplace that they hardly raise an eyebrow. Ryan O'Neal and Linda McCartney for marijuana possession, Louise Lasser and Greg Allman for cocaine possession, and little Timmy Rettig of the "Lassie" series has grown up enough to face five years in prison for cocaine smuggling. But Hollywood's appetite for dope is no greater than any other segment of the population—at the

worst, movie stars merely consume better quality stuff. It no longer seems possible to argue that the stars or their films are more corrupt or corrupting than other people or other media. They only reflect their times, and though this deserves no special praise, neither does it merit special blame.

12 The Trip: Hollywood Hallucinations

Maiden Voyages

Patrons attending the opening of producer-director William Castle's new film *The Tingler* in 1959 were treated to another in his series of gimmicks (which included 3-D sequences and illuminated skeletons floating over the audience) when they received vibrations at appropriate points in the action. Tingle they might, for they were seeing the first LSD movie. Vincent Price stars in his usual mad scientist role—this time he is trying to capture a tingler, a creature formed of nervous energy on the spine of frightened people and which can only be repulsed by screams. He theorizes that if he frightened a mute person the tingler would remain and could be captured. For this purpose he tests a solution—"not a drug, it's an acid"—by injecting himself with 100 micromilligrams (an obvious mistake for micrograms). He has blurring of vision—"like having nightmares when wide awake," and orientation problems—"The room is tilting from side to side." He struggles for control and records his trip. "Emotionally I begin to feel somewhat apprehensive. This is normal, however. The room is closing in on me. I can't make it stop. The walls—the walls—the walls . . ." Price bumps into a skeleton and freaks out completely, but, of course, he recovers. He locates an appropriate deaf-mute and injects her with acid after arranging some lovely scares. In a color sequence the faucets run red—probably the first color trip sequence on film. He succeeds in isolating the tingler—a crustacean creature resembling a eurypterid, but it kills him and crawls across the screen after the audience. LSD is never specifically mentioned and few people have realized that this was its first commercial film role.

The only previous visual hallucinogen preparation available to the American public seems to have been a half-hour television show from 1956 entitled "Lysergic Acid." It was one of the Confidential Telepictures series that included programs on pyromania, suicide, narcotics, and horror comic books. Price's only other tangle with hallucinogens was also on television in an early 1970s episode of "Get Smart" in which Price portrays a mad doctor who wants to send all of official Washington on a trip by poisoning the water supply.

Hallucinogens were abandoned to the underground filmmakers for the next half-dozen years, although the television series "One Step Beyond" featured one program (in about 1963) in which host John Newland journeyed to Mexico to film the mushroom ceremony (presumably as a consequence of R. Gordon Wasson's *Life* magazine article). Newland ate some mushrooms

Now they're cowering in fear, but shortly they'll be eating mushrooms and laughing. From the precocious Japanese film *Attack of the Mushroom People* (1963).

Vincent Price uses blow torches on animals and LSD on humans to create monsters in their nervous systems in the first LSD movie *The Tingler* (1959).

at the home of Viktor Reko, author of *Magische Gifte* (1949)—one of the earlier books on psychedelic plants, and there is a charming scene in which Newland chats with Reko about the colors and patterns he sees while viewing a strobe light.

Mushrooms were also the focus of the 1963 Japanese film *Matango*, picked up by those masters of exploitation films, American International, and distributed as *Attack of the Mushroom People*. A yachting party is cast ashore on an island where fungus and giant mushrooms abound. They find records on an abandoned ship indicating mushroom toxins and there are hints of radiation experiments. Hunger forces the party to eat mushrooms, which are easy to find when it begins raining and the island is covered with six-foot fungi. After a few comments like, "I read in a book a long time ago that Mexicans used them to enhance their perception," and "Japanese legends tell of happy mushrooms that put people in touch with the infinite," they begin laughing, seeing lights and visions (rather poor effects, but a peg better than *The Tingler*) and acting very spaced out. Unable to stop eating, they gradually turn into giant laughing mushrooms with hundreds of little

fungi growing all over them—the fate of all their predecessors. One man refuses to eat and eventually returns to Tokyo where his story results in his being committed to a hospital as insane. Looking out over the bustling city he repents. "If I really loved her I should have eaten the mushrooms and stayed with her—the island was no worse than this." Not a four-star movie, but certainly way ahead of its time.

A number of films appeared in the next few years that, though not mentioning any drug by name, seem to have been done by people who had some knowledge of drugs and hippies as these elements are incorporated in their plots. *Teenage Zombies* (1960) involves a plot to drop zombie pellets into America's water supply, and *Again* (1966) is a Spanish-Italian effort about a drug which, when combined with music, induces loss of self-control and suicide. *One Spy Too Many* (1966), the third of the "Man from UNCLE" films, featured a "mindbending will gas" (BE-30) stolen from the U.S. Army Biological Warfare Division. Someone seems to have heard of the army's experiments with acid. In the 1966 Italian-French-German flick *Secret Agent Superdragon* we find a CIA agent investigating the strange behavior of college students in Fremont, Michigan. They are being drugged into robots with Syncron 2 (in their gum and candy) by the Black Wolves, an international group plotting the overthrow of the United States. More recently, the Spanish *Liberxina 90* (1971) featured a chemical controlled by anarchist groups that wipes the mind clean of all establishment conditioning. This is reminiscent of the 1937 British film *Underneath the Arches*, in which revolutionaries try to seize a "peace gas."

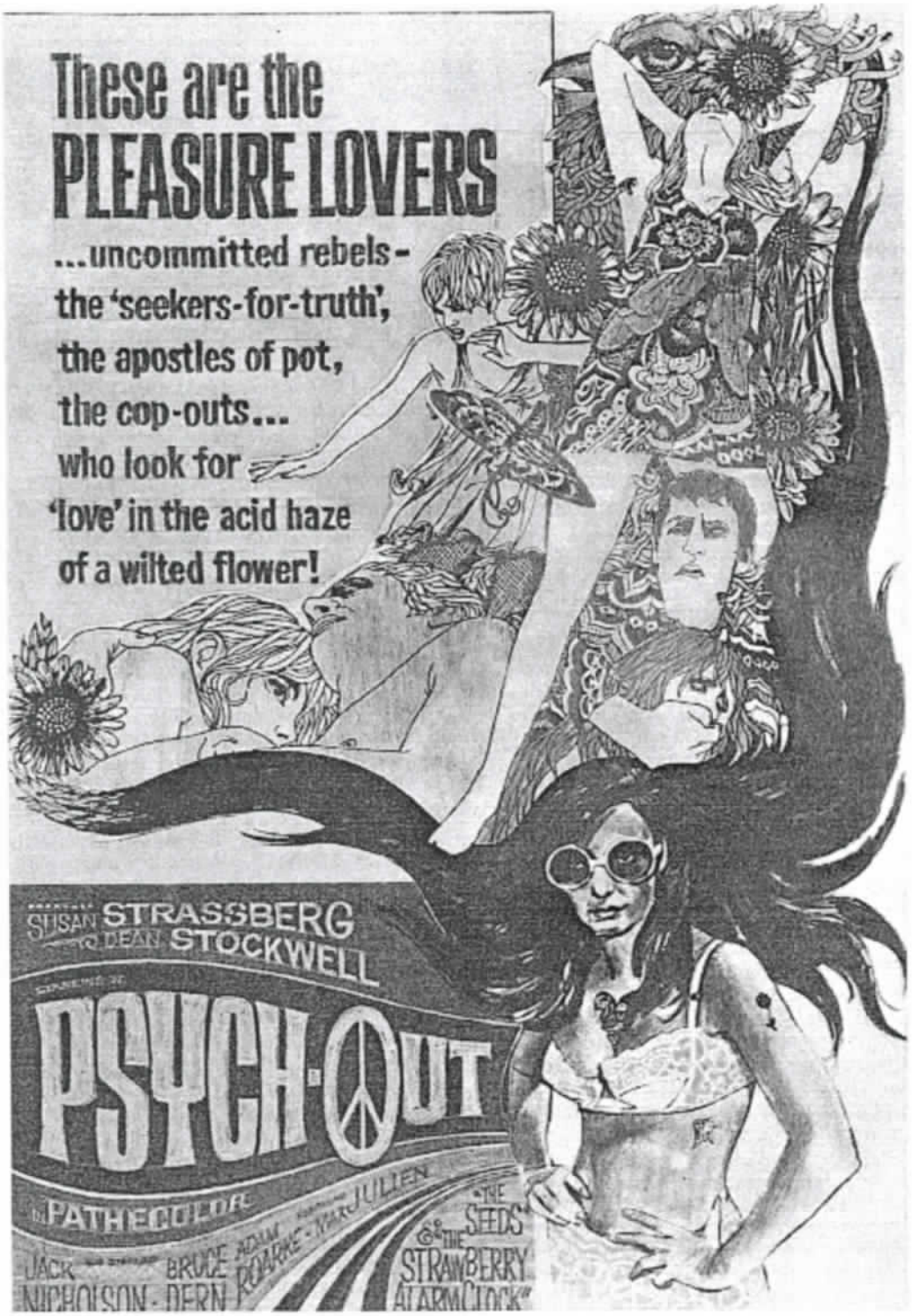
It was inevitable that a juicy plum like psychedelic drugs would soon be picked by exploitation filmmakers, and Albert Zugsmith (who produced the pot-leads-to-heroin film *High School Confidential*) scooped the field with *Movie Star, American Style; or, LSD, I Hate You* (1966). Much of the picture is an in-joke for Hollywood devotees with Paula Lane starring as a Marilyn Monroe type called Honey Bunny. Recovering from her latest suicide attempt, Honey is sent to a rest home where Dr. Horatio treats his patients with LSD. Heavy thoughts emerge from their psyches but the rest home's bizarre atmosphere renders cures unlikely. Zugsmith depicts the drug trip with a color sequence (a gimmick popular since the early silent films) that is probably the first tolerable attempt in above-ground films, and

It looks like a scene from a Bergman film, but it's Peter Fonda having a bad moment on LSD from *The Trip* (1967). Despite its flaws, it is a reasonably successful attempt to depict the LSD experience.

is in any case considerably superior to the trip color sequence in the other 1966 acid film *Hallucination Generation*. The latter film stars George Montgomery as an ex-college professor now heading an LSD and marijuana colony on Ibiza off the coast of Spain. When one boy's mother cuts off his allowance, George suggests that he turn to robbery, an idea he resists until George doses him with LSD. Of course, the robbery ends in murder with one participant retreating to drugs and the other to a monastery.

Another film that premiered in 1966, Conrad Rooks's *Chappaqua*, is several levels of consciousness above the preceding two efforts and can reasonably be regarded as the first feature-length classic of the psychedelic cinema. It was financed, written, directed, and starred in by millionaire ex-junkie Conrad Rooks. Its plot is nothing other than the story of Rooks's sleep cure for heroin addiction in a Paris clinic and the bulk of the film is composed of an intricate series of flashbacks, dreams, and hallucinations employing nearly every trick effect available. It is the most successful attempt to show the pains, fantasies, fears, euphoria, torture, and hallucinations of withdrawal, on the one hand, and of psychedelic voyaging on the other.

Additional features assuring instant classic status for this film are the beautiful sound track by Ravi Shankar and others and the bit parts by Allen Ginsberg (as Messiah), Ravi Shankar (as Sun God), blind musician Moonddog (as the Prophet), Swami Satchidananda (as Guru), jazzman Ornette Coleman (as Peyote Eater), the Fugs (as the Fugs), and William Burroughs (as a sinister pusher named Opium Jones). Veteran French ac-



Advertising copy for *Psych-Out* (1968). A reasonably honest attempt to portray the developing acid culture, it is now of interest mainly for the appearance of Jack Nicholson as a drug-using hippie musician.

Conrad Rooks in *Chappaqua* (1967), a remarkable psychedelic view of life. Though it ranks as one of the most impressive cinematic expressions of the psychedelic era, it is rarely seen.

tor Jean-Louis Barrault who starred in *The Children of Paradise* some twenty years earlier plays Rooks's doctor. Nevertheless, those without psychedelic experience may find the film mostly "art and artifice" and "camera tricks" (Judith Crist). It must be admitted that it does have some terribly obvious symbolism (a booted heel crushing sugar cubes that spell LSD) and there is sometimes the feeling of watching a monolithic home movie.

In 1967, Roger Corman and American International, who usually collaborated on second-rate Poe adaptations, "biker" films, or crime "mellers" (e.g., *Cry Baby Killer*, 1958), churned out *The Trip* starring Peter Fonda and with a screenplay by Jack Nicholson. A director of television commercials, Peter is about to crack under the stresses of life so he decides he ought to take acid. At first everything is beautiful and serene, and then sexual matters and flashes from old Bergman and Fellini movies (e.g., hooded horsemen, a mock trial while riding a merry-go-round) send him on a bad trip. Fonda assumes mankind's sins, attends his own funeral, and wanders away in a daze until friendly pusher Max (Dennis Hopper) sends him over to Salli Sachse's pad, where he calms down amid psychedelically lit breasts. Peter feels reborn but AI could not resist shattering the final frame to suggest that tragedy lay ahead, even though they began the film with a warning about the effects of LSD, and in spite of the fact that Corman dropped acid to prepare for the film and had a good trip. The treatment of the LSD experience was surprisingly good and the visuals were imaginative, with one lovely dream sequence of Dennis Hopper as a high priest, but the straight critics were understandably unimpressed. "And I would warn you that all you are likely to take away from the picture is a painful case of eye strain and perhaps a detached retina" (Bosley Crowther); ". . . a totally incoherent movie with erratic, repetitious and fake-arty effects that simply nauseate, both intellectually and physically" (Judith Crist). Some critics will never accept the fact that life has no plot and often no coherence.

In contrast, *The Love Ins* (1967) had plenty of plot but its feeble script and poor casting doomed it from the start. Susan Oliver and James MacArthur just do not make it as college students and the Hashbury hippies look like Hollywood plastic. Richard Todd plays a Timothy Leary type who resigns his college position over a question of academic freedom, advocates LSD for religious meditation on the "Joe Pyne Show," and becomes a hero in San Francisco's Haight-Ashbury district. He soon becomes nasty (he tells Oliver to get an abortion rather than ruin his image) and corrupt (he charges $5 for admission to his happenings), but is quickly martyred when turncoat MacArthur kills him for stealing his girl. Although there is a very nice psychedelic ballet version of *Alice in Wonderland* (Oliver is hallucinating this on acid while doing a public striptease), there is also a hippie suicide under LSD and the whole thing just is not convincing (probably for the same reasons that many "dope operas" fail—they are made by people on the other end of the generation gap, out for a quick buck).

Another 1967 production by Sam Katzman, this time for American International, was *Riot on*

Getting down with dope in a Chinese tobacco pipe during *The Trip* (1967).

Richard Todd as Timothy Leary type in *The Love Ins* (1967). He espouses peace, love, and dope, but charges five dollars for his happenings and pressures his mistress to get an abortion so she won't ruin his image.

George Montgomery presides over his colony of dope freaks on Ibiza in *Hallucination Generation* (1966). When not busy drawing psychedelic doodles, he doses followers with acid and inspires them to commit crimes.

Sunset Strip. This exploitation of the mid 1960s Strip riots features Aldo Ray as a cop whose daughter (Mimsy Farmer) smokes grass and is slipped acid and molested by some hippies in the course of a party. Ray has seen it all before, but not with *his* daughter so he beats up the hippies and starts a riot. The sound track was provided by some of the really heavy bands—the Standells, the Chocolate Watch Band, and the Enemies (or was that Enemas?). Need we say more?

LSD was in for a hard time as Hollywood simply added drugs to its sex and violence routines, and American International, knowing it was on to a good thing, produced *Psych-Out* and *Wild in the Streets* in 1968. In the former film Susan Strasberg (remember her as Eva Lovelace in *Stage Struck*, 1958?) is looking for her brother (the Seeker) in Haight-Ashbury. Her last letter from him said only "God is alive and well in a sugar cube, brother." She runs into Stoney (Jack Nicholson) and Dave (Dean Stockwell) who are acid-eating

rock musicians. Stoney remarks on the drums—"They don't sound so good without acid." They wander around looking for the Seeker while dropping acid and smoking grass to a rather feeble rock background by the Storybook and the Strawberry Alarm Clock ("Who cares what games we choose, little to win but nothing to lose"). When Stoney has to quiet a friend who is freaking out Susan asks why he takes that stuff, and he replies that "a man has got to search out for himself to get any rewards from life" and then invokes Nietzsche. Poor peace-loving Nietzsche—first he gets blamed for the Nazis, then for acid. Lots of hip philosophy along the way—"All the games have to go, man, 'cause it's all one big plastic hassle," and "You're righteous Stoney, but you're not very hip" (both by Dave to Stoney when he makes a fuss about Dave's making a pass at his girl friend. A straight lady remarks to her friends regarding a minister, "How can he stand these people and the way they dress?"—then a close up of a stained-glass window with long-haired and bearded Jesus. Dean and Susan take some of the powerful drug STP and he philosophizes some more ("Reality is a deadly bore") while she wanders away. Stoney arrives enraged. "You sick crazy bastard. You understand that she does not know that drug" and they run after her. Meanwhile, her brother, pursued by some straight toughs, has barricaded himself in a house and sets fire to it. Pursuing Susan to the accompaniment of eerie psychedelic sights and sounds, they find her just in time for Dave to push her out of the path of a car and die in the process. Dave: "I hope this trip is a good one." He dies and Stoney and Susan embrace. If you are wondering about some gaps in the plot—like why the Seeker is left in the burning house—you'll have to try persuade AI to show you the thirteen minutes they chopped out of the final release prints. On the whole, the film is tolerable, considering AI's standards and those of producer Dick Clark, who has turned out some really awful films.

In contrast to almost all their other efforts, AI went to a lot of trouble to try to make *Wild in the Streets* (1968) into a good film. The plot is simple—teenagers get the vote and take over the country with the help of LSD. It all begins when Max (Christopher Jones) blows up the family car and leaves home with the $800 he made selling LSD to teenagers. Seven years later the twenty-two-year-old Max, now the world's top rock star, lives in palatial splendor with his girl friend Sally (Diane Varsi). He appears at a rally for a young California congressman, but double-crosses him by asking for the voting age to be lowered to fourteen. Within a month eighteen states have given teenagers the vote, and then Max gets Sally elected to Congress. After dosing the legislators with LSD, they get a bill passed that eliminates age requirements for office holders and Max proceeds to win the presidency by a landslide. His first act is to send everyone over thirty-five to retirement camps where they are kept on a diet of LSD. But the revolution is not over. When Max mashes a crayfish belonging to some seven-year-olds, they vow to "put everyone over ten out of business." Although the film was reasonably well done, with good casting (except for the usual Hollywood blunder of making most of the hippies too old), a semidocumentary style, and guest appearances by Walter Winchell, Dick Clark, and Melvin Belli, one would think that its patently silly nature would have led the critics to pan it. But it seems to have made just the right appeal to some fears of the middle-class middle aged. "By far the best American film of the year so far . . . a very clear logic about where things lead, . . . brutally witty and intelligent film" (Renata Adler), ". . . one of the most provocative and interesting movies to come out of the Hollywood factories in a long time . . . the finest horror movie to come our way in a long while" (Judith Crist). Some of the film's dialogue does have a realistic ring about it, but some is absolutely incredible. The first flower child elected to Congress on the LSD ticket says, "America's biggest contribution is to teach the world that getting old is a drag."

Easy Rider (1969), in contrast, managed to capture some of the realities of the generation gap, enough to make it the largest grossing nonroad show release in the history of Columbia Pictures. Though it is more concerned with changing values than with dope, the film begins with Fonda and Hopper smuggling heroin over the Mexican border and selling it to a shady type in a Rolls-Royce (played by rock tycoon Phil Spector). Fonda and Hopper proceed to ride their cycles over the great Southwest, heading for New Orleans and the Mardi Gras. On the way they visit a commune and later get thrown in jail with an alcoholic lawyer (Jack Nicholson). Nicholson decides to accompany them and there follows the best scene in the movie in which Nicholson smokes his first joint and explains that the earth has been infiltrated by creatures from Venus. But the next night rednecks from a town they stopped in set upon them and kill Nicholson. Fonda and Hopper then proceed to a New Orleans brothel and later drop acid in a cemetery with two hookers, but the

Neofascist youths force everyone over thirty-five to swallow daily doses of LSD in *Wild in the Streets* (1968).

Phil Spector sampling the heroin smuggled in from Mexico at the start of *Easy Rider* (1969).

trip (filmed in 16mm) is a bummer (though the special effects are fine). Shortly thereafter, the two are killed on an isolated road when two rednecks in a pickup truck blast them with a shotgun. The film had at least three good features: brilliant camera work, fine background music by a variety of folk and rock stars, and a superb performance by Nicholson. On the other side of the ledger, there is almost no character development or story, the dialogue is often vapid, and the commune hippie scene is mostly Hollywood plastic. Fortunately the film's strong point—the rebel in a conformist society—is sufficiently interesting to carry the day (at the box office at least). So far as drugs are concerned the film's most notable feature is its casual presentation of drug dealing and use—a feature that scandalized some critics.

Bad Trips

By the time *Easy Rider* appeared, a number of films were in circulation that presented LSD as a

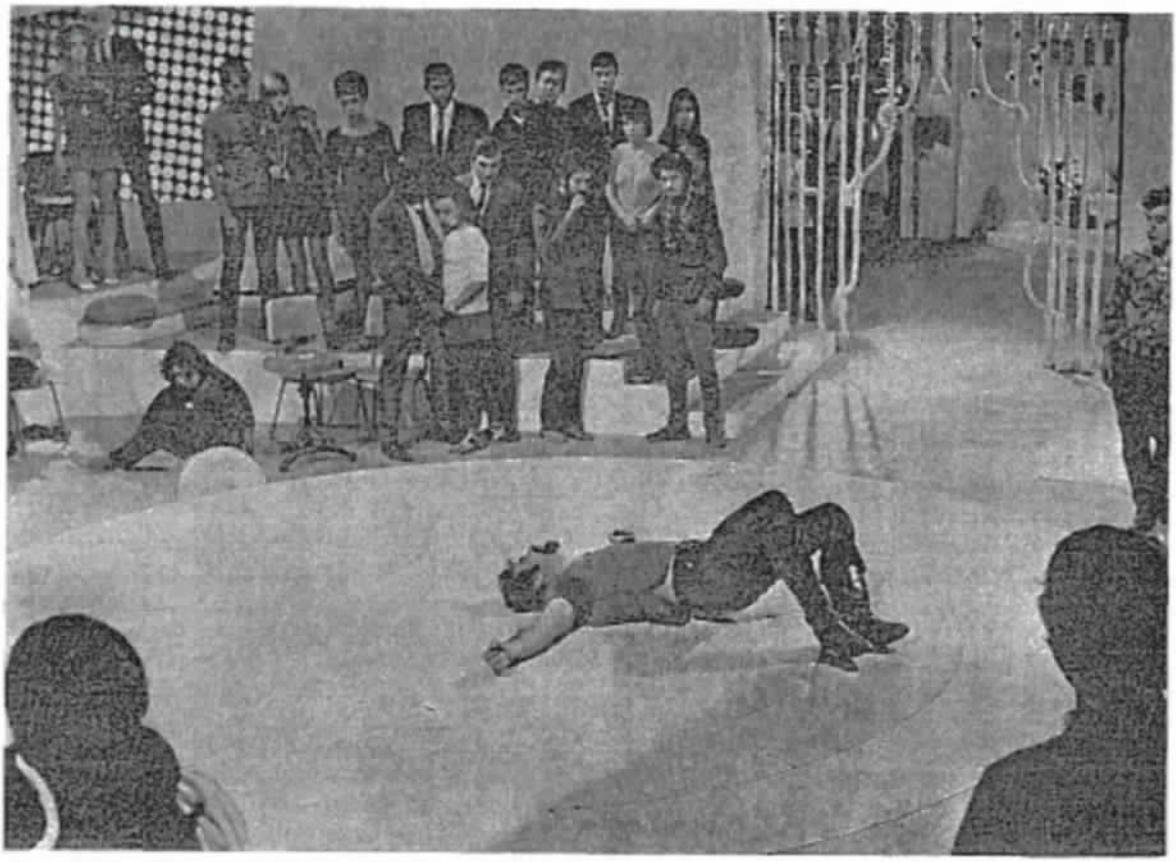
tool to be used for murder and mayhem. *Jigsaw* (1968), a remake of the 1965 film *Mirage*, has altered the story, and instead of Gregory Peck having amnesia as a result of shock, Bradford Dillman has it as a result of LSD. At the beginning of the film Dillman accidentally puts LSD-spiked sugar cubes in his coffee and is totally confused and spaced out. He has a bad trip for the most part, seeing a murder, blood on the walls, and so on. When he comes to later he finds himself in a strange apartment with a dead woman. Unable to remember even his name, Dillman consults a private detective (Harry Guardino) with whose help Dillman finds his way back to his job in a top secret government think tank, where he helps set up and analyze nuclear war games (played by army and navy personnel). Meantime, two hippie dealers—Michael Pollard (C. W. Moss from *Bonnie and Clyde*) and Roy Jenson—kidnap Guardino, feed him three caps of acid "enough to freak out an elephant," beat him up, and turn him loose. After stumbling around awhile, Guardino runs into Dillman (whom he sees as a giant spider) and jumps on him but returns to normalcy almost immediately. Heavy stuff this acid, not only does it make you see spiders, it makes you want to ride them! Harry now knows the mechanism of the amnesia. "Lysergic acid—LSD, better known as trip tickets," and opines that the three caps eaten by Dillman were "enough to keep an acid head traveling around in never-never land for a week." "They put it on blotters and chew it or on sugar cubes and hide it in the refrigerator." Harry decides that Brad ought to take another trip to cure his amnesia, so his girl friend scores a matchpack full from Michael Pollard (who steals every scene he is in). This time Dillman sees roses opening, thunderballs exploding, and remembers enough to confront a colleague at the think tank. This colleague fights with Dillman and Jenson who, splattered with paint, pursues the villain to the roof, is ignited by a torch, and falls off clutching the murderer. The trip sequences, amnesiac flashbacks, and rapid pace make for what may be the greatest number of shots and most rapid cutting of any above-ground film. The breathtaking visual display, punctuated by the excellent score by Quincy Jones, comes off extremely well and the trip sequences are admirable. Though the extreme confusion and amnesia are not characteristic of LSD, the brilliant colors, rapidly flashing images, and emotional lability are depicted nicely. Unfortunately, naive viewers were likely to carry away a very negative image of LSD.

Michael Pollard is a drug purveyor, "tour conductor," and scene stealer in the LSD murder mystery *Jigsaw* (1968).

Negative images of LSD were clearly the intent of *The Big Cube*, a joint Mexican-American effort produced in 1969. Here we find George Chakiris as a hippie medical student in love with heiress Lana Turner's daughter. When Turner disapproves of their romance, they begin dosing her coffee with LSD-impregnated sugar cubes. Turner suffers some tolerable special effects that generate amnesia and cause her to go crazy. Later, a friend restores her memory by having her act in a play of these events. Chakiris returns to his dingy pad and destroys his mind with acid. Although it is certainly possible for people to be scared by acid, insanity and amnesia are unlikely results, and this bit of dreadful propaganda even has Chakiris being tormented by a roomful of giant spiders (though he doesn't try to ride them). Such films are realistic only in that they are self-fulfilling prophecies—as part of the scare tactics against drugs in particular and unusual psychic states in general, they help to create paranoia and panic.

Speaking of which, *Paranoia* is a 1968 French-Italian film originally titled *Orgasmo* in which Carroll Baker is driven mad with hallucinogens and debauchery. One reviewer commented, "Only the haunting memory of *Succubus* prevents me from naming *Paranoia* the worst movie of the year."

Acid is again used for evil ends in *The Filthy Five* produced by William Mishkin and Extraordinary Films. Two women want to disable boxer Johnny Longo, one out of hatred and the other because she wants him dependent on her. To this end, they induce him to take acid at an orgy and help him to fall out a window. Perhaps he was



A climactic scene from *The Big Cube* (1969). At the hip night spot "Le Trip," Lalo and Johnny "cube" an unsuspecting lad who freaks out and dies.

lucky—a young hippie in *Sign of Aquarius* (1970) has a bad trip and gives birth to a huge egg, though even this may be preferable to the fate of others in this film, who take their first trips during a musical ritual called "Om Pax Om." A couple gets so high on drugs that they are unable to recall anything about a murder in *Schizoid* (1971), an Italian-French-Spanish film also shown as *Lizard in a Woman's Skin*. The 1970 French film *La Rupture* begins with a man on LSD attacking his wife and son.

In contrast to most of the above films, which indicate that LSD triggers bizarre phenomena that have no relationship to reality, *The Weird World of LSD* (1967) showed people releasing their inner fears and desires. One shy lady becomes a nymphomaniac, and a fat man eats everything in sight—the "food trips" more familiar to marijuana users. Other maiden voyagers in this graphic study have fights, are pursued by demons, fantasize beautiful women, or just get overwhelmed by the sensory input after ingesting the magic powder.

By this time, acid had become the rage. Timothy Leary was making headlines and LSD had become a household word. It began to turn up in the strangest places and in the most unlikely hands, in movies as well as in life. Hollywood shrinks were dosing neurotic stars with it and the growing fraternity of acid heads saw to it that everyone had access to LSD. Two of Boris Karloff's last films capitalized on the public's fascination with this fantastic drug. The Mexican-American production *Snake People* (*Isle of the Snake People*) was a weird mixture of voodoo, snake worship, and LSD, whereas the British film *The Crimson Cult* of the same year (1968), tried to lend credence to its occult theme and kaleidoscopic visions by adding a preface about drugs that "can produce the most complex hallucinations. . ." Even Clint Eastwood, whom someone has described as a grown-up James Dean tranquilized beyond all emotion, wound up tan-

Successful groupie contemplates her rock star in the 1970 British film *Groupie Girl*.

gling with acid freaks. In *Coogan's Bluff* (1968) he goes to New York to nab an escaped killer who is in Bellevue recuperating from a dose of LSD.

In the late 1960s it looked as though LSD might be an ideal tool for some of the nasty tricks that secret agents like to play, and it accordingly appeared as an incapacitating device in several spy films. In the television movie *Asylum for a Spy* (1967), originally a Chrysler Theater production from 1965, Robert Stack is given two tabs of LSD by Felicia Farr with the comment, "LSD makes sodium pentothal look like a banana split." The 1968 British *Sebastian* starred Dirk Bogarde as the head of an all-female decoding unit. Foreign agents induce Bogarde's girl friend to give him a drug in champagne and he experiences some of the nicest special effects in any trip film, though they are very brief. However, the bad guys cannot get anything out of him so they try to make him commit suicide. "Come on man, let's see you fly." "Yes, I can." says Dirk, moving toward the window. But goodness triumphs and John Gielgud saves him, commenting later, "Well, we all need taking out of ourselves from time to time."

Another predictable place for LSD to surface was in the endless series of biker films that have been churned out ever since Marlon Brando's superb performance in *The Wild One* (1954). In the same year Russ Tamblyn appeared in *Seven Brides for Seven Brothers* and in 1958 he starred (if that is the word) as the undercover narc in *High School Confidential*—one of the classic marijuana films. As his career continued to plummet, Tamblyn appeared in several of the acid, grass, and cycle flicks. *Free Grass* (1969), also known as *Scream Free*, features him as the head of a gang that smuggles grass and kills narcs. Along the way, between mayhem and bad dialogue, he puts LSD in a buddy's drink to make him hallucinate and to disable him. Similarly, in

Peter Fonda surveys the debauchery in *Wild Angels* (1966). One of the earlier cycles-and-drugs epics, it lacked the class of *Easy Rider* (1969).

1971's *Satan's Sadists*, Tamblyn is a psychopathic pothead biker, his 1950s MGM lollipop image hopelessly lost. His gang gets their kicks from murdering young lovers—and anyone else who happens along. Just for the hell of it they put acid in the coffee of some schoolgirls before killing them. For once at least, the ads for this film delivered what they promised—"Human Garbage—they get their kicks from cruelty."

The Angry Breed (1969) features James MacArthur as a Nazi biker who puts acid in the punch at a party in order to eliminate his rival for a part in a movie. *The Young Graduates* (1970) likewise had a group of pill-popping bikers, as did *Hell's Bloody Devils* (1971). The latter film has John Carradine, horror movie star and father of "Kung-fu" star David, and Broderick Crawford (depending on your taste, you may remember him from *All the King's Men* or *The Vulture*) milling around in an incredible mélange of Nazis, drugs, sex, Hell's Angels, Colonel Sanders, and murder. *The Hellcats* (1969) was a similar mess that had one interesting feature—Roger Corman seems to have had absolutely no association with it. Lastly, we have *Machine Animal*, a 1970 Japanese film featuring a female gang riding around on Hondas. In one episode they steal 500 LSD tablets from three men, one an army deserter from Vietnam.

Several films impugned LSD in a very oblique fashion. *The Producers* (1968) try to ensure the failure of their play "Springtime for Hitler" by casting a spaced-out actor named LSD in the lead. A drug dealer and rapist named Acid is part of the unfortunate cast of *The Hooked Generation* (1968). Finally, the college professor in *Desperate Characters* (1971) is wracked by the fear that his students will dose him with acid. Evangelist Billy Graham rescues kids from dope in the British *Two a Penny* (1968), where thievery is a side effect of psychedelics.

One hoped that the day of the sleazy anti-LSD exploitation films had come to an end, but the release of *Blue Sunshine* (1977) quashed such

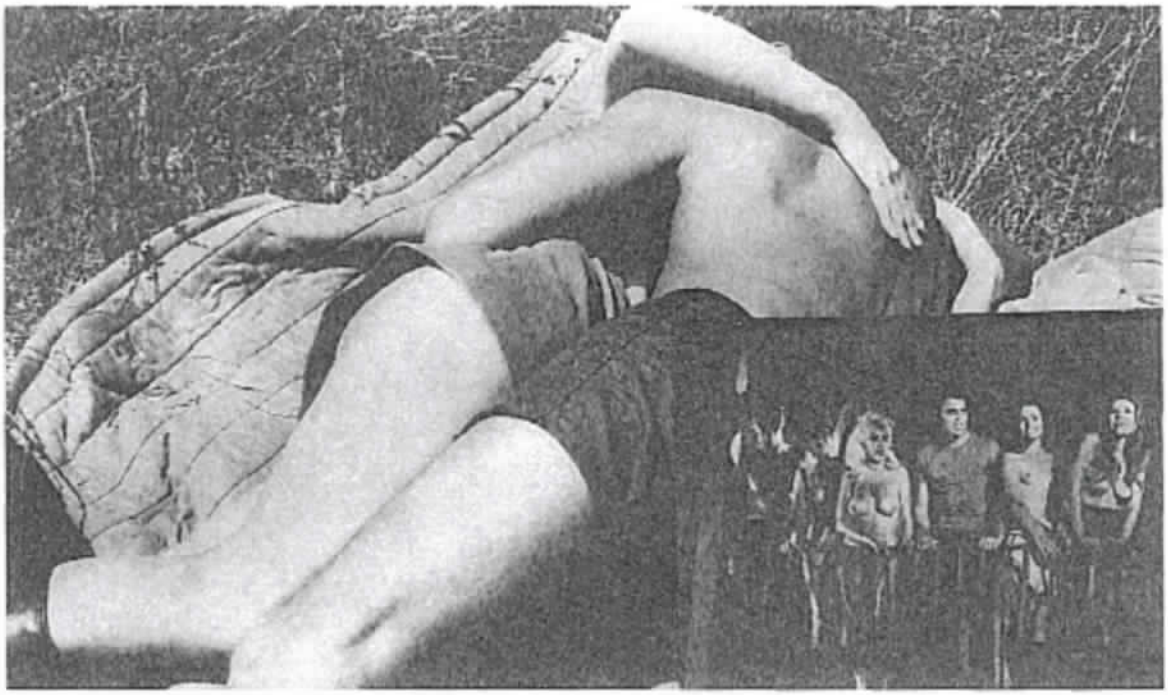
hopes. The story asks us to believe that there were 256 doses of Blue Sunshine LSD distributed in September 1967 which, ten years later, causes users to loose their hair, go insane, and commit random murders. This "chromosome time bomb" confines the story's star to a mental hospital and is supposedly ticking away in the other 255 users.

The Psychotomimetics of Everyday Life

Some films, particularly the more recent ones, have portrayed LSD as a relatively ordinary facet of life, and one that could even be pleasant and instructive. Andy Warhol's films *Chelsea Girls* (1966), ★★★★ (*Four Stars*, 1967), and *Trash* (1970) all dealt incidentally with acid. A tripping young chap stands under colored lights and talks about his sexuality in *Chelsea Girls*, and the *Alan and Dickin* segment of ★★★★ features a reading from a text on LSD and Buddhism (presumably by Alan Watts). In *Trash*, Joe Dallesandro is given money to buy acid by wealthy Andrea. In *Marjoe* (1972) hip evangelist Marjoe Gortner casually mentions LSD as one of the factors that eventually led him to see Bible-slapping religion in a totally different light.

Love Is a Carousel (1970) has a nice trip scene when a young girl on the road is introduced to LSD by an artist, and in *A Boy . . . A Girl* (1969) it is young Dean Martin, Jr., being introduced to acid by an older woman. A serious and somewhat successful effort to depict the attempts of a suburban couple to cope with drugs and the generation gap was *The People Next Door* (1970). The couple is shocked to find (1) their daughter is hallucinating on LSD, (2) the model son of the school principal is her dealer and (3) their daughter is hospitalized while freaking out on STP. However, all's well that ends well as mother slaps daughter around in the hospital and they have a reconciliation. The same year saw Sally Field (*The Flying Nun*) leaving home for communal drug experiences in *Maybe I'll Come Home in the Spring*. This television movie ad libbed some of the dialogue and wound up with more impact than most films of its type.

Drug trippers of slightly older types (full-blown hippies as opposed to the aforementioned teenyboppers) were the subject of films such as *Been Down So Long It Looks Like Up to Me* (1971). Based on Richard Farina's semiautobiographical



***The Acid Eaters* (1968). Everything's groovy inside the fifty-foot pyramid.**

Counter-cultural rumblings in San Francisco's Haight-Ashbury. Timothy Leary looks down from the wall in the documentary *Revolution* (1968).

Mimsy Farmer and Klaus Grunberg try the acid cure for their heroin problem in *More* (1969). Critics found the characters insipid and the drug taking horrendous.

Now Mimsy and Klaus and friend try grass and sex, then more acid, then more grass, then more . . . another scene from *More* (1969).

novel, it stars Barry Primus as a disenchanted college dropout. An art professor turns Primus on to hallucinogens but he has a bad trip and becomes even more disenchanted. A pair of European releases, *More* (1969) and *Valley Obscured by Clouds* (1972), shown as *La Valle* in Europe, feature LSD trips and very spacey music by Pink Floyd, superstars of space rock. *More* is basically a heroin film in which the central characters try to cure themselves with the help of LSD. The film is almost unique in exploring the theme of hallucinogens as a cure for the emotional problems leading to drug addiction, but unfortunately Stefan and Estelle fail in their cure and he is soon dead of an overdose of heroin. *La Valle* is also unique in that the hippies turn on, tune in, and drop out in a valley in New Guinea. James Fox was plied with hallucinogens by a reclusive rock star (Mick Jagger) and his concubines in 1970s *Performance*. This British film contained a song entitled "Rolls Royce and Acid," which gives a fair idea of its atmosphere, and presumably of Jagger's life-style as well.

Those making the psychedelic scene are even older in films such as *I Love You, Alice B. Toklas* (1968) and *Alex in Wonderland* (1970). In the former, Peter Sellers gives one of his best performances as a successful Los Angeles lawyer who chucks it all for good dope and a fair share of Leigh Taylor-Young's love. One lovely scene in his bachelor apartment-turned-crash-pad is dominated by a 300-pound man having a bad trip on LSD, amid countless other frenzied happenings.

Alex in Wonderland cast Donald Sutherland as a Fellini type adrift in Hollywood. The similarities to Fellini's classic *Eight and One-Half* as well as appearances by two fake and one real Fellini led critics to dub this *One and One-Half*. Alex takes LSD but he still is aimless and confused and follows the conventional route of lovely wife (Ellen Burstyn) and expensive house in suburbia. Fellini himself talked about his LSD experience on Canadian television a few years ago, and in his segment of *Spirits of the Dead* (1968), an English actor being interviewed on Italian television responds to "do you use LSD or other drugs?" with "Oh yes, when I want to return to normal." This segment, adapted from Poe's writings, is very surrealistic and is one of Fellini's best efforts.

Cosmic Laughter

Good vibrations and bright colors suffuse the 1968 British animated film *Yellow Submarine*. It is often regarded as a paean of praise to LSD ("Lucy in the Sky with Diamonds" is one of its songs), and since it is about the Beatles, who musically led an entire generation through acid, this view is hard to contradict. To make things perfectly clear, Frankenstein drinks a potion early in the film and becomes John Lennon. Though it was instantly obvious that the film was a modern classic, *Time* magazine gave it a bad review, calling it "a bad trip" and the title song "a sly euphemism for a drug inspired freakout." Nevertheless, nearly everyone from eight to eighty loved it and the only thing in the film that might be censored somewhere is the comment that Argentina is a possible refuge for the Blue Meanies. It seems reasonable to regard this film as the first really enduring cinematic monument to LSD.

Another visually stunning film owing much to acid was *200 Motels* (1971), featuring Frank Zappa and the Mothers of Invention. This berserk montage was aptly described as a visual and aural assault disguised as a movie. It was the first film to be made with the remarkable videotape-50 process and this permitted some of the most extraordinary visual effects ever seen in a commercial film. Hands and heads melt, Ringo Starr's jacket stays in place while its purple color floats off into space, and the entire screen breaks up into tiny diamond facets (however, some of the best effects are missing from current prints). The movie industry, with its typical lack of creative intelligence, seems not to have made any further efforts in this direction. Only a few video visionaries such as Nam June Paik and Jordan Belson have explored the remarkable effects that can be obtained with video while the commercial video and film establishments have almost completely ignored them.

Casino Royale (1967) was another British production that had a few nice visuals. In one sequence James Bond (David Niven) breaks out of Woodie Allen's SMERSH headquarters with "highly explosive" vaporized lysergic acid. Vaporized LSD also played a role in the bizarre 1966 *Mother Goose a Go-Go*, also known as *Unkissed Bride*. Tommy Kirk plays a newlywed with a strange problem—he faints when his bride begins reading aloud from Mother Goose. A psychiatrist cures him by spraying him with LSD while he sleeps. This makes Kirk incorporate into reality the fairy-tale characters from his fantasies, which presumably allows him to perform his husbandly role.

In another incredible acid film of the 1960s,

Jackie Gleason and Austin Pendleton are Alcatraz convicts who dose everyone with acid and sail away in garbage cans attached to inflated plastic bags. *Skidoo* (1968) also had Gleason becoming convinced that violence is evil after licking LSD-soaked stationery belonging to his cellmate "the Professor." But even with Groucho Marx as a Mafia-type boss named "God" and a promotional trailer by Timothy Leary, the film was mostly a failure. Only *In Harm's Way* was as complete a critical and commercial disaster for producer-director Otto Preminger. *Skidoo* was supposedly inspired by Preminger's first acid trip; if so, he should have taken a few more trips on acid before making the film. Vincent Canby seems to have summed up critical response with "for people whose minds need pressing by a heavy, flat object." Nevertheless, the film has become something of a cult film, and for those whose heads are prepared, it can provide many laughs.

The President's Analyst (1968) also played acid for laughs. A very successful satire on many sacred cows including the telephone company, the film featured James Coburn in the title role. On the run from American and foreign agents, Coburn takes refuge with a group of hippies. "Hey man, trade some Congolese hash for some LSD?" "Yeah man." "Mother's milk" says one as he looks lovingly at a vial of blue liquid. (In the early days LSD sometimes came in liquid form and was often blue because of indole oxidation or because it was colored to disguise it as Aqua Velva after-shave lotion.) The merry band then serve blue-colored cocktails at a party and everyone trips on acid while long-haired drummer Coburn beats out a groovy rhythm.

In $ (*Dollars*, 1971) which also played acid for laughs, Warren Beatty and Goldie Hawn execute an ingenious plan for robbing a vault full of safe-deposit boxes, one of which contains the stash of murderous dealer Candy Man. They flee Germany and get out of one jam only because their captor decides to celebrate with a fatal glass of champagne (liquid LSD). *The Smugglers* was a 1969 French comedy in which a young customs officer and two women get their kicks by smuggling acid, marijuana, whiskey, and cigarettes over the Alps. Smuggling was also the theme of one of the more unlikely acid movies to come along. Doris Day is a mod cosmetics consultant who becomes entangled with a gang that smuggles a powerful hallucinogen from Switzerland in face powder in *Caprice* (1967). The hallucinogenic properties supposedly appear after the powder is ignited. Though LSD is never men-

Soul-rock star Tina Turner as the Acid Queen in *Tommy* (1976).

Goldie Hawn lofts champagne bottles filled with liquid LSD in $ (*Dollars*, 1971). The bubbly later proves the undoing of a thief who celebrates with a drink.

Doris Day s chats with a *Caprice* (196

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Hard-core

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Doris Day smuggles hallucinogenic cosmetics. Here she chats with a Swiss "perfume" chemist in a scene from *Caprice* (1967).

tioned, this seems to be an obvious Sandoz joke (Sandoz of Switzerland invented and first marketed LSD).

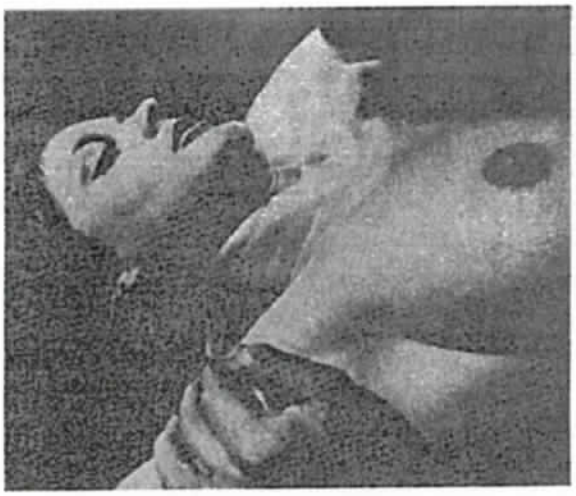
The 1967 film *The Busy Body* contained an incidental reference to acid. One of Robert Ryan's hoodlums was in charge of "horses and LSD."

Hard-core LSD

As previously noted, sex exploitation films frequently include drugs as an added attraction. Films of this genre produced prior to the 1960s are diffiult to find, and the vast majority of them have probably vanished. The collection of sex films of the Kinsey Institute for Sex Research seems to contain no drug references prior to the 1960s, but this undoubtedly reflects the paucity of the collection. Apparently films exploiting nudity and drugs first became common in the 1930s and such classics as *Marijuana—Weed with Roots in Hell* and *Cocaine—The Thrill That Kills* had both of these elements.

The Saucy Aussie (1963) may have been the first sex film to exploit LSD. Also known as *The Obscene Couch* and *The Oblong Couch*, it was filmed in and around San Francisco, site of the world's first intense psychedelic experimentation. An Australian tourist is given headache pills by a hotel clerk that do nothing for his pain, but enable him to see through women's clothing. The next day he takes more pills and is enchanted with his hallucinations, but by the evening everything is back to normal.

The year 1966 saw the appearance of three LSD and sex exploiters. *Unholy Matrimony* concerned wife swapping and blackmail with LSD-spiked drinks leading to a weird sex trip along the way. The San Francisco pornography business, lesbian drug-addict prostitutes, shoe fetishists, and Haight-Ashbury hippies who lose control on acid were the unlikely ingredients of *The Evil Pleasure*, also known as *Pornografi*. *The Love Statue*, also billed as *The Statue*, was the story of a Greenwich Village artist and not surprisingly



Sex and drugs is big box office in *The Takers* (*above*) from 1969 and *Beyond the Valley of the Dolls* (1970). A sprinkling of drugs on a churning collage of nymphomaniacs, homosexuals, bisexuals, transvestites, and sadists.

Getting off with balloons, body paint, snakes, drugs, and sex in *Psychedelic Sex Kicks* (1967).

had certain aesthetic pretensions. A Japanese singer doses the artist with LSD and introduces him to lesbianism and voyeurism, but the artist's biggest surprise comes when he returns home to find a statue that comes to life and seduces him.

As a drug that, in the popular mind, not only helped one but even forced one to let go of one's inhibitions, LSD was a natural plot element for the cheap pornographic movies, and in 1967 it appeared in at least seven of them. After an hour of sex and depravity, one of the prostitutes in *The Lusting Hours* shows just how low she can get by taking a hallucinogenic drug, whereas one of *Mr. Mari's Girls* is a drug addict whose response to LSD is an erotic dance. *Depraved* involves three couples with penchants for bisexuality and sadism who have an LSD party. But bisexual Rod makes the mistake of fondling sadist Bob and the latter crams Rod's head in a toilet shortly before Vera ends the festivities by leaping out a window.

Psychedelic Sex Kicks, produced by Pad Productions who were responsible for *The Saucy Aussie* four years earlier, included body painting, playing with snakes, and sex in a room full of balloons while the participants were high on grass and acid. This soft-core strangeness was perpetrated by a hippie who lured two women from Golden Gate Park in San Francisco. Turnabout is fair play, and in *Surfside Sex* it is two women who seduce a writer and give him LSD. LSD is also used by loose women to blackmail executives in *For Love and Money*. An entire town, including a Strategic Air Command base engages in an LSD orgy after a poet laces the water supply with acid in *The Enormous Midnight*.

In succeeding years the acid-sex cinema has continued to proliferate. A boring movie about bored jet setters who tape-record an LSD party on their yacht, *The Sex of Angels* (1968) has the novelty of being an Italian-German production. The partygoers throw all harmful items overboard except for one pistol, which is, of course, used by one of them to shoot himself fatally. Our heartstrings are, however, unlikely to be plucked by the characters whom critic Howard Thompson called a "foul-mouthed, unfeeling, flintsouled quartet." It was the Italians and Spaniards who gathered in Puerto Rico to shoot *Female Animal* (*La Mujer del Gato*) in 1970. Another jet-set film, it stars Arlene Tiger as fast-living Angelique who beds a count, his son, and a variety of others on the way to her first LSD trip. One of the novels of the Marquis de Sade was resurrected and transmogrified for *Juliette de Sade*, a 1969 European disaster. A bad trip is only one of Juliette's

interminable problems before she gives up the decadent life in Rome and flies to Nairobi. *Kama Sutra* (1969) was another European film, with a drugs, sex, and body-painting sequence inserted for American release. *Wanda* (*The Sadistic Hypnotist*) (1969) exploited Sacher-Masoch's favorite woman, though the plot had men forcing women to drop acid and engage in riotous sex play.

Moonshiner's Woman (1968) has a sad story, quickly told, of Lorilee who drops acid, sleeps with the wrong guy, and gets beaten up. Sandy likewise has a traumatic trip in *Sands of Ecstasy* (1968), but she ends up with the right guy and does not get beaten up. *Infrasexum* (1969) is the story of a sexually frustrated millionaire who cannot even get turned on by psychedelic orgies, whereas *The Animal* (1969) is a pervert who indulges in voyeurism and obscene phone calls when he is stoned. Another man with problems is the subject of *My Third Wife George* (1968). This time things start out fine with three foxy women and an LSD orgy, but all's not well when he finds out that his wife's other mattress mates include their pet gorilla. The Canadian *Love Is a Four Letter Word* (1970) tells a similar story of a middle-aged man who gets drugged at a hippie party and bares his sexual frustrations in his bizarre trip.

Turk is a "cool swinger," so when hoods crash his pot orgy he slips one a cube of LSD. The party continues as the hood has a bad trip and his friends cart him away in *Smoke and Flash* (1968). Even so, the hood was luckier than the man in *Blue Sextet* (1969) who leaps to his death when a nasty woman encourages his delusion that he can fly. It is amazing how frequently the fear of heights emerges relative to LSD—is it really acrophobia or just a general fear of letting go?

The campus gets its fair share of sex and drugs in such films as *The Dean's Wife* (1970). A student slips acid to the dean and takes him to an orgy, intending blackmail, but the dean flips out upon finding his wife in the clutches of another and commits suicide. Rosie and Fluff initiate innocent Wistful into Lambda Sigma Delta (LSD) sorority. Everyone has a high time with sex and acid until fraternity president and football hero Charlie attempts a solo flight off the balcony. Coming to in the doctor's office, Charlie decides he's had enough of the drug scene. *Campus Confidential* (1968) tells the story of three coeds, two of whom are attending a drugs-and-sex party while the third is seducing a disc jockey during his program. *Alice in Acidland* (1969) shows how a lesbian French teacher seduces her students with the aid of marijuana and LSD.

Pamela leaves school to become secretary to a rock music promoter and is soon enmeshed in sex and drugs on Sunset Strip. She downs some LSD at a party and is killed while bad-tripping on the Los Angeles Freeway in *The Hard Road* (1970). Another cinematic tripper named Pamela was the center of attention in *Pamela, Pamela You Are . . .* (1968). This time Pamela is a wealthy Long Island socialite who is seduced by Calvin, who has persuaded her to drink coffee with acid in it. Hallucinating out of control, Calvin's debauched friends, dressed as monks and nuns, throw garbage at Pamela and he whips her prior to raping her. Stumbling along the beach in the psychedelic color sequence, hands reach out of the sand at her (someone's been watching Cocteau films).

The Cycle Savages (1969) came in for their share of sex and acid as they gang-raped a high school girl before feeding her acid in order to make her one of their prostitutes (they run a white slavery operation in Las Vegas). Motorcycles, sex, and acid mixed again in yet another of Roger Corman's Hell's Angels takeoffs *I'm a Groupie*, a 1970 British production. Vickie meets rock musician Stewart and is soon making her way across the Continent with drugs and sex, tripping through rainy Berlin in the nude while imagining herself in meadows and music. Predictably, she soon takes the ultimate trip. *Groupie Girl* was another British film of 1970 that had young women running off with drug-taking rock groups. Some of *The Student Nurses* (1970) also had LSD-popping bikers for boyfriends.

Motorcycles provide escape for a group of white-collar workers in *The Acid Eaters* (1968). Every Friday afternoon they put on hip clothes and go to the White Pyramid, a fifty-foot tower where they have LSD parties. The acid freaks in *The Naked Zoo* (1970) live in Miami's Coconut Grove district and consequently drive Corvettes rather than motorcycles. With Rita Hayworth, Fay Spain, and a sound track by Canned Heat, this film has at least a touch of class. The same cannot be said for Boxoffice International's 1968 sex-and-acid pastiche *Mantis in Lace* (*Lila*). Lila is a topless dancer, innocently promiscuous until she picks up a young hippie named Tiger who gives her some acid. When a bunch of bananas appear in place of his head, she flips out, stabs him with a screwdriver, and scatters his hacked-up body in a vacant lot. Thus begins Tiger's new hobby of taking LSD and hacking up lovers, which only ends when she repeats the perfor-

Lila—a 1970 British film about a nightclub dancer who takes LSD and makes nasty messes of her lovers.

mance in front of astonished police.

While on the subject of bad trips and bad taste let us consider, as briefly as possible, another Extraordinary Films release by W. Mishkin—1969's *Gutter Trash*. Nude photographer Bill sends lesbian friend Stix to Greenwich Village to buy drugs from notorious pusher CooCoo. While buying marijuana and STP, Stix shows that her heart is in the right place by trying to stop CooCoo from beating his sex slave Minky. Later Bill and his friends have a wild sex-and-drugs orgy that ends when his wife, depressed by sex and STP, sets herself on fire and burns to death. Also screened as *Male and Female Sexualis*, this trash does not quite reach the bottom of the barrel. This distinction is probably reserved for *Sweet Saviour*, a 1971 film exploiting the Tate-La Bianca murders. Troy Donahue plays a Manson-type beach boy who organizes drug-and-sex parties for jet setters.

Preparing for a psychedelic sex scene in the 1970 British nudie *I'm a Groupie*. Another biker-sex-and-drugs effort of Roger Corman, its leading lady trips nude through the streets of Berlin but has a tragic demise.

"Rotten" seems to have been the most favorable critical comment.

Another third-rate mess of interest only because its cast includes horror film star John Carradine and Marvin "The Millionaire" Miller is *Is This Trip Really Necessary?* (1970). The plot, if such a gory phantasm can be so described, has an insane director of sex films killing off actresses with LSD and iron maidens, in time to a sound track by Weed's Own. *I Drink Your Blood* (1971) is also a definite candidate for some type of left-handed award. Hippie satanists have an orgy after dropping acid and beheading chickens. When an enraged grandfather comes to avenge his ravaged issue they dispose of this problem by forcing him to take acid. Gramp's twelve-year-old grandson gets revenge by selling them meatpies loaded with rabies virus. The mind boggles at the thought of the countryside swarming with rabid hippies high on acid. At least they did not misrepresent this film—it played on a double bill with *I Eat Your Skin*.

Help Wanted Female (1968) included karate in

addition to sex, drugs, and murder. JoJo teaches karate during the day and mugs traveling salesmen at night, while her roommate Luana is merely a call girl. One of Luana's johns takes acid and has a prolonged fantasy of perversion and murder. It all turns out to be a nightmare, but when he wakes up he decides to stab his nagging wife. *After the Ball Was Over* (1969) again mixes hallucinogens and murder. It is the old story of a man (Robert) trying to drive his wife (Evelyn) insane with weird happenings and drugs. A psychiatrist prescribes "tranquilizers" for her that are really hallucinogens, but she gets wise, slips Robert some of the pills, and smothers him while he is helpless. Hallucinogenic candy is served at a swinging party in *Candy Baby* (*Dreamy Love Bed*, 1969). One woman is lost in fantasies of lesbian love while another seduces guru Maharishi Narish Yogi. Reporter Elliot, tripping for the first time, is surrounded by nude women who want to seduce him, but he freaks out and runs out the door. *Blow the Man Down* (1968) is novel in that virgin Melissa is given LSD and raped by three lesbians.

Part of Doria's education by two bohemian artists in *Love Is a Carousel* (1970) is an LSD trip with nice special effects. *Mid-day Mistress* (1968) has the Mafia killing Groovy, a Greenwich Village hippie, because he is giving away free dope. In *The Stewardesses* (1969) one of the young women goes off for a vacation with acid. Lastly, there is *Ever Been on a Trip?* (1970), an independently produced 16mm pornographic drug film.

Tell It Like It Is

Documentary approaches to hallucinogens intended for the commercial cinema, as opposed to the drug-abuse films discussed later, have generally been so lopsided as to partake more of fiction than fact. The title tells the whole story in the Spanish-Argentinian *LSD, Viaje al Terror* (1967?) and perhaps also in Giuseppe Scottese's *Acid, Delirio dei Sensi* (1968), also shown as *LSD, $5 Paradise*. *Mondo Teeno* (*Teenage Rebellion*), *Mondo Mod*, and *Mondo Hollywood* all appeared in 1967. *Mondo Teeno* was the most ambitious, offering scenes from youthful activities (mostly drugs and sex) around the world. Scandinavian permissiveness, Italian and Japanese teenage prostitution, and American pot and acid are featured, though failure to translate large segments of the Italian dialogue tends to make the viewer's attention wander. That an unwed mother is shown giving birth at the end of the film tells you just how far things have gone. *Mondo Mod* is largely limited to Los Angeles hippies as is *Mondo Hollywood*. The latter effort, also screened as *Hippie Hollywood: The Acid-Blasting Freaks*, showed transvestites, body painting, flower children, and Richard Alpert talking about acid.

Hippie Revolt (1967) included freak-outs, crash pads, communes, and so on. The psychedelic sequences illustrating comments on drug experiences were either far out or merely distracting, depending on the viewer's tastes, age, and drug experience. Howard Thompson summed it up with: "The general tone and content of this film are pinpointed by one scribbled hippie slogan fleetingly caught by the camera: Like father, like son, like hell." This film was also shown as *Something's Happening*.

You Are What You Eat (1968) has essentially the same elements as *Hippie Revolt* concentrating again on the Sunset Strip scene. With narration and some songs by Peter Yarrow of Peter, Paul, and Mary, the film was reasonably successful in becoming a sort of *Eight and One-Half* of the youth scene in America. *Revolution* (1968) was similar in many respects, but focused instead on the Haight-Ashbury section of San Francisco. It captured the scene when the love-peace-dope-flower-child syndrome was peaking and optimism still prevailed. Renata Adler summed it up as "a certain gentleness and poetry, which seemed to show a way the country could use and cherish them, almost like aphids, for its leisure time." Shortly afterward it was all gone, a result of the madness of the surrounding society and the built-in self-destruct of hippiedom, but *Revolution* preserved it on film—a precious document in years to come.

Timothy Leary Is Alive and Well at Your Local Theater

One group of documentary films of special interest to the LSD cinema are those that record the career of Dr. Timothy Leary, psychologist, astral voyager, and chief spokesman for the psychedelic revolution. Possibly the earliest of these is Donald Nestingen's eight-minute *Goldfever* (1965?), which Nestingen describes as: "Filmed on the Millbrook estate when Dr. Timothy Leary was heading a group of dedicated people researching the potentials of human consciousness. A free form manifestation, created by Dr. Leary and his associates, of the relation between established

society and the antiestablishment of today; played out by a mad gold prospector and some turned on Indians."

In 1966 well-known independent filmmaker and critic Jonas Mekas made *Report from Millbrook*, a twelve-minute, color, 16mm film, which Mekas characterizes as "Images: the residence of Timothy Leary; the surrounding nature—flowers, trees, pastures. Sound track; an interview with Quinlain, Sheriff of Millbrook, who made the Leary arrest; interview by EVO reporter spring, 1966." In 1969 Mekas made *Diaries, Notes, and Sketches* in which Leary made a brief appearance.

Leary's next filmic appearance seems to be his interview on the Merv Griffin television show in 1966. He also appeared briefly in an NBC television show called "The Pursuit of Pleasure,' which was aired in 1967. Hugh Hefner and Ralph Ginzberg were among the others interviewed on this program. *Turn On, Tune In, Drop Out* was Leary's first serious attempt to communicate with film. Most of the film's eighty-two minutes show him sitting on the stage of a New York theater talking while a trio of Indian musicians plays behind him. There are also comments by Ralph Metzner and Rosemary Woodruff, Leary's wife at the time. Metzner takes a trip, complete with psychedelic visuals, while Leary acts as his guide. As the trip begins, Metzner drinks the potion and his sense organs come alive. Pulsing, stroboscopic colors and reverberating gongs represent the tuning in, or entering the body through the senses. First there is the circulatory system—we hear the heartbeat and see the pulsing red fluid. Metzner yells "Help, help—I'm drowning," but Leary, with Rosemary as the divine connection echoing his words, guides him to his center and down to the cellular level. "Life and death, down soft ladders of memory." In the next segment, "All Girls Are Yours," Metzner reexperiences all his love affairs both fantasied and real, accompanied by flashing images of women and flowers and Rosemary's voice. The "Freak-Out" follows when the dancer dissolves into a skeleton, accompanied by shrill sounds and demonic masks—one senses the *Tibetan Book of the Dead* at work here. Metzner imagines that he kills Rosemary, shown in strobe silhouette, but Leary guides him down the ladder of genetic memory that is as long as life. Metzner voyages back to steaming primordial pools, back further still to the beginning of time. He experiences the big bang with which the universe began and slowly reenters the world through beautiful scenes. Most of the sound track is available on a now-rare Mercury album.

In 1968, National Educational Television produced a debate on marijuana and LSD between Leary and psychologist-physiologist Jerome Lettvin. "LSD: Lettvin vs. Leary" is fifty-one minutes of 16mm blacks-and-white chitchat, most of which is dull. While excerpts from experimental films are shown, Leary defends LSD as a sacrament that helps one to penetrate the mysteries of life. Lettvin maintains that visions are not worth the loss of critical ability and that some LSD effects are similar to brain lesions.

Independent filmmaker and 3-D expert Lenny Lipton shot a silent 16mm film of Leary at his house in the Berkeley hills in 1968, and at this time, or shortly after, Leary made the short trailer for the film *Skidoo*. Leary participated in the antiheroin film *Release* (1972) produced by the Vienna Filmkollective. Leary was apparently being considered for the lead in the film of Hesse's novel *Steppenwolf*, but he was a fugitive at the time, and the CIA had him illegally deported to the United States. The following year his new wife Joanna produced a documentary of his incarceration *At Folsom Prison* (1973), filmed at Folsom and San Francisco.

Undoubtedly, before many years we will see at least one film based on Timothy Leary's life, perhaps entitled *High Priest* after his autobiographical book and possibly starring Robert Redford or Warren Beatty as the mature Leary.

Up and Down with This and That

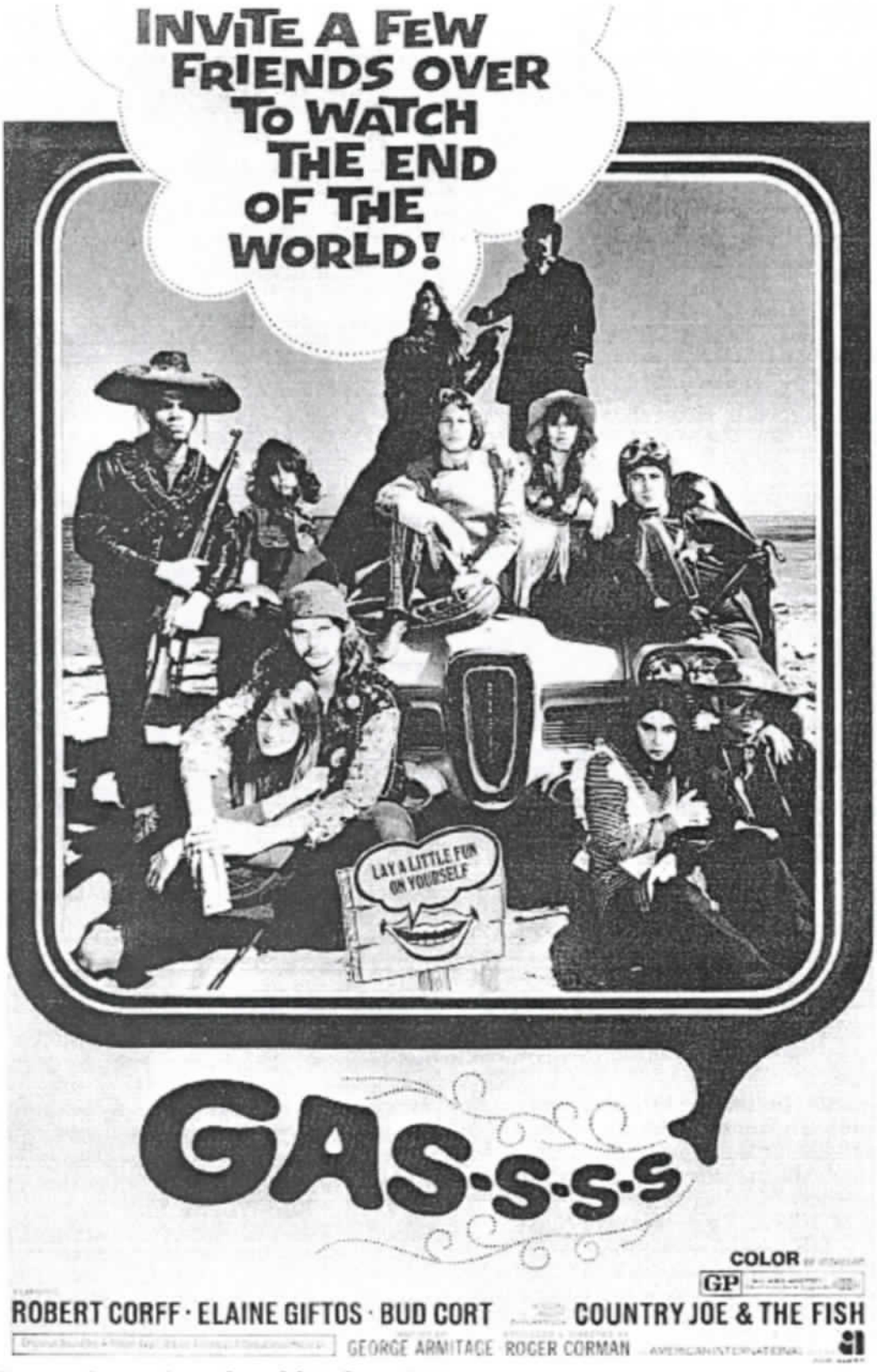
A number of films concerning minor hallucinogens, or those of uncertain nature, remain to be considered. One of the most remarkable and enjoyable of these is the 1968 British *Work Is a Four Letter Word*. David Warner stars as amateur mycologist Val, who lives in a highly automated world of the near future. Totally engrossed in hallucinogenic mushrooms, he takes a job as night attendant at a giant power station because he believes the conditions will be perfect for growing his new strain of mushrooms. Surreptitiously Val alters the station's functioning in order to optimize conditions for his giant Mexican mushrooms. The authorities discover his changes and chase him around the station, but it is too late. Even as they run, the entire station sprouts giant mushrooms up to five feet tall, and no one can resist sampling them. Soon everyone in the place is completely stoned, laughing hysterically while gobbling

The gang at the power plant sits down for a snack of magic mushrooms in the offbeat British film *Work Is a Four Letter Word* (1968).

mushrooms—red ones, brown ones, green ones. "It's not the effect I like—it's the taste," says Val as explosions destroy the station and black out the city. As darkness settles over the city Val and his new bride head for the forest with a baby carriage full of mushrooms.

Another futuristic British film in which drugs play a significant part was *A Clockwork Orange* (1971). At the beginning Malcolm McDowell and his three "droogs" consume a stimulating drugged beverage called "milk plus" and set off on their nightly crime spree. Mick Jagger was considered for the lead but British censors said they would not pass it. Stanley Kubrick maintained that "the thesis . . . warns against the new psychedelic fascism—the eye-popping, multimedia, quadrasonic drug-oriented conditioning of human beings by other human beings." Drugs have become commonplace in science fiction and we can expect them to become nearly universal in science fiction films of the future. B.J. Hollaway's amateur film *A Voyage to Arcturus* (1971) showed the space travelers eating hallucinogenic fruit.

Dark Dreams (1972) was a hard-core sex film in which a witch gets a couple stoned on hallucinogenic tea prior to their copulatory athletics in whipped cream and baby oil. *Professor Lust* (1967) was another unusual sex film about a chemist who, testing mind-altering drugs, invents hallucinogenic gases that transform him into a sneering tyrant. Naturally he then organizes brothels in which he administers the gases to the prostitutes and their clients in order to create desired fantasies. One man cavorts with Madame Pompadour at Versailles. *Scratch Harry* (1969) seems to be soft-core pornography that turns out to be the hallucination of a 1950s jazz musician. Weirder still is *Angel, Angel, Down We Go*



Drugs produce movies on the eyelids in *Gasssss* (1970).

James Mason takes prescribed cortisone and develops megalomania in *Bigger Than Life* (1956).

(1971), also seen as *Cult of the Damned*, in which folk singer Holly Near is Tara, a rich girl seduced into sex and mysticism by Jordan Christopher. Somehow Lou Rawls and Roddy McDowall fit in as members of Jordan's rock group. This peculiar effort was written and directed by Robert Thom, fresh from the fantasy of acid fascism, *Wild in the Streets*. Roddy McDowall made his directorial debut in a British film in the same year with *Tam Lin* (1971), seen by some as *The Devil's Widow*. Ava Gardner stars as a widow who feeds hallucinogens to her imprisoned lover, producing visions of fire and snakes and murderous Ava chasings him with weapons.

Other British films to deal with psychedelics were *Hysteria* (1965), in which a man is fed hallucinogens to help frame him for a murder, and *The Trouble with 2B* (1972), in which a spray produces instant happiness. A chemical in Roger Corman's *Gassss* (1970) induces movies on the inside of the eyelids. Critic Vincent Canby found this particular "gag" amusing, but as every psychedelic sophisticate knows, it is not a gag.

Drug-induced hallucinations were featured in the 1971 Italian-French-Spanish movie *Schizoid*, and also in Sha Na Na producer George Leonard's *The Evil Weed* (1972). A silent film with sound track *In the Buttocks of My Mind, I Can't Leave My Love Behind*, it follows George as he scores PSF (Psilo-cortisone stannis flouricine) and is off to dreamland (the East Village). Ray Milland starred in *X—The Man with the X-Ray Eyes* (1963), a very captivating little film about a doctor whose serum enables him to see through matter. Unfortunately, he sees futher and further until he gazes at the eye of God at the end of the universe. His mind slipping, he obeys the biblical injunction and plucks out his eyes. Comedian Don Rickles also appears as a quick-buck promoter who tries to capitalize on Milland's eyes.

George Peppard and Mary Tyler Moore are among the fake beat types in *What's So Bad About Feeling So Good?* (1968). A toucan arriving in New York on a Greek freighter spreads a peculiar disease that travels "up the nasopharynx to the limbic system." First there is a ringing in the ears and then people smile, stare at flowers, cut their hair, and generally straighten up their act and have a good time. Peppard and Moore are great as they join the merry band in spreading the disease. Tobacco and cigarette sales drop, people avoid their jobs, and the mayor calls in the army and the FBI. "Those commies sure are sneaky—we had information they planned to dump LSD in the reservoirs." Unfortunately, the disease stops when the antidote (8-anilno-amino-thiosemicarbazone?) is added to gasoline. Whatever it has to say about LSD, this film certainly is a boost for consciousness alteration.

James Mason gives a superb performance in another offbeat drug film *Bigger Than Life* (1956). Injecting the steroid cortisone on the advice of his doctor, he soon turns into a madman. Cortisone does tend to produce psychic alterations and those for whom it is prescribed must be watched carefully for such behavior.

Cameraman-turned-porno-king Russ Meyer talked Twentieth Century-Fox into backing *Beyond the Valley of the Dolls* (1970). Amid the churning and moaning collage of nymphomaniacs, transvestites, sadists, suicides, abortions, and orgies the film contains a liberal sprinkling of pot, pills, and peyote. A minister in the 1972 television movie *Haunts of the Very Rich* also sampled a little peyote. According to the cleric he merely lost his mind and body and was none the worse (or better) when he came to. Peyote, or perhaps locoweed, was the source of Lee Van Cleef's trip in the British flick *Captain Apache* (1971). But the critics were unimpressed. "Perhaps the ultimate absurdity is Apache's drug-induced dream sequences, replete with distorted images, vivid colors and psychedelic music."

Locoweed made a rare cinematic appearance in *No Drums, No Bugles* (1972). A pacifist flees to the West Virginia wilderness during the American Civil War and draws some consolation from the locoweed that grows there. In *Terminal Island* (1973) a doctor assuages his grief with the drugs he makes from the plentiful mimosa trees. These legumes contain dimethyltryptamine and related

indoles, which are powerful hallucinogens, but the film regards this as a drug habit to be overcome by love. Last, but certainly not least, we have *Family Plot* (1975) by Alfred Hitchcock in which the evildoers knock out their victim with the hallucinogen ketalar (ketamine), which they obtain from a dentist. Street people are more familiar with this drug under the name "green," which is the color the drug often has when it is illegally produced.

Real people using real psychedelics are seen in anthropologist Peter Furst's *To Find Our Life: The Peyote Hunt of the Huichols of Mexico* (1969), and *Yonomama* (1971) a film of a small group of Venezuelan Indians. The Yonomama are shown preparing and using (mostly for recreation) the hallucinogenic *epena* snuff, which the men (women rarely use it) take turns blowing into each other's noses through long tubes. After preliminary vomiting, they experience powerful hallucinations and two have this conversation:

"Do you think this drug is strong?"

"I already told you no!"

"I can't see so well any more—don't tell me it isn't strong!"

Next a traveling shaman arrives. His function is to go from tribe to tribe, get high on their best snuff, and tell stories while he is stoned. These stories are used by the people to help them manage their affairs. The story on this particular occasion told of whites and Yonomamas killing each other and ended with a white child killing and eating a Yonomama child and being killed in turn. It must have been an uncomfortable moment for the white filmmakers!

Mescaline visions were fundamental to Eric Duvivier's *Images d'un Monde Visionnaire* (*Pictures of an Imaginary World*) released in 1967. Along with the flashing, often multifaceted images of mescaline are surrealist or Grand Guignol deformations representing hashish effects. Mescaline makes a brief ripple in Frederick Wiseman's documentary *Hospital* (1970), when a stoned-out college student is brought in.

With a screenplay by Paddy Chayefsky and direction by Ken Russell, *Altered States* (1981) promised to be the psychedelic film of the decade. Obviously patterned on John Lilly's writings, the plot has the hero drinking a South American hallucinogen in an isolation tank. Unfortunately, instead of voyaging into higher consciousness, the plot descends into unbelievable fantasy at this point as the hero turns physically into a monkey. Those lovely costumes which weren't left out of the film are blurred over with optical effects and what could have been a fantastic trip becomes just another horror movie.

13 Avant-Garde, Underground, and Far Out

One striking aspect of Western civilization in the last two decades is the great development of opportunities for individual expression. Because of the expense involved film has lagged behind other media in this respect and it is only with the development of the super-8 format in the 1970s that film has become a truly public medium. Nevertheless, there was a great flowering of underground or independent filmmaking in the 1960s and it was inevitable that many of these films should have been influenced by the creators' drug experiences.

Although it is evident that the psychedelic revolution profoundly influenced underground as well as aboveground filmmaking, only some of the more obvious drug-oriented films are discussed here and readers who wish to explore this area further may consult some of the standard texts such as Renan's *An Introduction to the American Underground Film*, Curtis's *Experimental Cinema*, and Sitney's *Visionary Film*.

"Avant-garde," "independent," and "underground" all characterize these films to some extent, though perhaps "very low budget" would be a more appropriate category in which to include them all, since rarely do they exceed a budget of a few thousand dollars and many have been made for far less than that. As a consequence, these films are almost always 16mm shorts in black and white, and they are not distributed through the usual commercial channels. The technical aspects of these films are usually crude by Hollywood standards, but they are often personal, honest, free, and unpredictable to a degree rarely attained in the commercial cinema.

Many of these films convey a highly personal message and are not meant to evoke an intellectual response nor to provide entertainment for the masses. Undoubtedly, some of these films will be more comprehensible or enjoyable to those with psychedelic experience. One of the few failings of P. Adams Sitney in his otherwise superb book *Visionary Film* (1974) is his consistently intellectual approach to film. A closely reasoned exegesis is often an inappropriate response whether it be to cherries jubilee, a Mozart symphony, an orgasm, or a psychedelic film.

A few filmmakers have commented frankly on their drug experiences. "Early in life I experimented with peyote, LSD and so on, but in many ways my films are ahead of my own experience" (Jordan Belson). "It's a little like being high on a small amount of LSD" (Bruce Baillie commenting on his hepatitis). "Numbers 1 to 5 were made under pot; no. 6 with schmeck (it made the sun shine) and ups; no. 7 with cocaine and ups; nos. 8 to 12 with almost anything, but mainly deprivation, and 13 with green pills from Max Jacobson, pink pills from Tim Leary and vodka; no. 14 with vodka and Italian Swiss white port" (Harry Smith). For the most part, however, drug influences must be inferred from the films.

If Cocteau can be called the patron saint of the independent drug-inspired film, then Kenneth Anger can be regarded as its father, because of his early entry into films (he made *Fireworks* in 1947 at the age of seventeen) and his prominence as a figure in the film world. Anger's *Inauguration of the Pleasure Dome* was completed in 1954, but was revised in 1966 (the "Sacred Mushroom" or "LSD" version), and the latter version was specifically intended for psychedelically altered perception. Inspired by Aleister Crowley's magic rituals, the film shows costumed characters from classical mythology drinking a psychedelic witches' brew and experiencing changes in psyche and appearance. Rapid cutting and superimposition begin at this point. A triple-screen version was shown in 1958, and the 1966 version adds footage of naked souls from *Dante's Inferno* (1935) and quintuple superimposition of images. Subtitled *Lord Shiva's Dream*, it shows the Great Beast (Crowley) lighting a joint for his Scarlet Woman. Later, Pan's drink is poisoned with an aphrodisiac initiatory powder that Shiva had hidden in a chamber of his ring.

Anger has continued to use drug themes as incidental plot features. His well-known motorcycle film *Scorpio Rising* (1964) shows Scorpio taking a snort of cocaine (Michael McClure's "Ace of Light"), and the Deacon and Deaconess smoke hashish with the Magus in the costume of an Egyptian god in *Invocation of My Demon Brother* (1969).

Probably no other films discussed in this section have been given the attention received by Anger's efforts, though some have been quite polished and effective. Belgium, one of the founts of surrealism, has produced several notable films of this sort, including *Narcose* (1967) by Philippe Graffe and *Junkies Island* by Louis Langled, both of which utilize very limited imagery to create an impression.

Poles apart from Anger's works are the visually stunning pieces of Jordan Belson. Unfortunately, most of Belson's work is little known because he formerly refused to allow his films to be shown. His *LSD* (1954) is the second film in the underground psychedelic cinema, though it was later abandoned and reworked into his *Cosmos* (1971?). Belson's Vortex Concerts, given in San Francisco in the late 1950s, and also at the 1958 Worlds Fair in Brussels, profoundly influenced the subsequent use of visual imagery in avant-garde and commercial cinema and were crucial to the development of the light shows that have become such a fixture of the pop scene.

After his Vortex period, Belson produced a series of films of stunning visual complexity—*Allures* (1961), *Re-Entry* (1964) often regarded as his masterpiece, *Phenomena* (1965), *Samadhi* (1967), and *Momentum* (1969), all accompanied by electronic sound tracks of his own composition. Belson has also done special effects for Hollywood films such as *Journey to the Far Side of the Sun* (1969). The films are full of cosmic imagery of outer space—suns, clouds, stars, and amorphous lights that often pulsate with bodily rhythms such as heartbeats or breathing. All of Belson's visual trickery is very smooth and sophisticated—it is usually difficult to decide how it was achieved. *Allures* deals with rebirth of matter whereas *Re-Entry* analogizes between space flight and the death-rebirth cycle as described in the *Tibetan Book of the Dead*. As the name implies, *Samadhi* is concerned with the altered consciousness of yogic states and the tantric energy flows. *Momentum* concerns a journey to, and inside of, the sun, and marks Belson's entry into films made with computers and videotape. Since these are among the most sophisticated visual expressions of the psychedelic age, they are described in detail. The following is exerpted from Gene Youngblood's *Expanded Cinema*:

> *Allures* begins with an ethereal pealing of bells. A centrifugal starburst of pink, yellow, and blue sparks whirls out of a black void. Its points collect into clusters and fade. Bells become weird chimes; we sink into a bottomless orange and black vortex. An intricate pink mandala of interconnected web patterns spins swiftly into the distance. A caterpillarlike coil looms ominously out of infinity. We hear a tweetering electronic warble, a collection of threatening piano notes. Pink and yellow sparks wiggle vertically up the frame. Distant snakelike coils appear and fade. A tiny sun surrounded by a huge orange halo disintegrates. There are flying cometlike petal shapes.
>
> Oscilloscope streak-dots bounce across the frame with a twittering chattering metallic noise. They form complex triangular and tetrahedronal grid patterns of red, yellow, and blue. Out of this, evolves an amorphous yellow-white pulsating globe of fire without definite shape. It vanishes, and a blue neon-bright baton rotates slowly into infinity.
>
> "I think of *Allures*," says Belson,
>
> > as a combination of molecular structures and astronomical events mixed with subconscious and subjective phenomena—all happening simultaneously. The beginning is almost purely sensual, the end perhaps totally nonmaterial. It

> seems to move from matter to spirit in some way. *Allures* was the first film to really open up spatially. Oskar Fischinger had been experimenting with spatial dimensions, but *Allures* seemed to be outer space rather than earth space. Of course, you see the finished film, carefully calculated to give you a specific impression. In fact, it took a year and a half to make, pieced together in thousands of different ways, and the final product is only five minutes long. *Allures* actually developed out of images I was working with in the Vortex concerts. Up until that time, my films had been pretty much rapid-fire. They were animated, and there was no real pacing—just one sustained frenetic pace. After working with some very sophisticated equipment at Vortex, I learned the effectiveness of something as simple as fading in and out very slowly. But it was all still very impersonal. There's nothing really personal in the images of *Allures*.

After the glowing blue baton vanishes, the screen is black and silent. Almost imperceptibly a cluster of blue dots breaks from the bottom into magnetic force-fields, which become a complex grid pattern of geometrical shapes superimposed on one another until the frame is filled with dynamic energy and mathematical motions. A screeching electronic howl accentuates the tension as galaxies of force-fields collide, permutate, and transmute spectacularly. Some squadrons rush toward the camera as others speed away. Some move diagonally, others horizontally or vertically. It's all strongly reminiscent of Kubrick's *2001*—except that it was made seven years earlier.

Elsewhere in the film, rumbling thunder is heard as flying sparks collect into revolving atomic structures whose nuclei emanate shimmering tentacles of tweetering multicolored light. At the end, we hear ethereal harp music as a pulsating sun, fitfully spewing out bright particles, reveals within itself another glimmering galaxy.

Re-Entry is chiefly informed by two specific sources: John Glenn's first satellite orbit, and the philosophical concept of the *Bardo*, as set forth in the *Bardo Thodol* or *Tibetan Book of the Dead*, a fundamental work of Mahayana Buddhism. According to Jung, *Bardo* existence is rather like a state of limbo, symbolically described as an intermediate state of forty-nine days between death and rebirth. The *Bardo* is divided into three states: The first, called *Chikhai Bardo*, describes the psychic happenings at the moment of death. The second, or *Chonyid Bardo*, deals with the dream state that supervenes immediately after death, and with what are called *karmic illusions*. The third part, or *Sidpa Bardo*, concerns the onset of the birth instinct and of prenatal events.

With imagery of the highest eloquence, Belson aligns the three stages of the *Bardo* with the three stages of space flight: leaving the earth's atmosphere (death), moving through deep space (karmic illusions), and re-entry into the earth's atmosphere (rebirth).

The film, says Belson, "Shows a little more than human beings are supposed to see." It begins with a rumbling thunderous drone, possibly a suggestion of rocket lift-off. In a black void, we see centripetal, or imploding, blue-pink gaseous forms, barely visible as they rush inward and vanish. The sound fades, as though we have left acoustical space. After a moment of silence, the next sound is wholly unearthly: a twittering electrical pitch as vague clouds of red and yellow gases shift amorphously across the frame. Suddenly, with a spiraling high-pitched whine, we see a gigantic solar prominence (one of two stock-footage live-action sequences) lashing out into space, changing from blue to purple to white to red. Now blinding white flashes, as though we're passing the sun, and, suddenly, we're into a shower of descending white sparks that become squadrons of geometrical modules moving up and out from the bottom of the frame, warping and shifting to each side of center as they near the top. . . .

The "boiling out" sequence is among the most dramatic in all of Belson's films. Suddenly, we hear a thunderous rumble, which increases in intensity until the bottom of the frame begins to turn pale manganese blue and cobalt violet, a gaseous boiling cloud that surges up over the frame turning alizarin crimson. We descend through it, as though it is being blasted upward by some explosive force far below. Image and sound increase to unimaginable intensity as though we're hurling through sheets of space fire in a cosmic heat belt. The spacecraft is out of our solar system and into another dimension. Death has occured; we move into the second stage of the *Bardo*.

At a corresponding point in the *Bardo of Karmic Illusions*, the Sanskrit text reads: "*The wisdom of the* Dharma-Dhatu, *blue in color, shining, transparent, glorious, dazzling, from the heart of* Vairochana *as the Father-Mother, will shoot forth and strike thee with a light so radiant that thou wilt scarcely be able to look at it.*"

This of course could be interpreted as a supernova whose maximum intrinsic luminosity reaches one-hundred million times that of our sun. The image in Belson's film is somewhat like slow-motion movies of atom blasts in Nevada with the desert floor swept across by a tremendous shock wave. At another point, it appears as a sky of mackerel clouds

suddenly set aflame and blown asunder by some interstellar force. Shimmering iceberg shapes of every hue in the spectrum dance like galactic stalactites against a sizzling, frying sound. This becomes a dizzying geometrical corridor of eerie lights almost exactly like the slit-scan *Stargate Corridor* of Kubrick's space odyssey—except that *Re-Entry* was made four years earlier.

Carl Jung describes the final stage of the *Bardo*: "The illuminative lights grow ever fainter and more multifarious, the visions more and more terrifying. This descent illustrates the estrangement of consciousness from the liberating truth as it approaches nearer and nearer to physical rebirth."

The images assume majestic dimensions. Seemingly millions of minute particles suggesting *mesons*—cosmic rays that survive in the atmosphere for only a millionth of a second—cascade in sizzling firestorms down from the top and up from the bottom in shards of viridian, ultramarine red, Thalo blue. There's a sense of unthinkable enormity. Finally, we see a white sun surrounded by a pulsating red halo, which is then obscured by vapors. "The film does manage to transport whoever is looking at it," says Belson, "out of the boundaries of the self. At that very moment is when the foundation slips out from under us and very rudely we're brought back to earth. It's all very much like the process of spacecraft re-entry. You're out there, free, totally free from the limitations of earthly distance, and, suddenly, you have to come back, and it's a very painful thing."

Momentum was completed in May of 1969, after eighteen months of painstaking study and labor. In one sense, it's a refinement of the whole vocabulary he's developed through the years, distilled to its essence. But there are new effects inspired by this particular subject. *Momentum* is a calm, objective experience of concrete imagery that manages to suggest abstract concepts without becoming particularly symbolic.

It begins with stock footage of a Saturn rocket whose afterburners blaze in rainbow fury. We hear echoing ethereal music and slow cyclic drones. Next, a solar image in mauves and irridescent ruby, huge prominences flaring in slow motion. A series of graceful lap-dissolves brings us closer to the sphere as it revolves with a steady and ponderous dignity. In spite of its furious subject, *Momentum* is Belson's most serene and gentle film since *Allures*. This treatment of the sun as an almost dreamlike hallucinatory experience is both surprising and curiously realistic—to the extent that one can even speak of "realism" in connection with solar images.

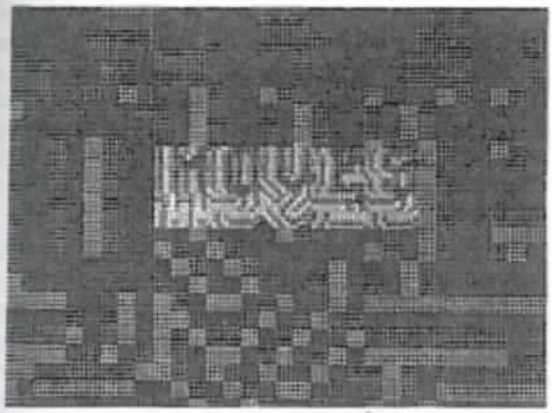
There's a visceral, physical quality to the images as we draw near to the surface and, with a soul-shaking roar, descend slowly into blackness: apparently the suggestion of a sun spot. Flaming napalmlike clouds of gas surge ominously into the void, which suddenly is shattered with an opalescent burst of light. We move through various levels of temperature and matter. Belson's now-familiar techniques seem to possess a pristine clarity and precision not previously so distinct. Sweeping cascades of flames seem especially delicate; fantastic towering shards of luminescent color reach deeper levels of the mind; the translucent realms of kinaesthesia leave one speechless.

Moving deeper into the mass, images become more uniform with a textural quality like a shifting sea of silver silt. Millions of tiny flashes erupt over a field of deep blue vapors. Quick subtle movements and sudden ruptures in the fabric of color seem suppressed by some tremendous force. Indefinte shapes and countless particles swim in a frantic sea of brilliance.

"Then the film goes into fusion," Belson explains. "A state of atomic interaction more intense than fission. This is supposed to take place on the sun, fusion." A blinding red fireball breaks into a multipointed star of imploding/exploding light energy, flashing brighter and brighter, mounting in intensity. An image similar to James Whitney's *Lapis*—a collecting of millions of tiny particles around a central fiery core—builds up to the moment of crescendo, with all the colors of the universe melting into one supremely beautiful explosion, and suddenly we're deep in interstellar space, watching a distant flash as a new sun is born.

The films of Harry Smith are also visually stunning, though quite different from those of Belson. Most of Smith's works involve collage or painting directly on film and some are the finest ever done in this technique. His *Number 10* is an "exposition of Buddhism and the Kabala in the form of a collage" and depicts incredibly complex mandala evolutions, similar to the eyes-closed imagery produced by psychedelic drugs. *Number 12* (*Heaven and Earth Magic*) is a complex collage film that was originally six hours long. *Number 13*, which Smith says was inspired by LSD, was to have been an animated version of *The Wizard of Oz*, but the death of his backer caused its abandonment and only a fragment remains. Smith is also known for his Folkways recording of the Kiowa peyote ceremony.

Many other underground film artists continued the psychedelic animation that was to culminate in *Yellow Submarine*. In *Hamfat Asar* (1965), one of Larry Jordan's most elaborate animations, an



Stan Van Der Beek's and Kenneth Knowlton's variations on the word *movies* produced by a Fortran-primed digital computer interfaced with a microfilm plotter.

antique seascape serves as the background for a seemingly endless variety of objects (including mushrooms) and creatures that appear, transmogrify, disappear, and reappear. Peter Spoecker's *Pulse* (1969) is described by him as follows: "This film is entirely animated and consists of over 6,000 meticulously executed, often detailed drawings. Two artists spent over a year of full-time-plus work to complete the task. Some of the work was done under the influence of LSD. The film contains abstract as well as representational elements. The sound track is a synthesis of sounds from an extreme variety of sources."

Potpourri (1968) is another of Spoecker's animations and is said by him to be "a tour de force of animation and time drawing involving the work of seven artists. A major portion of the drawing was done under the influence of LSD and a variety of other hallucinogens. The drawing is almost wholly nonrepresentational. The sound track is a chaotic, mind-bending sound flow which matches the character of the visual quite well. The work of seven 'psychedelic' artists is blended into a constantly changing pattern where the identity of each artist is lost in the totality. None of the artists are sure at times who did what, but the finished film has an organization which transcends the plan of any one individual."

John Hawkins describes his unusual acid-inspired animated film *LSD Wall* (1965) as "an attempt to reproduce some visual hallucinations while on a trip (a number of years ago) done in the major portion with clay animation. On the average, it took one hour to shoot one half-second's viewing time. I felt that clay was the best medium to demonstrate what one might see under the drug experience."

Patricia Marx's four-minute animated *Things to Come* (1953), with cinematography by Jordan Belson, contains graphics created while she was under the influence of hallucinogenic drugs, and is the first so-called trip film, or psychedelic light show. Bob Greenberg says his *Poeme* (1968?) was "designed as a silent visual experience based upon musical relationships . . . the film has been happily received as a home movie of *My Trip*. Guaranteed to work with or without acid."

Another film owing much to psychedelic visions, Paul Sharits's *Ray Gun Virus* (1966), uses stroboscopic alternation of solid color frames, to induce what he terms "the sense of striving, leading to mental suicide and death, and then rhythms of rebirth." Other interesting comments on this film were made by Stan Brakhage: "I really do think you have a very fine film there of magnificent subtlety in its by-play with the texture of film and eye's grain. . ."; Ed Emshwiller: "The retinal retention of afterimages is remarkable!"; and the New York Museum of Modern Art: "With films like *Ray Gun Virus*, LSD may become obsolete." *Nothing* (1968), another of Sharits's flicker films, employs the imagery of the five Dhyani Buddhas in a Tibetan mandala, among other things, and was characterized by its maker as "a journey toward the center of pure consciousness (dharma dhatu wisdom)—space motion generated rather than illustrated—time color energy create visual shape—in negative time growth is inverse decay." Similarly, George Landow's *Bardo Follies* (1967) is centered on images from the *Tibetan Book of the Dead*, and employs repetitious film loops to create a rhythm in the images that gradually change from human to amorphous.

John Avildson, later to gain fame for *Joe* and other films, made the five-minute trip film *Light, Sound, Diffused* (1966), and John Casanaugh produced *Acid Man* in the same year. Bob Beck did the visuals for an eleven-minute color film *The Psychedelics* (1968?) and Ira Cohen produced his LSD trip film *The Invasion of the Thunderbolt Pagoda* about this time. Another film of this period, *Orgia* (1968?), was described by its maker, Willard Maas, as "a fragment of an abandoned long work on Saint Theresa of Ávila. A sexual orgy symbolizing the decadence of modern society. . . The opening scene shows the director handing out masks to the actors—the same ones used in *LSD Wall* by John Hawkins. The taking of LSD was part of the original script."

Michael Weise's *Tree* (1968?) was advertised as "for psychedelic interpretation," and a similar interpretation was clearly called for in *Approach: Innocence* (1969?), which starred Michael Sar-

razin. The intimate association of psychedelics with the production of *Theoria* (1970) was described by its maker Marc Adrian in the film co-op catalog. (If his trip lasted only thirty-four minutes, he probably injected DMT—dimethyl tryptamine.)

> A study about drug experiments. While I was giving myself a shot of a widely used drug compound I was filmed. At the same time I made a written report about associations and colour-visions that were produced by drugs. Later on this report served as the script of the film. The upshooting remembrances and visions were reconstructed and made visible by filmed documents of my life. Through a complicated system of copying it was also possible to imitate the colour visions.
>
> During the whole time of the experiment a record player was playing a theme of an old opera. The whole context of the produced sensation has the outer appearance of a strange, somewhat wicked catholic mass. Most of the produced associations were naturally dealing with my ideas about art, society, or are simply mixed-up remembrances. The auditory imaginations were imitated as well as possible. The length of the film corresponds to the length of the experiment, which lasted for about 34 minutes.

Michael Zuckerman's *Soul Trip Number Nine* (1969?) was likewise clearly related by its author to consciousness-expanding experiences. "STNN is the story of burned-out love. In images of startling originality it takes the viewer to the shadow world of dreams and yearnings that hovers in the psychedelic twilight of the turned-on mind. Slowly as the lovers sink deeper into a drugged state their unconscious desires rise to the surface. In brilliant colors the images tumble across the screen to reveal the feelings evoked by this, their last trip together. . . ."

Robert Branaman's *Night Light and Day Hi's* (1965) shows the moving landscape in Big Sur painted over with psychedelic patterns, and Homer Groening's *Psychedelic Wet* (1967) uses lots of tricky camera work and color filters to simulate the effects of being turned on without drugs and was consequently touted in drug-abuse film lists. David McLaughlin's *Stoned Adventure* (1967?) was exactly that. As he relates it: "The film is a record of a trip in a car. That's me driving and filming at the same time." John Gruenberger's *Belladonna* (1968?) was described by Geoffrey Mallen: "The strange quality about the film may be due to its faithful recreation of the shapes of dreams . . . . This is a subtly mesmeric, narcotic experience. It is as if the layers of flesh were to peel away to reveal the mind at work, except that here, we become the mind, and layers of perceptual reality dissolve before our eyes, all according to the plan of a writhing subconsciousness . . . memorable for its aura of sickness and evil. . . ."

Ben Van Meter is well known on the West Coast for light shows and trip films such as *Acid Camp* (1964?) and *Oldsmobile* (1965), the latter inspired by peyote. *Acid Mantra; or, Rebirth of a Nation* (1968) shows young people being free, whereas *Naked Zodiac* (1969) is a feature-length film on the astrological signs, one of which is represented by a nude lass who takes hallucinogens. Van Meter's most recent film *Set Your Chickens Free* (1974), is an LSD-inspired film made with Fabulous Furry Freak Brothers originator Gilbert Shelton.

Storm De Hirsch has composed a number of striking films including *The Color of Ritual, the Color of Thought* (1967?) and a trilogy composed of *Divinations* (1964) made without a camera by drawing on the film, *Peyote Queen* (1965), and *Shaman* (1967). *Peyote Queen* is an eight-minute ritual incantation with drum-punctuated visual imagery of which she says: "My third eye takes me on a frame to frame binge of color, calligraphy, laminations, etchings and incisions on film." D. Noguez, writing in *La Nouvelle Revue Française* commented: "A very beautiful work! The abstractions drawn directly on film are like the paintings of Miró moving at full speed to the rhythm of an African beat."

Ken Kesey, author of *One Flew Over the Cuckoo's Nest* has produced, with friends Ken Babbs and others, a marathon trip film or film of a trip *Intrepid Traveller and His Merry Band of Pranksters Search for a Cool Place* (1964–74). Bruce Connor's *Looking for Mushrooms* was also produced over a long period (1961–67). It seems to have peyote and/or magic mushrooms as a central motivating force, and Connor remarks of it: ". . . famous documentary containing full information, coffee can, light, maps, passwords, invisible fingers, flaming apple jellies, shiny elbows, upsides, etc. Special effects by Isauro Nava, Rancho Del Cura, Huatla De Jiminez, Mexico."

Various other underground figures have recorded drug use as part of the youthful odyssey. Jacob Burckhardt and George Fishman digressed on the theme of *Snorting Speed in the Bennet Hall John* (1969?): "A possible solution to the marginal

***Set Your Chickens Free* (1974) is a delightful LSD-inspired film by and for hippies.**

student speed problem. If there is a consistent individual preoccupation among the members of this group (marginal students), it might be designated as the discovery and adoption of illegal drugs such as marijuana, LSD, amphetamines, etc." Similarly, Rudy Burckhardt's *Inside Dope* (1971) treats drugs in documentary though lighthearted fashion. The filmmaker comments: "*Inside Dope* is a pseudoeducational, fictitious documentary survey of the ups, downs, ins and far outs of dope. . . . Including a crack drill corps of marching pills (in an animated sequence by poet Larry Fagin)."

Jon Cutaia's *Rituals* (1966) also shows youth involved with drugs—the sequence of a woman freaked out on acid who resorts to razor blades got the film banned by UCLA for three years. Jon Waters's feature-length *Multiple Maniacs* (1969?) was billed as a freakshow of dope addicts, homosexuals, and a giant hallucinatory lobster. This brings to mind Rob Nelson's *Bag* (1971?), which he explains is ". . . the edited record of three months roaming in the Roxbury ghetto of Boston in search of a film. The sound track features an interview with a black drug addict encountered on a street corner who, in his own words, has just had a good bag. Feeling good and talking because of it, he describes fifteen years of taking drugs, larceny, jail sentences, hospitals, etc."

Related films are Eduardo Guerrero's *Arms and Needles* (1971?) and Warren Sonbert's *Amphetamine* (1966). *Amphetamine* shows boys shooting up at a party, having blurred vision, and engaging in sex. William Burroughs's *Towers Open*

Fire (1963), produced and directed by Anthony Balch, conveys some of the chaos of the world with its scrambled sights and sounds of drugs, masturbation, homosexuality, violence, guns shooting, people disappearing, and so on. Burroughs maintains that the aboveground cinema has barely begun to exploit the possibilities inherent in our actual daily experience of the world. We experience things speeded up, slowed down, repeating themselves with frequent memory lapses, flashbacks, and prominence of odd things or feelings. Burroughs simply demonstrates how unimaginative most editing is by presenting some randomly spliced film and/or tape, which invariably arranges itself into some order. Each random arrangement forces us to regard its segments in very different ways and creates dramatically different responses. Nevertheless, perhaps Burroughs's most bizarre connection with films is his narration of the 1921 Danish witchcraft film *Haxan*.

In his brief career, Ron Rice was able to produce some remarkable footage. *Senseless* (1962) is loosely structured around his trip to Mexico, with frequent pot smoking, whereas *The Queen of Sheba Meets the Atom Man* (1963) and *Chumlum* (1964) are easier to follow with the eye than with the brain. The latter can be regarded as an erotic reverie in which time is distorted or folded over and one sequence shows filmmaker Jack Smith (*Flaming Creatures*) smoking hashish in Arabian costume.

Bhob Stewart makes some interesting remarks relative to his film *The Year the Universe Lost the Pennant* (1961): "When I was working on [the film] in 1961, I was just about to lose faith in my theory of random, sometimes free, associative images and junk the whole project. Then I took mescaline and knew instantly that I was right. The months of self-doubt and idle play came to an end and I completed the film in the following two weeks."

Dave's Fantastic Fifties Rock Group (1968) is another personal filmmaker's view of life. Wheeler Dixon remarks of his film: "Now Dave has a speed freak in the front room and deals in hot cigarettes and smoke for a living. . . . In four sequences: getting up, making a pickup, smoking up and the morning's tea." Dixon also discovered a two-and-one-half-minute piece of film shot in 1932, showing Cab Calloway and his Harlemaniacs performing, which Dixon circulated as *Reefer Man*. John McLean's *End of the War in Vietnam* (1969?) provides a journey through the mind of a turned-on GI on a beach in South Vietnam—"a time loop at the end of an unseen war." Another personal view of the world is Jim Hoberman's *Customs and Immigration* (1971), "an over-the-shoulder and look-back-in-confusion view of sex, drugs and cinema."

Underground films with the accent on marijuana include Glen Reisman's *How I Dumped My Dope and Started Picking for Gold* (1971?), Len Glaser's *The Joint* (1969?), Severo Perez's *Mozo, an Introduction into the Duality of Orbital Indecision* (1969?), which Perez describes as "a satire on 'stone' films—it follows a man through an afternoon high," and Bill Haugse's *Sgts. Banned* (1968?). Haugse characterizes the latter film as "funking around in Venice, Calif.—Sunday afternoon and the kits—stereopticon dream; old ladies playing cards"; with the "Had a smoke and I stepped into a dream" Beatles sound track. Michael Lions's *Hipmatized* (1970) tells how a "young businessman begins home from the office. On his way, hip people invade his world. While dancing Berkeley street people seep into his mind, hip people in Seattle give him a ride, offer him a joint, sing to him, and forcefully persuade him. He submits."

Underground creators have also turned out some stoned animation. Tom Paxton's dope song "Hanoi Gold" has been animated by Jon Wakuluk (1969?) and John Kimball's *Canabus* (1968) is a three-minute film of animated joints. J. Gray and J. Cherry animated the Jefferson Airplane song "White Rabbit" (1969).

James Servais has produced *Mme. Curie* (1967?)—"early work, the vampire myth—mescaline cure," and *Coke* (1968?)—"a cocaine commercial—very hard, very yellow, very obscene—a good rush." Another film combining vampires and a drug perspective is Stig Wegge's *A Taste of Sister Morphine* (1968?). Composed of eight short segments and available only in 8mm, it was produced for the Church of the Vampire for use in the rituals of the cult. A cut version has been made available for public release. "Each film is a reverie, a vampire vision, that sucks life and color from the earth to the heartbeat rhythm of pale animal children, the fantasies of dark and icy women." Also in a class by itself is Lenny Lipton's super-8 documentary on a drug-using guru with nine wives, *Foundation of the Revelation* (1975).

Some underground films of nebulous origin are *Imagination* (dealing with LSD), *Airplane Glue, I Love You, 1x1 = infinity* (LSD), *Tom's Film* ("The fine art of toke and split"), *Euphoria* ("Remember what it was like thirty-five minutes after you smoked your first joint?"), *Permutations*

(1967) and *Amanita Pestilans* (1963). The latter concerns an enormous smelly mushroom that appears on a man's lawn, making him the object of ridicule.

This should suffice to give some idea of the range of variation in the underground psychedelic cinema. The influence of these films on underground or aboveground films is difficult to gauge, but programs of experimental films have been frequent events on the West Coast, and in New York, at colleges in the United States, and at universities and film festivals in Europe throughout the 1960s and 1970s. Few of the filmmakers have actually gone on to work with major production companies, and their main influence has been through some of the younger members of the film establishment who have viewed these works. Underground films have much of value, but the conservative and monopolistic nature of the film industry make innovation and creativity difficult.

14 Ups and Downs and Sideways

Valley of the Dolls

Barbiturates were introduced into the practice of medicine in 1903 and it was not long before sleeping powders made their appearance in films. Barbiturate addicts and sedative overdoses steadily increased in number and frequency, but it was not until after World War II that they became almost universally available.

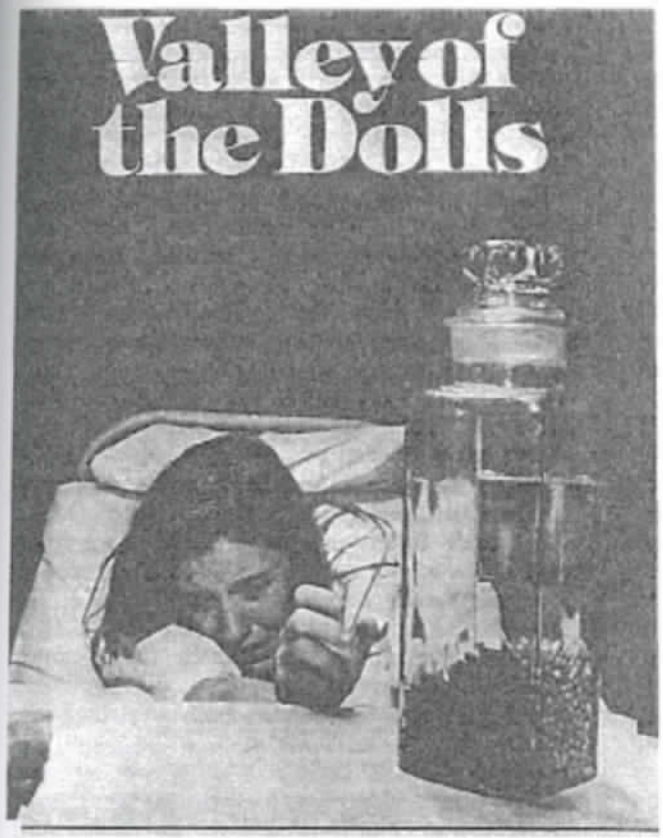
By far the commonest use of barbiturates in films was as a means of suicide or murder. A man murders his mistress with an overdose of sleeping pills in the German film *Die Nacht der Zwölf* (1945). Few references occurred in the next decade and it was only in the 1960s that barbiturates came into their own as destructive tools.

A modernized version of the Greek classic *Phaedra* (1962) has Melina Mercouri committing suicide with barbiturates, and Rex Harrison murders Susan Hayward with "reds" in the U.S.-British-Italian *The Honey Pot* (1967). Aspiring actress Kim Stanley winds up with reds and whiskey rather than fame and fortune in *The Goddess* (1958). *The Slender Thread* (1965) is the telephone line over which Sidney Poitier attempts to locate an overdosed Anne Bancroft. Warhol's *Lupe* (1966) starring Edie Sedgwick, faithfully describes Lupe Velez's fatal overdose of sleeping pills. John Cassavetes's *Faces* (1968), one of the few independent films to win critical and commercial acclaim, has one of the troubled wives attempting suicide with sleeping pills.

There was a virtual epidemic of ups and downs in postwar Japan, and many films reflect this. *Bushido—Samurai Saga* (1963) has a modern episode in a long family history in which a woman commits suicide with barbiturates, and *Manji* (1964) has a similar theme. *Waterfront Blues* (1970), *Law of the Outlaw* (1971), and *Resurrection of the Beast* (1969) likewise depict sleeping pills as the modern alternative to cliff leaping for distraught women. Interestingly, men are seldom shown using downers for an easy demise in films, though they often do so in reality.

"Dolls" is a slang term for barbiturates in some circles, and *Valley of the Dolls* (1967), for all its dreadful acting and painful clichés, offers an uncompromising study of career-oriented women who alternate ups and downs to enable their bodies to cope with their ambitions. Barbara Parkins, Patty Duke, and Sharon Tate are some of the reds and bennies crowd and the last commits suicide with barbiturates.

Suburban Roulette (1968) promised sex and swapping but delivered only dull dialogue and a barbiturate overdose. Someone forgot to tell them that sex would be more fun if they took off their swimming suits! Sophia Loren is a rock-and-roll singer who becomes enamored of priest Marcello Mastroianni and, driven to distraction by the impossibility of the liaison, she attempts to terminate her misery with the old reliable downers in *The*



Patty Duke reaches for some reds in *Valley of the Dolls* (1967). The credits were the most interesting part.

Hilary (Susannah York), returning to Ferguson Farm, searches for her brother Pink's (Peter O'Toole) stash of pills in *Brotherly Love* (1970).

Priest's Wife (Italian-French, 1970). Anne Baxter has her second near-fatal cinematic bout with pills in *The Late Liz* (1972). The film was based on the autobiography of heiress Gert Behanna, whose religion forbade the use of alcohol.

Ann-Margret gobbles reds in *Carnal Knowledge* (1971), and Maude (Ruth Gordon) shuffles off this mortal coil and her youthful admirer in *Harold and Maude* (1971) with the help of pills. Joanne Woodward has a flash of her pill-popping mother gobbling handfuls of reds in *Rachel, Rachel* (1968). Barbiturates and tranquilizers are not used for murder or suicide but to keep a mental patient imprisoned in a hospital in the French-Italian *To Die of Love* (1970). Turnabout is fair play and it is a mental patient who gives barbiturates to school-children in *The Silent Playground* (1963).

Barbiturates mix with drugs, sex, and violence in the cycle saga *Black Angels* (1970). Rival gangs indulge in internecine rumbles after the blacks get the whites loaded on reds. *Tribes* (1970) shows a Marine Corps recruit using downers to cope with the rigors of basic training. Army psychiatrist Gregory Peck gives "flak juice" (sodium pentothal—the so called truth serum) to his patients for therapeutic purposes, with modest results—one leaps off a tower—in *Captain Newman, M.D.* (1964). Another doctor administered barbiturates (veronal) with untoward results in *House of Wax* (1953).

A few films even use barbiturates for comic relief. New Yorkers drop a few in the inferior Doris Day comedy *Where Were You When the Lights Went Out?* (1968), and disappointed groupies submerge their sorrows with them in Frank Zappa's wonderful madness *200 Motels* (1971). We end this rather depressing area of the filmic pharmacopoeia with a bright scene from an otherwise dismal Bob Hope comedy—*Global Affair* (1964). Hope has some business with a cop whom he tells to hurry because he's taken some sleeping pills. In response to the cop's query, Hope says he's taken nembutals whereupon the cop opines, "I like seconals better—pop a couple in the morning and stay groggy all day."

Cocaine

By the time the talkies arrived the heyday of cocaine was over. A scare campaign followed by repressive legislation had greatly diminished both the use and availability of cocaine. The situation prior to World War II was very different from the present in that most of the cocaine appearing on the black market was diverted from legally manufactured cocaine, either directly from France and Germany, or indirectly via Asia or Latin America. As with opium and marijuana, cocaine use was driven underground and humorous or casual references to it virtually disappeared, except for a few songs in musicals of the early 1930s. Cab Calloway did one of his famous drug songs in *The Big Broadcast* (1932) and Cole Porter's musical *Anything Goes* (1936) contains a version of his song "I Get a Kick Out of You" with the original lyrics "I get no kick from cocaine/I'm sure that if/I took even one sniff/It would bore me terrifically too."

John Barrymore, riding the crest of the wave created by his performance in *Svengali*, portrayed a mad ballet master who keeps a stash of white powder that is consumed by an addict who then kills him in a frenzy (*The Mad Genius*), (1931). The nature of the drug is unspecified, but the behavior is consistent with the use of cocaine or the heroin-cocaine mixtures often used at the time. Boris Karloff has a regretably small role at the beginning of this film. *Little Giant* (1933) contained a passing reference to the white wonder, which was omitted from its subsequent remakes (the last with Abbott and Costello). The same year Claude Rains gave a fine performance as *The Invisible Man* who vanishes and eventually drives himself mad with an Indian drug called monocaine. A cocaine-containing species of the same genus as the coca plant occurs in India (*Erythroxylon monogynum*) and the paranoia experienced by Rains is reminiscent of cocaine effects.

With the exception of the "nose powder" incident in Chaplin's *Modern Times* (1936), already mentioned, the next American film to mention "snow" was the camp classic *Cocaine Fiends* (1939), a remake of *The Pace That Kills* (1928), which has been described in detail. There are many points of difference between this film and its original, chief of which is that the girl who becomes enmeshed in drugs and vice in the big city is the central character rather than her brother. In this version Eddie and his sister Jane are working at a roadside restaurant rather than on a farm and city slicker Nick brings his "headache powders" to them—they don't even have to go to the big city for vice. Within minutes of meeting Nick, Jane comes up with a headache and good old Nick is right there. "Say, I've got the greatest headache medicine in the world." "It's marvelous—I feel better already," and off she goes leaving behind mother, God, and greasy spoons for fast Nick and

the gang at the Dead Rat Café. From here on the plot is very similar to *The Pace That Kills*, with Eddie following Jane to the city, getting hooked by a fellow employee, and winding up an addict living with his pregnant hooker girl friend. Again brother and sister meet in an opium den, Eddie's lady drowns herself, and the coke king is snuffed (this time by his own daughter).

Like the earlier film, *Cocaine Fiends* features a preface about the dangers of drugs, off-screen coke sniffing, and "one dose and you're hooked" nonsense, but both films depict the effects of cocaine with reasonable accuracy, a remarkable achievement for a pre-1960s film.

Another cocaine film made about this time is *Cocaine—The Thrill That Kills*. Probably all that is left of it is the poster advertising it as "a timely warning to the parents of today," though it may be another title for *Cocaine Fiends*.

Europe was no stranger to cocaine in the 1920s and 1930s; in fact, it was probably more common there than it was in the United States. Half a dozen European novels of the period used cocaine smuggling as a central plot element and several films seized upon such a sensational drug for additional spice. In 1929, "Seamark" (Austin Small) published the novel *Downriver*, about a Dutch-Chinese captain who uses his boat to smuggle cocaine from China to London. In 1931, the British-French Gaumont company filmed *Down River* starring Charles Laughton as the half-breed Captain Grosman. This trip, Grosman decides to go for big stakes and brings in several hundred pounds of coke in a secret compartment of his boat, the *Yangtse*. Pretty but foolhardy Lady Hillary Kittredge decides to spy on him and ends up being kidnapped and forcibly addicted to cocaine. Captain Grosman is a mean cookie—he uses a light gun with magnesium flares to blind narcotics officers and coats his knives with bushmaster venom. He also smuggles his coke ashore in old biscuit tins that are sold to a Dutch junkman who is later revealed to be Grosman in disguise. But he is no match for Lady Kittredge who discovers his stash inside a stone Buddha, injects him with an overdose, and slips a warning note to the narcs.

Charles Laughton contemplates his cocaine-filled Buddha while henchmen dispose of a spy in the British drug-smuggling drama *Down River* (1931). This is probably one of his better roles, but the film is rarely seen.

One can only hope that more of this film survives than the still shown, since it sounds like one of Laughton's juicier roles.

One also hopes that *Der Weisse Daemon* (1932) has survived since it features Peter Lorre in a drama about a cocaine-addicted singer and the drug traffic in postwar Germany. A German film catalog describes the plot:

> A young singer addicted to narcotics! The truth about the destructive scourge of cocaine! Unscrupulous jobbers unmasked as the wire-pullers of the dangers of mania!
>
> After many long years in South America, Heini Gildemeister is looking forward to returning to Hamburg. But what has happened to his sister Gerda? How could the brilliant young singer change so completely? Why do her eyes glow so feverishly? The doctor tells him the bitter truth: cocaine! In her condition, Gerda cannot go on tour to Paris. But her manager, Dr. Urussev, cunningly thwarts all plans. Heini is involved in a wild brawl in a harbour tavern, and Gerda leaves without resistance. A hunchback gives a lead to the narcotics gang. Gerda's friend Dora, who is being infamously exploited by Urussev, stands by Heini. In an aircraft accounts are finally settled with the head of the gang. With a gargling scream, Heini's opponent plunges to his death. Gerda is admitted to a sanatorium. In relief Dora and Heini watch her condition improve visibly, as she again learns how to smile.

Pola Negri was another German star who played in a cocaine film prior to emigrating to Hollywood. She played the lead in *Tango Notturno* (1937). As the disappointed lover Mado, she attempts suicide, seeks to obliterate her sorrows with cocaine, and finally shoots herself. In real life Negri had better things to look forward to—she starred opposite Adolphe Menjou in *Hi Diddle Diddle* (1943).

The many appearances of the morphine-and-cocaine-injecting master sleuth Sherlock Holmes

in silent films have already been mentioned. During the first two decades of the sound film strong censorship resulted in the playing down or elimination of Holmes's doping in films of that era. *The Hound of the Baskervilles* (1939) showed Holmes's dalliance with the "white fairy," but the scene was cut out and only added again in the version that appeared in the 1970s. In the last sentence of the film Holmes appeals to his friend, "Oh Watson—the needle." In *Sherlock Holmes and the Secret Weapon* (1942), he suggests that his archenemy Moriarty should kill him imaginatively by slowly withdrawing all his blood with a syringe. Moriarty chuckles—"The needle to the end, eh Holmes?"

Basil Rathbone and Nigel Bruce starred in a dozen other Holmes films, but none of these contain any drug references. However, several dozen other sound films based on the Holmes stories may depict Holmes's drug peccadillos. These include such British releases as *The Speckled Band* (1931), *The Triumph of Sherlock Holmes* (1935), *Sherlock Holmes and the Silver Blaze* (1936), *The Man with the Twisted Lip* (1951), *Sherlock Holmes Fatal Hour* (1930), *Fog* (1965), *A Study in Terror* (1965), and *The Hound of the Baskervilles* (1959). Among the American sound Holmes films are *The Return of Sherlock Holmes* (1929), *The Adventure of the Missing Rembrandt* (1932), *The Sign of the Four* (1932), *Sherlock Holmes* (1932), *A Study in Scarlet* (1933), *Poison Belt* (1935), and *Murder at the Baskervilles* (1936). Germany enriched the genre with *Der Hund von Baskervilles* (1936), *Der Mann der Sherlock Holmes War*

Cocaine withdrawal hallucinations plague Sherlock Holmes (Nicol Williamson) in *The Seven Per Cent Solution* (1976).

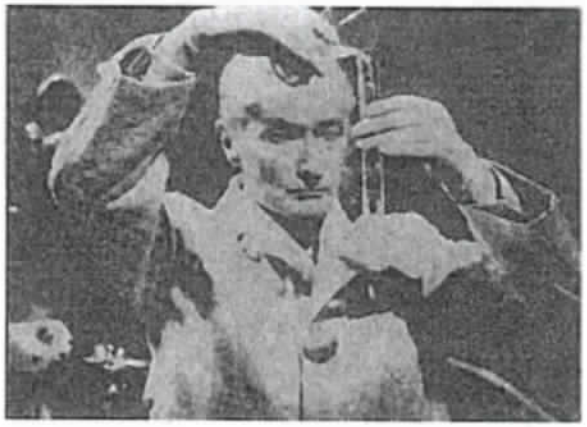
(1937), *Die Graue Dame* (1939), *Valley of Fear* (1964), and *Sherlock Holmes and the Deadly Necklace* (1964).

Robert Stephens as Holmes uses cocaine to escape boredom in Britain's *The Private Life of Sherlock Holmes* (1970). Holmes abandons the drug while he is involved with a case concerning a tiny submarine run by midgets, but he solves it in short order and returns to the needle. Holmes's most recent bout with cocaine occurs in *The Seven-Percent Solution* (1976), which explains Holmes's preoccupation with Moriarty as the result of a cocaine paranoia, so it's off to Dr. Freud for a cure. Freud withdraws Holmes from cocaine, which produces a series of bizarre hallucinations with beds full of snakes and hounds of the Baskervilles. This is a little hard to believe since hallucinations usually cease very quickly once the use of the drug is terminated, and it would be more plausible to have the visions occur during heavy use.

The reasons for regarding Dr. Jekyll's drug as cocaine, and the many silent films on this theme have been mentioned earlier. The arrival of sound added a further challenge to the Jekyll-Hyde role. *Der Andere* (1930) capitalized on the title of the 1920 version (also German-made) but the split personality in this version was not drug-induced. Fredric March won an Academy Award for his superb characterizations in Rouben Mamoulian's *Dr. Jekyll and Mr. Hyde* (1932) with Miriam Hopkins excellent as Ivy. Spencer Tracy and Ingrid Bergman did more than justice to the roles in MGM's *Dr. Jekyll and Mr. Hyde* (1941). In March's portrayal, the drug induced dramatic physical alterations and Hyde looked and acted like an animal, but Tracy's changes were vastly subtler, psychic ones. Subtlety was not achieved in *The Son of Dr. Jekyll* (1951) and only Louis Hayward's charisma saved the film from total oblivion. Boris Karloff, Lou Costello, and Reginald Denny were also transformed in *Abbott and Costello Meet Dr. Jekyll and Mr. Hyde* (1953), but this time they took their drug by hypo—perhaps for the first time in cinema. After this, Jekyll has frequently been seen to inject his medicine.

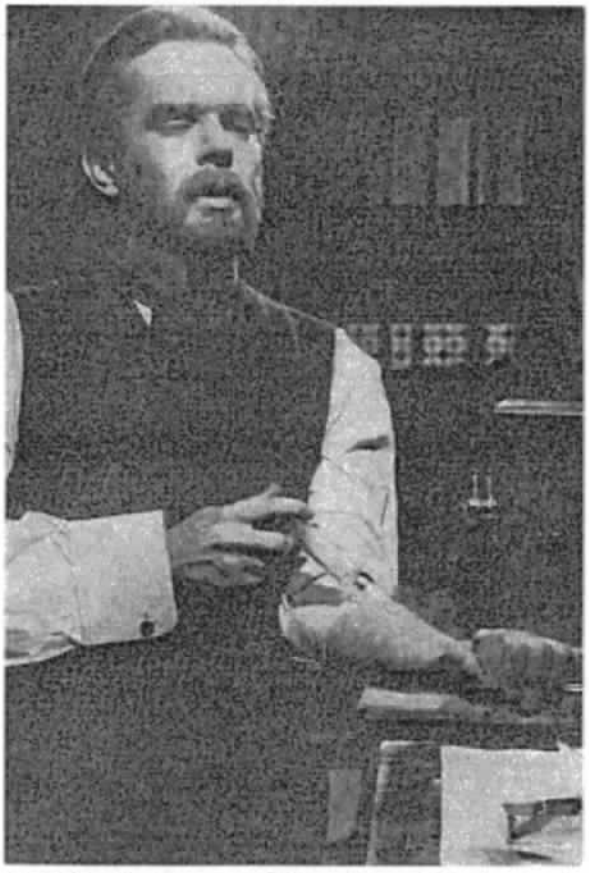
Bad genes give Gloria Talbott the creeps in the first distaff version of the talking era—*Daughter of Dr. Jekyll* (1957). In the British-U.S. *Horrors of the Black Museum* (1959), Jekyll's serum was used to transform a man into a killer, but Britain's *The Ugly Duckling* (1959) played it strictly for laughs with a moronic Jekyll and a slick jewel thief Teddy Hyde. Another British film version of the Jekyll-Hyde story that appeared the following year used Paul Massie and a feeble script, but was not without its novelties. *The Two Faces of Dr. Jekyll* (1960), shown in the United States as *House of Fright*, showed the injection transmogrifying Jekyll into a dashing, handsome Hyde complete with a fresh shave! He even tries to woo his own wife and succeeds in taking over Jekyll's body without using the drug, but Jekyll's part of the brain reasserts itself, produces the physical changes in Jekyll, who is promptly arrested for murders committed by Hyde. There is an intriguing scene in which Jekyll converses with Hyde in the mirror.

Rising horror star Christopher Lee had a role in the preceding film, and in 1971 he played the lead in *I, Monster*. Lee had previously had a similar part in which personality changes occurred in strange dreams (*Alias John Preston*, 1955) so he



Jean-Louis Barrault as Jekyll and Hyde in Renoir's *Le Testament du Dr. Cordelier* (1959). The modern Hyde takes a taxi.

Following modern trends, Christopher Lee changes into Hyde with an injection in *I Monster* (1971), but he is pointing the needle in the wrong direction.



Paul Massie changes to Hyde with an injection in the British *The Two Faces of Dr. Jekyll* (1960). The film has some interesting innovations, one of which is his strange manner of injecting.

proceeds cautiously. First he injects a cat, which becomes so fierce he has to kill it, and then a woman whose response is to reveal her erotic dreams. However, self-injections produce an ugly, slovenly, roué who, in true modern tradition, reverts to his former self with a different injection. The next year Britain produced a "liberated" rendition of the classic with *Dr. Jekyll and Sister Hyde* (1972), sometimes referred to as *Dr. Jekyll and Miss Hyde* or *Dr. Jekyll and Mrs. Hyde*, wherein *he* becomes *she*.

In the meanwhile, America had produced another of Jerry Lewis's dismal noncomedies, *The Nutty Professor* (1963), in which Lewis turns from goof to campus hero with a potion, but he is still a goof. Jack Palance turned in another polished performance as the good doctor in the U.S.-Canadian *The Strange Case of Dr. Jekyll and Mr. Hyde* (1967), in which Dr. Jekyll takes his medicine to separate the good and evil in him. However, only the evil Mr. Blood comes out in *The Man with 2 Heads* (1971, U.S.-British).

American television has actually produced some tolerable Jekyll and Hyde features. The old Bob Cummings television series had a "Dr. Jekyll and Mr. Cummings" episode in 1955. Cummings seems to have been training for his role—he was widely reputed to be a speed freak. Michael Rennie did a creditable job in the part in a mid-1960s television serial and Adam "Batman" West assayed a new potion in an episode of Rod Serling's "Night Gallery" in the 1970s. Kirk Douglas was Jekyll-Hyde in a bright and bouncy television musical adaptation in 1973.

Predictably, the pornographic filmmakers plucked such a ripe plum for their purposes, and in quick succession came (pardon the expression) *Dr. Sexual and Mr. Hyde* (1971), *The Adult Version of Jekyll and Hyde* (1972), and *Naughty Dr. Jekyll* (1973?).

Nor were non-English filmmakers lax in exploiting this theme. Italy leads the field with *Il Dottor Jekyll* (1951), *Dottor Jekyll* (1964), *Mio Amico Jekyll* (1960), *Dr. Jekyll* (1964), and *Twelve Plus One* (1970), a French collaborative effort with Orson Welles as proprietor of a theater with a Jekyll and Hyde play. *Mio Amico Jekyll* was a cheat—the good doctor transferred personalities from one person to another by a machine. Argentina produced a free adaptation with *El Hombre y la Bestia* (1951) as did Mexico in *El Precio del Demonio* (1958) and *Pacto Diabolico* (1968). The latter stars John Carradine and is peculiar in that the changes happen after drinking extracts from women. The theme was used

Women's (or men's) liberation comes to Dr. Jekyll, whose medicine transforms him into a woman in *Dr. Jekyll and Sister Hyde* (1972).

Four interpretations of Mr. Hyde: *above left*, John Barrymore; *above right*, Fredric March; *below left*, Jack Palance; and *below right*, Kirk Douglas. Some recent versions have made Hyde more debonair and the drug effects less magical.

in two films from India's rising film industry—*Shada Kalo* (1953) and *Black Cat* (1959). Internationally acclaimed director Jean Renoir and actor Jean-Louis Barrault gave class to a French version *Le Testament du Dr. Cordelier* (1959), shown in the United States as *Experiment in Evil*. Jesus Franco directed a free adaptation for German backers *Die Geliebtes von Dr. Jekyll* (1965), shown elsewhere as *Dr. Jekyll's Women*.

Cartoon versions have appeared from time to time, the first being the Tom and Jerry episode *Dr. Jekyll and Mr. Mouse* (1947). *Dr. Jerkyl's Hide* (1955) was a Looney Tune with Sylvester the Cat, and further feline antics were presented in *Mighty Mouse Meets Jekyll and Hyde Cat* (1951). Jekyll and Hyde were among the guests at *Mad Monster Party* (1967), a puppet animation. Shorts with the good doctor as their subject have included the Canadian *Gentleman Jekyll and Driver Hyde* (1950), the British *Teenage Jekyll and Hyde* (1963), and the American *The Jekyll and Hyde Portfolio* (1971).

Stock footage from the 1915 version was included in *Dr. Jekyll's Hide* (1932), in the Snappy series, and likewise for the 1920 Barrymore film in *Why Russians Are Revolting* (1970).

A vaudeville routine is based on Jekyll and Hyde in *Sing, Baby, Sing* (1936), and Dick Van Dyke plays it for laughs in a silent movie scene from *The Comic* (1969). The lighter side of personality transformation highlights episodes in *Two Weeks to Live* (1942) and *Paris When It Sizzles* (1964), in which Mel Ferrer has a brief fling as Hyde.

Although the drug aspects of Jekyll and Hyde are of major importance in that virtually everyone in the Western world became exposed to the idea that mind-altering drugs have evil consequences even if they are fun for awhile, there are many other ways of responding to, or analyzing, this story. It is a story of conflict between the conscious and the subconscious, between the superego and the id, between free and restricted sexuality, between good and evil. Or, it can be regarded as a psychological study of schizophrenia. In each case, however, the ability of drugs to expose the conflict and to influence its outcome can be emphasized, and even the recent films on this theme have not begun to explore this ability with the depth that our expanded consciousness allows (though a few other films have made attempts).

Perhaps the first postwar picture to defy the Motion Picture Production Code's ban on drug themes was *Fall Guy* (1947). Produced by Walter Mirisch for Monogram, this film was based on the short story "Cocaine" by Cornell Woolrich. The Italian *Brief Rapture* (1952) provided a Continental view of coke fiends, but was quite anomalous since Italian snowbirds had their innings in the 1910s and 1920s. The film may be based on Pitigrilli's classic novel *Cocaina*, published in Milan in 1921. The Italian classic *Bitter Rice* (1950) also involves cocaine.

Almost a decade passed before the appearance of the next cocaine flick—*Paris Blues* (1961), in which Paul Newman tries to cure flamenco guitarist Serge Reggiani of his cocaine addiction, which has supposedly reduced him to a miserable wreck. Again, the use of cocaine in this film is somewhat anomalous since "coco" had its heyday in Montmartre some forty years earlier, and though coke is undoubtedly still used there, paranoia and mania are more credible sequelae of overindulgence. The coke scenes were incidental to the story of Americans in the Paris jazz scene. but critics seized upon them gleefully: ". . . attempts to excuse dope addiction (the addict loves birds and is a wonderful guitar player)." "The dope addiction . . . may be an indigenous part of the Paris milieu. . . but it is irrelevant to the story and is reprehensibly included."

Two European films of 1967 referred incidentally to cocaine. Boris Karloff tells us about cocaine-addicted children in Ecuador in the Italian documentary *Mondo Balordo*, though in reality they are probably adolescent males chewing coca leaves in Peru and are neither addicted nor using cocaine (oral consumption breaks it down to methylecgonine). *Trans-Europ-Express* (1967) starred Jean-Louis Trintignant as an imagined character in a movie within a movie. Script writers imagine him traveling the T-E-E with a suitcase filled with cocaine belonging to a Paris gang. Those interested in esoteric connections may note that "Trans-Europ-Express" was the title of a 1977 album by the German rock group Kraftwerk.

By the 1970s cocaine had really come into its own. Snorting had become the superchic act in rapidly widening circles and the illicit factories in South America were zealously supplying the demand. Films quickly reflected this increasing concern with "snow" and even Westerns like *Two Mules for Sister Sara* (1970) began to include a sniff or two in the action. This film is also remarkable in that it includes a tolerable performance by Clint Eastwood. Supernarc "Popeye" Doyle, played by Gene Hackman in an Academy Award-winning performance, seems to derive his frantic energy from a few snorts at the beginning of *The French Connection* (1971).

The year 1972 was a blue-ribbon year for

Fernando Rey and partners sample smuggled cocaine in Luis Buñuel's *Discreet Charm of the Bourgeoisie* (1972). Some regard the film as a series of cocaine and marijuana fantasies.

celluloid snorts. You could *Go Ask Alice* and her friends, who separated out their lines in true modern style with a razor blade, you could wheel with the dealers in *Dealing* and *Super Fly* or you could find out the real reason for *The Discreet Charm of the Bourgeoisie*. *Dealing* had only a couple of quick sniffs which were incidental to its marijuana-smuggling plot, but in *Discreet Charm* the ambassador to France of the Latin American Republic of Miranda has his diplomatic pouch stuffed with "nose candy," and some of the scenes in this deliciously bizarre film can be viewed as paranoid cocaine fantasies. Some critics even revealed how out of touch they are by claiming it was heroin being smuggled, whereas everyone should know by now (particularly in the wake of *The French Connection*) that heroin is always smuggled *out* of France.

Super Fly, a slang term for cocaine, deserves special consideration as the first modern film to portray the life of a cocaine dealer. The film produced an unusual amount of acerbic commentary in reviews and at press conferences. Superficially, the film is just another of the sex, drugs, and violence scenes in the black ghetto, but it is unusual in its focus on the dealer's point of view and in showing him as successful at the end. Ron O'Neal plays the hero Priest (so called because he carries his coke samples in a crucifix) who tries to make a killing by dealing thirty kilos of coke so he can quit the racket. His supplier turns out to be the deputy commissioner of police, whom he outwits to get all the wine, women, and song that a few hundred thousand dollars can buy.

Made by, and to a large extent for, blacks (it had an all-black and Puerto Rican crew, black financing, and black director, Gordon Parks Jr., whose father directed *Shaft*), it is the most financially successful black film to date. It was probably the first black film to be picketed by blacks, who claimed that it glorifies drugs and the hustler's life-style. Blacks Against Narcotics and Genocide (BANG) picketed the film in several cities, prompting O'Neal and producer Sig Shore to repeatedly deny this interpretation during their promotional tour. Shore commented, "Our story is not about dope, but about a dope hustler; his life, not his product is being examined," and O'Neal added, ". . . I wouldn't have done it if I felt it condoned dope traffic. The trouble with *Super Fly* is that it's too real for a lot of people to accept." O'Neal went on: "There's no reason why Priest should be killed off at the end. Why shouldn't a pusher win? It happens in real life. . . . Never in the film do we say that coke pushing is good. All throughout the movie Priest is trying to get out of the racket. . . Movies have always emasculated black men. We don't do that in *Super Fly*."

This film was also unusual in that it became the focus of debate on the physical consequences of cocaine use and its differences from heroin. O'Neal commented: "The heroin pusher is the scourge of the black community, but we're talking about cocaine, which is basically a white drug. Very few black people could afford cocaine at $800 an ounce, even if they had a taste for it. It's mainly an expensive, downtown vice, it's for the Park Avenue crowd. And since cocaine is not physically addictive, people do not steal and rob to get it; there are no coke junkies, nobody ever overdosed on cocaine." Some doctors claimed that cocaine was damaging and at least one member of the black community lashed out at O'Neal. Black poet Gaston Neal argued: "I was on drugs for seven years and I know you can buy cocaine in bags as cheap as five dollars and ten dollars—and I know of at least twenty coke overdoses."

Critical reaction varied from the praise in the *New York Times*: ". . . a brilliantly idiomatic film—A very good action movie. . ." and ". . . the one recent black movie that has any

original distinction as a film. . .."; to villification by *Time* magazine: "sleazy . . . inept"; and the *New Yorker*: "The self-righteousness of the men getting rich on this movie is unclean." But the public, captivated by its flash, pace, and a fine Curtis Mayfield score, made *Super Fly* a runaway success. The growing mystique surrounding cocaine undoubtedly also added to the film's box-office appeal.

Cocaine has continued to make frequent, incidental appearances in a wide variety of films. Walter Pidgeon plays a coke-sniffing con man in *Harry in Your Pocket* (1973), and another Harry has a few snorts en route to illumnation in the Magic Theater in the contemporary interpretation of a Herman Hesse novel in *Steppenwolf* (1975). The Streisand-Kristofferson remake of the James Mason-Judy Garland classic *A Star Is Born* (1975) includes cocaine use among the vices. Woody Allen's recent film *Annie Hall* (1977) includes a scene that has occurred from time to time in real life. Allen tries a pinch at a party and his sneeze blows a substantial quantity of the expensive powder in every direction. Cocaine was the central theme in the independently produced Italian film *Naso Freddo* (*Cold Nose*, 1975), which has a spacey electronic sound track by Franco Falsini. *The Rubber Gun* (1977) shows the attempts of a group of drug-dealing artists to remove a suitcase full of cocaine from a train station locker under the noses of waiting cops. Diane Keaton has a couple of snorts in the poignant and tragic *Looking for Mr. Goodbar* (1977), and a variety of Long Islanders indulge in *Cocaine Cowboys* (1978). The use of coke for sexual stimulation is explored in *Sensations* (1977), and an old woman has a few snorts in *Pretty Baby* (1978). Burt Lancaster peddles coke in *Atlantic City* (1981), and Mrs. Van Der Veer snorts a bit shortly before her demise in *Wolfen* (1981).

The great popularity of cocaine will almost certainly lead to its frequent appearance in future films.

Speed Is of the Essence

Although silent films often made use of accelerating potions and pills (probably modeled on cocaine) for comic relief, amphetamines were first introduced into medicine for their stimulant effects in 1935, and the general public gained awareness of them only after the World War II. Within a decade amphetamines were used and abused all over the world and dexedrine had become part of the truck driver's standard equipment along with his six-pack and radio. Seeing its opening, Hollywood churned out *Death in Small Doses* (1957) with Chuck "Rifleman" Connors as a pill-popping truck driver. An investigation begins when some truckers pop too many dexies and sail their rigs across fields and through buildings. Although Chuck grinds his teeth for over an hour before his fatal climactic crash, most viewers will probably need more than pep pills to stay awake through this dull melodrama.

With the upsurge of Hollywood interest in drugs in the late 1960s and the 1970s, amphetamines naturally came in for their share of abuse. The film version of Jacqueline Susann's novel *Valley of the Dolls* (1967) revolved around the use of uppers and downers by ambitious and screwed-up women and, remarkably, it succeeded in being as bad as the book. Russ Meyer's soft-core sequel *Beyond the Valley of the Dolls* (1970) likewise exhibited pills along with everything and everybody else in reach.

A cycle racer strung out on speed buzzed through a few scenes of *Alice's Restaurant* (1969) and the eminently forgettable pornie *Gutter Trash* (1969) used ups to help them get down. "Pope" Ondine (Bob Olivio) injects methedrine while receiving "penitents" in Warhol's *Chelsea Girls* (1966), and another independent New York film, Palmer and Weisman's *Ciao! Manhattan* (1970) features Warhol star Edie Sedgwick as a down-and-out speed queen.

The title stud uses uppers, downers, inners, and outers while balling his aimless way through college in *The Magic Garden of Stanley Sweetheart* (1970), and a redneck is provoked to murder when a cynical hippy addict gives his daughter an overdose of methdrine in *Joe* (1970). Sally Kellerman plays charged-up speed freak Kitty Kopetzky in *Slither* (1973), a film also interesting for a pre-"Mary Hartman" appearance of Louise Lasser. Cisco's friend Jesse is strung out on speed and heroin in *Cisco Pike* (1972).

Inevitably, Hell's Angels types gulped "whites" in a few recent flicks. Both the *Black Angels* (1971) and their white counterparts do up uppers prior to slaughtering one another, and in *Vanishing Point* (1971) Barry Newman bets the owner of a Hell's Angels hangout that he can make it from Denver to San Francisco in record time with the help of his "bennies"—he loses. This brings to mind *Drive, He Said* (1971) wherein Gabriel attempts to flunk his draft physical with a pill-popping, no-sleep marathon. Speaking of marathons, speed is one of many mind alterants incidental to (or integral with) the documentary action in *Medicine Ball Caravan* (1971).

"Yeah boys, I've been drivin' eighteen hours and ain't had a single cup o' coffee," he might be saying. Chuck Connors (*left*) is an amphetamine-popping truck driver in *Death in Small Doses* (1957).

Stripping for action in *Night Call Nurses* (1972), a Roger Corman piece about an amphetamine-addicted truck driver.

Speed was the star of another 1971 film *Believe in Me*, originally entitled *Speed Is of the Essence*. Michael Sarrazin is an intern doing drug-abuse research with the help of his meth-head neighbor. He and his girl friend Jacqueline Bisset are soon eating, snorting, and shooting large amounts of the "nonaddictive" substance. Although the insane life of a house full of speed freaks has potential for a good film, this one is not it. The same crew who turned *The Strawberry Statement* into a vacuous utterance did likewise with this film. Critical comment ranged from poor to bad with most of the blame falling on the uninspired script. The many opportunities for character development and insight into the nature of the speed experience were squandered.

Similar comments apply to Roger Corman's *Night Call Nurses* (1972). This time we have Janis and Kyle—a young, amphetamine-dependent truck driver. Unlike *Death in Small Doses*, this trucker crashes in the hospital and Nurse Janis helps him through his withdrawal hallucinations.

The Erotic Circus (1969) is apparently the only

pornographic methedrine movie, and it is appropriate bizarre. A family of nuts, including a rapidly aging methedrine dealer and assorted sadists and masochists, gathers for a drugs-and-sex orgy. Next morning the house if strewn with corpses and the meth dealer is castrated as well. Dear old mother proves to be the butcher, and as the caretaker diligently removes the carnage, she devises means to castrate him, too.

Mother, Jugs and Speed (1976) features Harvey Keitel as a pill-popping ambulance driver. The film's other two stars are Bill Cosby and Raquel Welch and guess who plays Jugs. *Outland* (1981) has Sean Connery as an outer-space cop fighting pushers of an amphetamine derivative that drives users mad.

Sound films and censorship arrived almost simultaneously in Hollywood, so references to narcotics and psychedelics were few in the twenty-five years that followed the introduction of talkies. But the alteration of consciousness and the control of personality with drugs was too useful a theme to pass up and many films got around the bluenoses by omitting emotionally charged words like "addict" and "narcotic" and by showing the drug use in pills, potions, and gases rather than by sniffing or injection. Also, the drugs were usually unnamed and were used for evil purposes rather than for kicks.

Bela Lugosi repeatedly conducted his evil machinations with the aid of drugs. In *White Zombie* (1932) he turns people into zombies with a potion, but by 1945 censorship had relaxed a bit and he was able to attain this end with injections in *Zombies on Broadway*. In *The Ape Man* (1943), Lugosi injects himself with a serum to obtain simian powers, and in the same year George Zucco zapped his victims with a zombifying gas in *The Mad Ghoul*. A brain-paralyzing fluid was used to stupefy the unwary in *The Living Ghost* (1942).

The British comedy *Swinging the Lead* (1935) involved a gang of crooks who smuggle a drug that changes personality. Several cartoons of this period also had psychedelic drug themes. In *Mickey's Garden* (1935), one of Walt Disney's expensive Technicolor films, a bug spray sends Mickey on a remarkable psychedelic trip not to be excelled until the acid-inspired 1960s. Everything in the rippling landscape swells to huge size, including the familiar red and white mushrooms *Amanita muscaria*. The next year Disney produced *The Worm Turns* in which a chemist's formula gives great strength rather than hallucinations. About this time there appeared a Popeye cartoon in which he gobbles locoweed instead of spinach and has wild hallucinations as his brain machinery flies apart.

Hypnotism is a fascinating subject and whenever possible, "B"-films use it to inject some interest into otherwise vapid plots. *Shadows in the Night* (1944), one of the "Crime Doctor" series starring Warner Baxter, had the good doctor prowling around after people who were walking in their sleep as a result of a hypnotic gas. *Shock* (1945) features Vincent Price as a corrupt psychiatrist who tries to destroy the mind of a witness with drugs and hypnotism, and *The Mysterious Mr. M* (1946) found evildoers using "Hypnotrene" to induce trances.

A mind-altering oriental herb "dulls medicinal processes" and makes robots of its victims in *Federal Agents v. Underworld Inc.* (1948) whereas *Tromba the Tiger Man* gives himself a drug to aid his hypnotism of the big cats in the 1949 German film. Nina Foch is drugged and forced into a new identity in the engrossing drama *My Name Is Julia Ross* (1945), and Jean Dean is likewise subjected to mind-bending medicine in *Radar Patrol vs. Spy King* (1950).

Serums that destroy the will appear in *Killer Ape* (1953) and in the Indian *Mangu* (1955). *The Master Plan* (1954) involves a will-destroying drug used by spies, and another British film *Stop Me Before I Kill!* (1961) presents the idea that drugs can be used to convince a man that he has killed his wife. Victims were turned into mindless slaves with drugs in *Teenage Zombies* (1960) and in *Return of Dr. Mabuse* (1961), a European flick starring Gert (Goldfinger) Frobe.

Other European productions featuring enslaving drugs are *Kiss, Kiss, Kill, Kill* (1965), *Son of Samson* (1960), *The Invincible Brothers Maciste* (1964), *OSS 117—Mission for a Killer* (1965), *Chinese and Miniskirts* (1968), and *I Love You, I Kill You* (1971). The last film is interesting in that it presents a West German view of the future—the police dispense pills to dissenters to produce conformity.

The Spanish *Bombs for Peace* (1959) floats along on a gas that generates peacefulness, a theme used earlier in the British *Underneath the Arches* (1937). A euphoric gas is also thematic in *Operation X-70*, a Belgian animated short by Raoul Servais.

Robert Vaughn and Boris Karloff are injected with a mind-bending drug in *The Venetian Affair* (1966). The drug does not work on Vaughn—unfortunate, since it might have improved his act-

ing. Bette Davis is a female Fu Manchu who softens her prisoners' cerebral cortices with chemicals in the British-American *Madame Sin* (1971).

The use of the so-called truth serums by police and psychiatrists became general knowledge after World War II and this device began appearing in films. *The Snake Pit* (1948) displays narcosynthesis with mental patients, whereas in the British film *Highly Dangerous* (1950) a truth serum is used to extract secrets from a scientist. In *The Yellow Cab Man* (1950) Red Skelton is given drugs to elicit the secret of his "elastiglass" but he regresses to childhood and goes on a psychedelic voyage adorned with wavy images and walruses. A Russian doctor successfully uses sodium pentothal to extract the secret of an alien device from a soldier in the science fiction melodrama *The 27th Day* (1957). In *I Was A Teenage Werewolf* (1957) a doctor administers scopolamine to a delinquent (pre-"Bonanza" Michael Landon) in order to regress him to his primitive past with hypnosis—"The only hope for mankind is to go back and start over again." However, the lad seems to have had a werewolf in his family tree and he spends most of his remaining screen time fastened to the necks of various unfortunates. In spite of the trail of corpses, good old dad stands by him: "Tony's a good boy—I don't care what they say."

Victims compulsively spew out the truth after Christopher Lee gives them a shot in *The Brides of Fu Manchu* (1966), and Stewart Granger is drugged during a dental appointment and relieved of a safe combination in another British effort—*The Secret Partner* (1961). Even Doris Day has her moment of truth when she is drugged by Richard Harris in *Caprice* (1967).

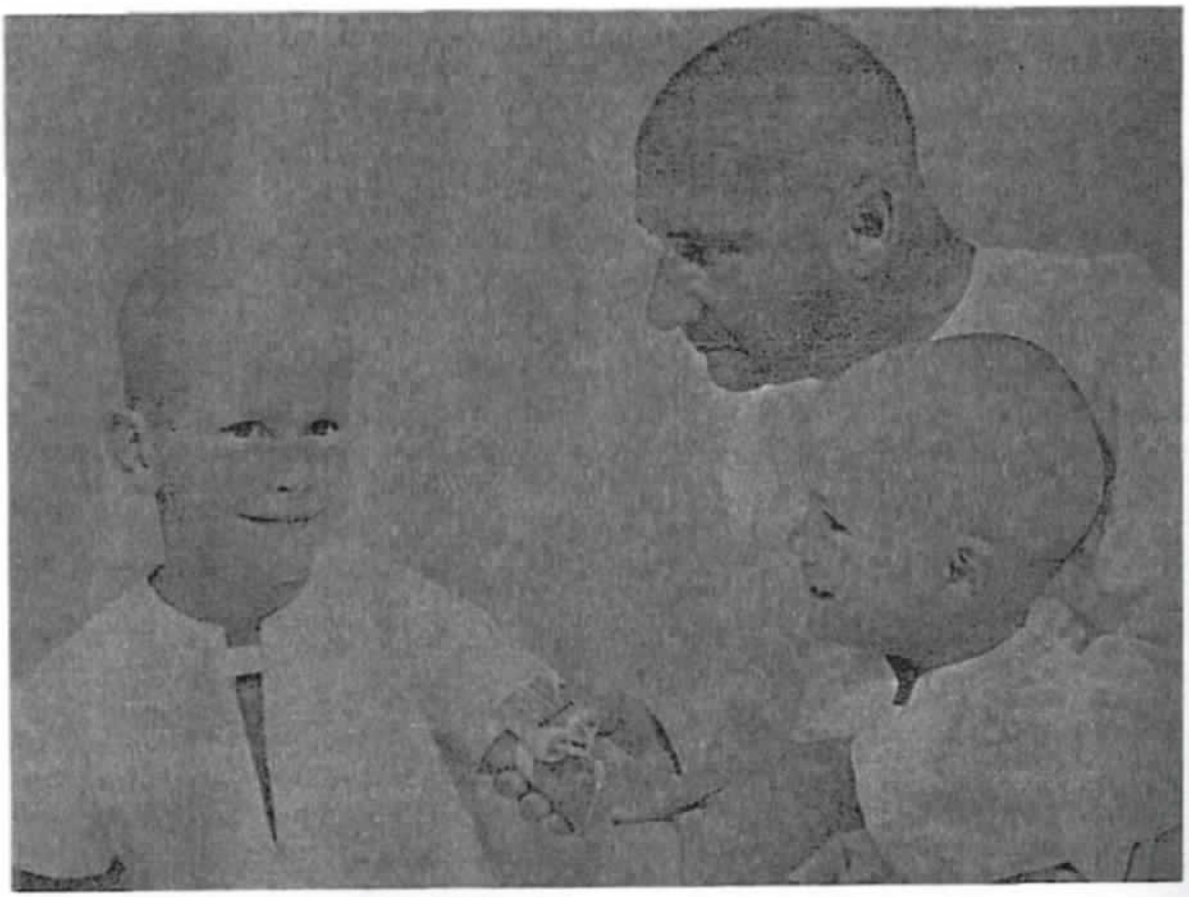
Occasionally, a bad guy loses his patience and reverts to classical means of drugging recalcitrant victims. Chloroform is employed in this fashion in such diverse offerings as *Sherlock Holmes in Washington* (1943), *Tony Rome* (1967), the Japanese *The Blind Beast* (1969), and the Italian-Spanish *Next!* (1970). It is chloral-hydrate-impregnated bread that brings the title titan tumbling down in *War of the Colossal Beast* (1958). Drugged drinks are used in Hitchcock's *Notorious* (1946) and *The Lady Vanishes* (1938).

Visions of drug-oriented future societies have been common in science fiction for decades, but only a few of the recent science fiction films have explored this area. Foremost among these is George Lucas's *THX-1138* (1971) in which the people are kept in control by making drug use mandatory. "If you feel you are not properly sedated, call 344210—Failure to do so may result in prosecution for criminal drug evasion"—they are constantly reminded by the disembodied voice of authority coming over the loudspeakers. When one of the couples stop taking their sedatives, emotions, sex, and love emerge, but the lowered drug levels are detected and the couple is convicted of drug evasion and sex perversion.

The movie version of Ray Bradbury's novel *Fahrenheit 451* (1966) also shows the citizens preoccupied with drug taking and Julie Christie overdoses on "blues" at the beginning. *Rollerball* (1975) likewise depicts the members of a totalitarian society preoccupied with drugs. The owner of a rollerball team gives his assistant a pill for pleasant dreams and everyone carried his box of little white pills. In Woody Allen's *Sleeper* (1973) people get high by holding a little silver ball, and in Kubrick's *2001: A Space Odyssey* (1968) it is the computer HAL who suggests that troubled astronaut Dave take a stress pill.

The production of a state of catalepsy or suspended animation has been another favorite use for drugs. Warner Oland used such a potion in *The Return of Dr. Fu Manchu* (1930) and a serum generated the deathless sleep in the British *The*

Oskar Werner watches Julie Christie being treated for an overdose of "blues," a common problem in Ray Bradbury's vision of the future, *Fahrenheit 451* (1966).



Continuous mandatory use of psychochemicals from birth to death is George Lucas's vision of the future in *THX-1138* (1971). A drug evader (Donald Pleasance) examines two kids receiving intravenous happiness.

Living Dead (1934). *The Crime of Dr. Crespi* (1935) was burying alive a vjctim in a drug-induced trance. *Castle in the Desert* (1941), *Secret Service in Darkest Africa* (1943), *Dick Tracy Meets Gruesome* (1947), *The Black Castle* (1952), and *The Black Sleep* (1956), this one with Bela Lugosi up to his old tricks, all eliminated bad acting with drugs. Recent films have continued the practice, as in *Cleopatra's Daughter* (1960), *Shock Treatment* (1964), *La Duquesa Diabolica* (1964, Mexican), *Sandokan the Great* (1964), *Nightmare in Wax* (1969), and *The Oblong Box* (1969), with minor variations. Psychiatrist Lauren Bacall produces catatonia with injections in *Shock Treatment* and a witch doctor provides the dope in *The Oblong Box*.

Tranquilizers, though they do not usually produce catalepsy, certainly play an important role in diminishing the pains of life. In view of their extreme popularity, tranquilizers have for some unexplained reasons appeared in only a few films. Perhaps tranquilized people do not make for very scintillating dialogue. Richard Widmark mixes tranquilizers and alcohol and wakes up the next day with his memory gone in *The Tunnel of Love* (1958), and Glenn Ford fortifies himself with tranquilizers before murdering a blackmailer in *The Gazebo* (1959). The British *Dr. Crippen* (1963) kills his wife with an overdose of tranquilizers, and Faye Dunaway plays a neurotic model who keeps it together with alcohol and tranquilizers in *Puzzle of a Downfall Child* (1970). *Doctors' Wives* (1971) use tranquilizers and other pills to ease their sorrows, and the judge pops pills to keep cool in *What's Up, Doc?* (1972).

Vincent Price is the head of a ring that uses drugs to pacify young ladies for white-slavery purposes in the European film *House of 1,000 Dolls* (1967), and women are kept drugged in a

"So this is what drugs do to you," he might be thinking. A tense moment from *Nightmare in Wax* (1969), one of many films showing suspended animation produced by drugs.

"Take two in a cup of warm blood before retiring," he should be saying! A doctor dispenses pills that convert people into vampires in *Mark of the Vampire* (1957).

bizarre brothel where old men pay only to look and touch in the Japanese production *The House of the Sleeping Virgins* (1968). An international dope ring kidnaps stewardesses and drugs them in the pornie *Fly Now, Pay Later* (1969). The ring smuggles a drug called "khelp" into New York and one of the women is driven insane by an overdose of the drug. Women are injected with drugs that produce desire and paranoia in another 1969 pornographic movie *The Ultimate Degenerate*.

Youth serums are another favorite theme of the silent era that has continued to be popular. Ollie is changed into a monkey by a scientist's youth serum in Laurel and Hardy's *Dirty Work* (1933), which is similar to Edison's *Dr. Brompton—Watts Adjuster* (1912). Two British films of 1938 explored this theme in a comic vein. Tubby Hayes plays Adipose in the tale of a youth-restoring weed that leads to a trial for treason in ancient Greece in *Crown Trial*, and a timid chemist invents a potion that gives confidence and strength, but turns him into a baby in *Oh Boy!* Cary Grant displays strange behavior after ingesting a rejuvenation formula in *Monkey Business* (1952). *Satanik* (1968), a European film, uses a youth potion, and a rejuvenation serum requiring human blood keeps assorted weirdos alive for centuries in *The Man Who Turned to Stone* (1957).

Strength potions have likewise remained a popular theme. The sad clown Harry Langdon gulps a superstrength serum in *The Shrimp* (1930) and a pill performs similar wonders in the British *Handle with Care* (*Lookout Mr. Haggis*, 1935). A serum makes Joe E. Brown an all-star college hero in *The Gladiator* (1938) and even the Bowery Boys get to quaff such marvelous liquids in *Hold That Line* (1952). Foreign filmmakers also took to the idea. The Japanese *Knockout Drops* (*Toyko no Tekisasu-Jin*, 1957) follows a Texan whose potion generates supernatural strength, India's *Superman* (1960) derives invisibility as well from his favorite medicine, and Italy's *Hercules Pills* (*Le Pillole di Ercole*, 1960), invented by a Chinese scientist, transform men into mountains of muscle. Sometimes the dope is so good it even brings back the dead, as in *Dick Tracy's G-Men* (1939) and *Decoy* (1946). Even Walt Disney heroes sometimes get off on the drugs. The football team is given a little extra zip with a drug in *The Monkey's Uncle* (1965) and Soupy Sales gets so invigorated that he flies in *Birds Do It* (1966).

Other films that propagandize about the beneficial effects of strange chemicals are *The Immoral Mr. Teas* (1958), in which an anesthetic allows him to see through clothing, *The Road to Hong Kong* (1961), in which a drug cures amnesia, and the British effort *The Sandal* (1969) in which a drug-induced dream saves a woman from suicide.

A sizable segment of the general public remains rather wary of drugs and often ascribes disastrous consequences to their use, and many films do likewise. A man is transformed into a monster with drugs and plastic surgery in *Black Dragons* (1942), whereas serum alone is sufficient in *The Creeper* (1948) and in *The Neanderthal Man* (1953). Boris Karloff concocts devilish potions that transform him and Lou Costello in *Abbott and Costello Meet Dr. Jekyll and Mr. Hyde* (1953). *Mark of the Vampire* (1957) is unique in

that pills rather than munching on jugulars transmogrify people into night creatures. India's *Shikari* (1964) has a similar theme, but in *How to Make a Monster* (1958) it is the makeup man who creates monsters by adding novocaine to the makeup and using hypnosis. In spite of its title, the Italian *The Hyena of London* (*La Jena de Londra*, 1964) merely shows the making of a criminal by the injection of fluid from a dead criminal's brain.

A fluid makes a man hate women in the Philippine *Kalabog en Bosyo* (1959). An oriental drug that produces sleepwalking is featured in *The Moonstone* (1934) and a new anesthetic causes nightmares in *Strange Impersonation* (1946). In 1939, MGM produced *Remember?*, a story about a drug that makes people forget the past (marijuana?). A serum causes insanity in girls in India's *Pagal* (1941) whereas the East German version of *Wozzeck* (1948) presents the idea that beans may produce delusions. Louis Hayward and a friend escape from Devil's Island with the help of a flower extract which produces the signs of plague in *The Return of Monte Cristo* (1946). A most remarkable drug enables a couple to read minds on a telescreen in the Czech *Who Killed Jesse?* (1965).

It's a Gas

In 1799, a young English chemist was the first to experience the exhilaration of nitrous oxide, later to become popularly known as laughing gas. In the months that followed Humphrey Davy giggled frequently, had mystical experiences, and was at least once found lying on the floor. The medical world continued to experiment with nitrous oxide and by the middle of the next century it had become the first gaseous anesthetic and the source of a psychedelic experience for thousands. Humphrey was eventually knighted and the gas was largely replaced by safer anesthetics. When the cinema made its appearance, the gas was often employed as a comic plot element. It has been a source of inspiration, comic and otherwise, for such diverse souls as Theodore Dreiser, Allen Ginsberg, and the Grateful Dead.

Many famous comics played nitrous oxide for all it was worth. The classic efforts of Chaplin and Laurel and Hardy in the silent era set the stage. The Three Stooges shoot laughing gas out of army cannon in one of their shorts. Bob Hope plays a bumbling dentist who accidentally inhales gas meant for his patient and pulls the wrong tooth in a hilarious sequence of *The Paleface* (1948). Anne Baxter compares an experience of speaking words that feel like someone else's to a time when a dentist gave her anesthesia in the superb *All About Eve* (1950). The dreamlike quality was exploited in an earlier film in which the whole story is conveyed in a dream induced by an anesthetic (*When We Look Back*, 1936).

Carry On Nurse (1959) provides a British view of the subject when a group of patients are overcome by the gas. Another British film dealing with nitrous oxide, though this time in a serious vein, is *Corridors of Blood* (1962). Boris Karloff stars as a nineteenth-century English doctor attempting to invent surgical anesthesia. Karloff heats liquids to generate gas that he inhales gleefully. He notes its anesthetic properties when he continues chortling even after he gashes his hand. Unfortunately, his attempt to anesthetize a patient fails and he begins adding tincture of opium to the gas. Soon he is hopelessly addicted and there follow some grisly scenes in the operating theater as Karloff tries to perform surgery with trembling hands. Next he is stealing dope from the hospital dispensary and abetting murder, and he is soon fatally stabbed by a not-yet-famous Christopher Lee. But all's well that ends well and as the celluloid sinks slowly in the west, Karloff's son is shown successfully administering surgical anesthesia from a gas tank.

The year 1967 was a banner year for giggles with three films appearing. A laughing gas is accidentally discovered in the French *Le Fou du Labo 4*, but with characteristic French flavor, it also makes people love one another. One of Dean Martin's sleazy James Bond imitations *The Ambushers* contains among its many implausible gadgets a cigarette that produces a laughing gas smoke, though this may have been inspired by marijuana rather than Sir Humphrey's beloved gas. Finally, Woody Allen's *Casino Royale*, which has a little bit of nearly everything and everybody, has a flying roulette wheel spraying laughing gas in the climactic scene.

A recent entry in the Pink Panther series—*The Pink Panther Strikes Again* (1976)—contains the funniest laughing gas scene in the history of films. Peter Sellers as the bumbling Inspector Clouseau impersonates a dentist in order to gain access to the castle of archenemy Dreyfus (Herbert Lom). Clouseau naturally gets zonked on his own gas, and as his fake wax nose melts off, he pulls the wrong tooth.

15 Drug-Abuse Films

From its inception the cinema has been used as a propaganda tool in the fight against drug abuse. In the earlier chapters of this book the many preachments against alcohol, opium, and morphine are documented. The censorship included even those films that clearly militated against drugs and very few of these were made from the mid-1920s to the mid-1950s. Though the early efforts at preventing drug abuse had little other than their themes to distinguish them from other films, films aimed specifically against drug abuse began to appear in the late 1940s that were noticeably different from Hollywood drug films in many respects. These drug-abuse films were generally short, low-budget efforts with amateur actors and poor production standards. Almost all were 16mm black-and-white films produced by educational groups and distributed through educational channels.

Such films as the Austrian *Moderne Laster* (1924) and the British *Dream Flowers* (1930) anticipated such later developments. Likewise with *Sinister Menace* (1931?), which was produced under the auspices of the League of Nations by the Egyptian government and later distributed in the United States by Dwain Esper, the producer of such classics as *Marihuana—Weed with Roots in Hell* and *Narcotic*. *Sinister Menace* employs the scare tactics that were the mainstay of drug-abuse films until the 1970s. We are shown healthy, well-muscled Egyptian police doing exercises with their shirts off, and then we see the sickly, shriveled addicts of opium and hashish. The narrator assures us that this is the inevitable consequence of using narcotics.

Such dismal scenes were painted in film after film, and when the psychedelics appeared in the 1960s, the name of the drug was changed but the format of the drug-abuse film remained essentially the same. Since most of the early drug-abuse films concentrated on heroin, we begin this survey with those films that emphasize addicts, opiates, and cures.

Tea, Horse, and Crime

The Encyclopaedia Britannica Educational Corporation released the first of the postwar drug-abuse films with *Wastage of Human Resources* (1947). *The Drug Addict* (1948) and *Payoff in Pain* (1948) followed quickly, probably in response to addiction among returning servicemen and the reestablishment of the narcotics traffic that had been interrupted by the war. The year was notable for the appearance of the first documentary on drug addicts, which was probably the most informative and accurate to appear for the next decade. *Drug Addict* (1948), directed by Robert Anderson, whose career reached from *Hearts of the World* (1918) to *The Crowning Experience* (1960), was produced in Canada and succeeded so well that it was banned from the United States. *The Terrible Truth, Drug Addiction*, and *H—The Story of a Teen-Age Drug Addict* graced the year 1951. *The Terrible Truth*, the first in a long line of dreadful drug dramas from Sid Davis, was produced with the cooperation of the Los Angeles juvenile authorities. The film "documents the story of one teenage girl,

typical of youthful addicts. Starting with an occasional marijuana cigarette, she is induced to experiment with a fix of heroin. In a few days, she is a hopeless 'hype,' ends up with a criminal record and a blighted future." And all this occurred in only ten minutes of screen time!

Drug Addiction, after some preliminary discussion, with animation, of marijuana, heroin, and cocaine, proceeds to another "typical" case. Handsome Marty Damelon is given a reefer by a fellow high school student and soon he is so high on dope he slashes his lips while drinking from a broken Coke bottle and in a flash he's rifling his poor old mother's purse for enough money to get a dose of heroin. Before you can say "rehabilitation," Marty is toiling in the sunny fields of the Lexington Federal Hospital. A mid-1960s rating by the Educational Film Library Association found this film "excellent." *H—The Story of a Teenage Drug Addict* is very similar except that a social service worker instead of federal doctors lead the young addict back to the straight and narrow path.

Subject: Narcotics (1952) differs from the preceding efforts in relying entirely on information about the drugs rather than case histories. This film includes shots of actual injections and of the prostitution associated with heroin and was intended more for adult groups. *Narcosis* (1954, revised 1958 and 1965), which was made for use by the police, is likewise informational in intent, though similarly filled with misconceptions and propaganda. *Teenage Menace* (1953), an uneasy mixture of Hollywood melodrama and drug-abuse education, is a full-length film distributed through commercial channels. It is the already old story of the high school kid who gets hooked by his friends and a nasty pusher, and contains some graphic footage of the kid administering a fix. New York censors banned the film, though the New York State Supreme Court overruled them.

A curious item of this period is F. Thomas Mueller's *Narcotic Evils* (1954), a twenty-five-minute silent, color 8mm production about which nothing further seems to be known. The first version of *Narcosis*, revised in 1958 and 1965, appeared in 1954. An instructional film for California police, the film has an unusually vivid withdrawal scene.

Even osteopaths joined in with *Drug Addict* (1956), in which addiction is described as a personality problem. Television entered the arena in 1956 with a production by National Educational Television, *Addiction Among Teenagers*, also released as *Narcotics Traffic*, which attempts to give an overall view of the narcotics problem with comments from an addict and a sheriff. *Tea, Horse and Crime* (1957), another NET production, focuses on the association of marijuana and heroin with crime and shows an addict undergoing withdrawal until he is relieved with a shot of his favorite substance.

The National Film Board of Canada financed *Monkey on the Back* (1955). Based on the true story of a Canadian addict, it was one of the first films to view the problem from the addict's perspective. *The Dangerous Drugs* (1957) was also unusual in that it concerned itself only with barbiturates and amphetamines. With a narration by future California Governor Ronald Reagan, the film told how partying youths, doctors' patients, and truck drivers acquire the habit. But narcotics were still the drugs of choice for films, and *Drug Addiction—A Medical Hazard* (1956), partly scripted by H. J. Anslinger, *Heroin Addiction—Living Death* (1957?), and *Assassin of Youth* (1957) were competing for screen time with their gory tales of depravity. Regulatory aspects are emphasized in a U.S. Army production *Investigation of Narcotics Offenses* (1958), and in *Residence Investigation No. 1* (1970). *Narcotics* (1959) and *Seduction of the Innocent* (1961) again stress the progression from soft drugs to heroin. The latter is another Sid Davis effort, and the addict this time begins with bennies rather than with the traditional marijuana.

Someone Is Watching (1958) encourages medical personnel to be highly paranoid about their stocks of narcotics. The old keep-'em-running-scared tactics are again in full flower in *Tomorrow May Be Dying* (1959) with its two teenage female addicts, one with an addicted baby. An addicted teenage girl is also spotlighted in *Narcotics: The Decision* (1960) with animated sequences and details of the drug traffic and withdrawal coloring the tale of barbiturates to marijuana to heroin with many graphic needle shots. *Face of an Addict* (1961) repeats the theme of *Drug Addiction—A Medical Hazard* in its depiction of a young doctor turning to morphine for relief. Doctors are also highlighted in *Narcotic Addiction: Its Medical Management* (1963)

Antidote for Addiction (1961?) turned out to be a half-hour film for professionals that shows the Nalline method for detecting heroin addicts. Nothing new was added by *The Last Fix* (1963?), *About Addiction* (1965?), and *Drug Addiction* (1966), the latter one of a series of drug abuse films supported by the Xerox Corporation. *Nar-*

Drug-abuse films as seen through the eyes of underground comic book artist Gilbert Shelton. It is not far from the truth in depicting the bias and gross exaggeration of most such films made in the 1950s and 1960s.

cotics: A Challenge to Teachers (1967?) crammed the pundits full of facts about drug-prone youngsters and addicted babies, whereas *Narcotics: Pit of Despair* (1967) gave us yet another young man following the old barbiturates-to-marijuana-to-heroin trial. *Little Pusher* (1967?) was merely an episode from the "Dragnet" television series, with all the preposterous oversimplifications and stereotypes, but it was nevertheless used as an "educational" film. *Arcade* (1968) was an Australian film by Jim Sharman that told the tale of a narcotics overdose in its six minutes. San Francisco television station KQED provided one of the first convincing inside views of the addict's world in its documentary on *Drugs in the Tenderloin* (1968), which included vivid interviews with addicts, some of them almost too stoned to talk.

Focus on Heroin (1971), though attempting modernity with its use of ex-addicts relating how they started, still strains credulity with withdrawal and ambulance scenes and its not-so-subtle implication that marijuana leads to herion. *Faces of Boredom* (1971) uses a documentary approach to examine the causes and effects of addiction and closes with a gory scene of scraping and cauterizing abscesses on addicts' arms. The controversial *Heroes and Heroin* (1971), originally an ABC television program, documented heroin use among GIs returning from Vietnam. *Life in New York* (1970) indicted heroin by interposing shots of fashionable Park Avenue with those of Lower East Side junkies. *Outreaching Today's Addicts* (1971?) and *Heroin* (1971) both presented data on addict culture and treatment programs in a factual style. The ultimate in shock and gore was attained by the U.S. armed forces film *Narcotic Deaths* (1970, in two parts).

Some of the films focused on the sources of, and traffic in, narcotics. An hour-long special by CBS News *The Business of Heroin* (1964) followed heroin from the Turkish poppy fields to the New York streets, with interviews of addicts and pushers. *The Narcotics Trade* (1964) emphasized Southeast Asia as the heroin source and showed details of heroin production. *Some Grains of Truth* (1967) was a British television film that presented evidence for the existence of a network that imported marijuana and heroin from West Africa to Europe. NBC television described the relation of narcotics to other underworld activities in New York in *They Get Rich from the Poor* (1970). *Flowers of Darkness* (1969) surveyed the whole problem, but concentrated on the need to control poppy cultivation and to understand and treat addicts. *I.T.N. Reports Drugs* (1968?) and *The Opium Trail* (1966) were other documentaries on narcotics produced for British television.

A number of films on the narcotics trade have been produced and/or distributed under United Nations auspices. *False Friends* (1967) is a nine-minute animation intended for Eastern audiences that shows the cure of an opium-addicted worker. Mexico's *Enforcement Measures and the Destruction of Illicit Crops* (1965?) is self-explanatory, whereas the Mexican *Polvo Amargo* (*Bitter Dust*, 1964?) shows the degradation of an addict and his exploitation by drug traffickers. Three silent Thai films of opium production and use in that country—*Opium Growing in Thailand*, *Opium Addiction*, and *Hill Tribes of Northern Thailand* were produced in the 1960s. The coca leaf was the subject of the Bolivian *Cultivo y Commercializacion de la Coca* (1967?). American productions included *Hell Flower* (1967?) and *Chasing the Dragon* (1970?).

Junkies' Journeys

In attempting to understand addiction, filmmakers began to make detailed studies of addicts. Anderson's *Drug Addict* (1948) was a pioneering effort. *The Addicted* (1958) by CBS News also presented a detailed case history, but only in the mid-1960s was this type of film to be fully developed. *The Story of a Prisoner* (1965) provided an in-depth look at an ex-addict in prison and his attempts at rehabilitation, and *The Baby Race* (1966) allowed a New York black addict twenty-seven minutes to relate his somewhat incoherent story. Another New York black was the subject of Shirley Clarke's documentary *Portrait of Jason* (1967), and ex-addict and author (*Down These Mean Streets*) Piri Thomas described his experience with drugs in Spanish Harlem in *World of Piri Thomas* (1968). *Escape to Nowhere* profiles a sixteen-year-old addict and though it was designed to facilitate communication, it suggests that her aimless life is primarily the result of heroin.

Hooked (1966) provided a forum for a group of ex-addicts to relate their experiences and thoughts on addiction, as did *Fight or Flight?* (1967). Although both of these films are interesting, they are somewhat rambling and are biased by the individual's own slants on addiction and help to further certain misconceptions (e.g., marijuana leads to heroin, and drugs are to blame for their prob-

lems). Like many films of this type, these films fail to provide much insight into the addict's early life and paint such a dismal picture that it seems there is almost no way out for the addict. *Darkness, Darkness* (1970), *No Expectations* (1971), and *Got My Own* (1974) likewise have various people talking about their addiction. Most of them are still addicts who are not enrolled in drug programs and the tone is less optimistic. In *Darkness, Darkness* two parents of addicts are interviewed and the addicts are white. Ex-addict the Reverend Jesse James, a leading worker in the San Francisco ghetto, is featured in *Rapping* (1969).

British television profiled an addict and his brother in *The Addict Alone* (1967) and did a follow up three years later in *Half a Lifetime* (1970). The addict was still on dope and in worse condition, in spite of the year he had spent in jail. *The Facts Are These: Fixed for Death* (1969) and *Gale Is Dead* (1970) were also produced for British television with the first featuring a group discussion with registered addicts and the second being a posthumous study of a young girl who died of an overdose at the age of nineteen. Addicts and former addicts describe their experiences with drug addiction and withdrawal in *Heroin* (1970) and *Better Dead* (1972).

Dramatized versions of addict life also started to appear in films, the first of these being *Hide and Seek* (1966). Unfortunately, this attempt emerges as rather trite and sentimental, perpetuates some myths (one shot hooks him), and is very pessimistic about the addict's possibilities for escape. *Day in the Death of Donnie B.* (1970), *Blue* (1970), and *Slow Death* (1971) were funded by the National Institutes of Mental Health and produced by young black filmmakers. All three of these films depict the world as hostile to their young black protagonists and promulgate the notion that the almost inevitable outcome of drug addiction is death. The same dismal forecast and absence of alternatives characterize *Not Me* (1971), *Trick Bag* (1971), and *Death, Drugs and Walter* (1970). The creation of such negative images is unfortunate since some of these films (especially *Not Me*) are very powerful dramas. *H + 2, Concerning Two Heroin Addicts* (1970) was unusual in following two addicts on parole and their attempts at rehabilitation. The overwhelming influence of social factors forces viewers to ponder the question of whether it is more difficult to be an ex-addict or an addict, and the film emerges as a moving indictment of the California parole system.

Therapy

As drug abuse reached epidemic proportions in the mid-1960s, a wide variety of therapeutic approaches for addiction were instituted. The best known of these was Synanon, a California program for heroin addicts, which received major emphasis in some dozen films that appeared in the next decade. One of the first was the television movie *Junky* (1964), which surveyed the drug problem generally, but focused on Synanon as a treatment. The next year Hollywood released the full-length commercial film *Synanon*, which has been detailed previously. The film provides some insight into the brutal honesty of the group encounter sessions (the Synanon "game"), but degenerates into a maudlin romantic tale. *David* (1965) was a cinema-verité look at a young addict's first week at the Synanon house and the pressures of adapting. *Or Die!* (1966) has the look of an hour-long documentary commercial for the Synanon approach, filmed during six months there. Synanon was rapidly becoming a national organization and the television show *Synanon in Prison* (1966) explored the operation of its methods in Nevada State Prision. A two-part television documentary *The Most Adult Game* (1967) followed the history of Synanon and showed the technique being used with children. *Children of Synanon* (1969) also showed the children of Synanon residents confronting their parents and one another during the game. *House on the Beach* (1968) again detailed the Synanon operation and explored the personality of Synanon founder Charles Dederich.

Many other programs for the therapy of heroin addicts have been the subjects of films. Christianity was emphasized in *Miracle on Broad Street* (1968) and *The Youth Drug Scene* (1969), in addition to the commercial feature films, such as *Way Out* and *The Cross and the Switchblade*, already discussed. Halfway houses for addicts, which were usually modeled on Synanon and included some form of encounter sessions, were presented in *H.A.V.E.N. in Hell* (1965), *Three* (1967), *Circle* (1968), *One Approach* (1972), and *We Have an Addict in the House* (1972). *Three* strongly emphasizes the addict's weakness while minimizing social factors, but nearly all films of this type do this since the programs are aimed at getting people to take responsibility for themselves. *Circle* and *One Approach* likewise emphasize self-discipline and show only the successes of their programs. *We Have an Addict in the House* shows parents becoming involved in the process and

strongly emphasizes their role. It is one of the better movies of this type. *Bridge from Noplace* (1968) was a good review of the drug problem, with the emphasis on addict rehabilitation.

British programs were detailed in *Report: Phoenix House* (1971) and *Drug Addiction Rehabilitation: National Addiction Research Institute* (1973). The operation of the United States government's National Addiction Center was described in *The Lexington Experience* (1971). The approach to prisoners by Narcotics Anonymous is shown in *Do Your Own Thing* (1970), whereas the various programs available in one town fill *Coping—The New Haven Story* (1971). Information on how to deal with addicts is given for drug-abuse personnel in *Confrontation—A Nurse and a Drug Addict* (1971) and *Counseling Techniques for Interviewing Addicts* (1973).

Films dealing with the heroin problem in one area often describe the methadone plans. Examples are *Scag* (1971 Philadelphia), *Run Up and Down These Streets* (1972 Santa Fe, New Mexico), and *Junkies Are People* (1972 San Francisco area).

Keep Off the Grass

When the marijuana epidemic arrived in the 1960s and pot became as common as premarital sex, the forces favoring the suppression of marijuana had little modern propaganda available. There were the aforementioned pot-leads-to-heroin films, but these told almost nothing about marijuana. The only drug-abuse film directed specifically against marijuana was *Assassin of Youth* (1957), which took its title from H. J. Anslinger's famous essay. Although the film attempted to present some scientific evidence on the effects of marijuana on mice and humans, its main thrust was to show just how vile "reefers" were and it presented the Gospel as the only prevention and cure.

The absence of marijuana films was largely relieved by the distribution of programs originating on television. In addition to those mentioned in the chapter on television, a half-dozen such films were made in the late 1960s. CBS Reports gave us *Marihuana* (1968), a generally excellent and impartial survey of the facts and opinions on marijuana available then, which implied a need to reevaluate the laws and the necessity of careful research. *World of the Weed* (1968), though relying mostly on stills, was likewise intelligent and informative. *Pot: The Current Scene* (1968) concentrated on interviews with subjects ranging from narcotics agents to drug users and clearly presented the whole spectrum of opinion. *The Law: How Effective Is It?* (1968) was a lively, often heated discussion by professionals that centered on legal aspects, and another panel of specialists debated the issues on *Marihuana, LSD and the Mind* (1968). *Research Report: THC—The Chemistry of Marijuana* (1968) was a misnomer, since it actually presented its effects on a single human subject in a controlled experiment. Unfortunately, the film failed to explain the crucial importance of individual variations, psychological set and environmental setting, and the subject was asked some biased questions. *You Can't Grow a Green Plant in a Closet* (1970) was an excellent panel discussion resulting from the National Marijuana Symposium, with most of the expert testimony having, for once, a slight liberal bias. Practically the only other item in the drug-abuse film catalogs of that time that shares this bias is *Love, Love, Love* (1967), a record of the "Legalise Pot" rally, featuring Allen Ginsberg, which was held in Hyde Park, London.

The antimarijuana filmmakers were not long in mustering their forces. *Scent of Danger* appeared in 1962, and *One Day Is Like Another* (1967) was a short drama "in which two students find a common interest as they smoke marijuana in order to see things as they really are." This was laudable motivation, since most of these films show the kiddies turning to grass only for kicks or on a dare, but predictably, they soon are disillusioned. Also predictable was the entry of Sid Davis Productions' *Keep Off the Grass* (1969), which though making a pretense at a calm, reasoned approach and citing the need for more research, applied the old scare treatment with the users of marijuana barely escaping the obligatory auto accident, mugging of kids, and selling to eight-year-olds. The film generally succeeded only in provoking laughter in any kid who was familiar with marijuana. As with many of the films of this kind, this one was subsequently withdrawn and revised or redone but Davis's *What About Pot* (1974?) is not a vast improvement.

Marijuana (1968) tried to make its antipot message more palatable with claims of impartiality and the presence of singer Sonny Bono, but underneath it was the same old marijuana-leads-to-hallucinations-violence-and-heroin rap. The same is true of *The Ballad of Mary Jane* (1970) and *Let's Talk About Marijuana* (1972) in which reefer personified tells you "I'm a put-on because

I dull your mind and waste your precious time" (with accompanying visuals more appropriate to LSD). *Marijuana: The Great Escape* (1970) pictured users of pot as lazy, irresponsible escapists who inevitably have serious car accidents, whereas *Pot's a Put-On* (1969) used a comedy format to show that users were dumb and irresponsible (one comments "marijuana helps my mind" while reading a comic book). The Department of Defense commissioned *The People vs. Pot* (1970), which showed marijuana triggering the "killer instinct" and LSD-type effects, and implied that marijuana was both addicting and a stepping-stone to other drugs. In contrast, *Drug Age—Why Marijuana?* (1969) has only shallow moralizing and leading questions as a priest chats with three users.

Focus on Marijuana (1971), narrated by singer Tommy "Oh! Sweet Pea" Roe, created the impression that there was very little scientific evidence on the effects of marijuana, but had some good segments in which youngsters deal with peer pressure to smoke. Spanish-speaking New York high school kids made a series of short films grouped as *Young Filmmakers Talk About Drugs* (1969) which included *The Potheads in Let's Get Nice*, *Teen Squad* (about a teenage narcotics squad), *The End*, *Life in New York*, and *Tomorrow Never Comes*. These films were mostly superior to the majority of drug-abuse films. *Weed* (1971), though starting with the legal problems of a busted teenager, is a generally accurate survey of marijuana history and effects. The Australian film *The Choice* (1971) also attempts honesty in its dramatized vignettes of adolescent drug experimentation.

Recent efforts that focused on pot with somewhat more sophistication than many of the preceding include the satirical *Marihuana* (1972?) by Roy Nolan, *Marijuana* (1973?) by Tom Rettug, and *Marijuana and You* (1974?). Other countries have also produced many films of this sort, but it is very difficult to obtain information about them. Morocco's *Le Kif* (1966?) tells (in Arabic) of the "misery of a family in which the father becomes an addict and the story of his rehabilitation. . . ."

A few of the marijuana films have been mature efforts to create understanding and to facilitate communication. The NIMH sponsored three such films, *Changing* (1971), *Communication Gap* (1969?), and *Counseling—A Critical Incident* (1971). The first of these, which is a real change from the typical drug-abuse film, presents a long-haired and bearded couple who smoke dope and discuss their changing life-style. The couple leave unresolved many questions, such as drug use by their kids, but the film should be useful for stimulating discussion. The same is true of *Gap*, which shows how communications break down between child and parent when the subject of marijuana arises, and for *Counseling*, which shows the talk between a pastor and a mother who has discovered that her child smokes marijuana. Similarly, *Mr. Smith, Your Kid's Taking Drugs* (1971) shows white, middle-class parents being confronted with the fact of their children's drug use. *A Walk in the Park* (1970) presents a very open-ended discussion of authority, discipline, and loneliness by three smoking teenagers.

LSD: Trip or Trap?

When the psychedelic tidal wave swept through the United States in the 1960s, the educational establishment hurriedly unleashed a torrent of anti-LSD propaganda that far exceeded anything ever evoked by marijuana or even by heroin. Though the enlightened minority quickly perceived that LSD was very similar to peyote and psilocybin mushrooms in its effects and was, therefore, probably safe, less adventuresome minds seized upon the occasional problems that the use of LSD produced and its association with the hippie phenomenon to produce some remarkably irrational and, in historical perspective, amusing anti-LSD (and antihippie and anti-altered consciousness) films. The only films on LSD available before 1967 were a rather dry lecture on the botany and chemistry of hallucinogens—*Hallucinogens* (1964), and a report on LSD therapy with alcoholics and the mentally ill—*LSD: The Spring Grove Experiment* (1966), both reproduced from television.

Television provided half a dozen other LSD commentaries in the next two years (see also the section on television). Timothy Leary's advocacy of LSD was featured on *The Pursuit of Pleasure* (1967) and *LSD: Lettvin vs. Leary* (1967), a debate that was thought-provoking, but which failed to provide much objective information. Lettvin made a sequel, *Professor Lettvin Tuned In* (1968), which stressed the ability of drugs to impair one's judgment, but as did most subsequent commentators on LSD, he greatly overstressed the potential for damage and almost completely ignored the potential for positive uses of psychedelics. CBS television news put down LSD and hippies ("acid users have difficulty with

love") in a slanted view of San Francisco's Haight-Ashbury district, *The Hippie Temptation* (1967). The same year, a local station produced a sympathetic look at the Haight-Ashbury hosted by poet-playwright Michael McClure, *The Maze* (1967). Another film originating on television was *LSD: A Trip to Where?* (1968), which, after the nice trip visuals at the start, degenerated into low-grade propaganda about homicides, genetic damage, and "psychotic reactions weeks and months later."

The burgeoning drug-abuse film industry turned out five LSD potboilers in 1967. *LSD: Insight or Insanity?* consisted of nine LSD researchers giving their views, all of which were biased to emphasize its potential for harm (a bad trip was "instant insanity" or a "never-never land of no return"). A personified LSD molecule told of the dangers ("hallucinations occur at any time up to a year," "horrible," "suicide"), but there were some enticing visuals as well. *The LSD Story* (also titled *LSD*) was a terminally boring navy production in which a military doctor lectures about "this material," which he obviously did not understand very well. The psychedelic title and the first five seconds of the sound track are the only tolerable parts of this film. *Hallucinogens and Other Noncarcotic Drugs Dangerous to Society* was slightly less dull, though considerably more biased, but *The Mindbenders* was suprisingly well balanced considering that it was sponsored by the Food and Drug Administration. The basic tone of the film was cautionary, but its interviewees gave both the pros and the cons of LSD usage, and the hallucinatory segments were very nice. Frightening imagery of slaughtered cattle and upside-down submersion in churning water filled *Mindscape* (1967), a student production about two men who each swallow half of a psychedelic tablet.

Blinders, headphones, and the doctor's comforting hand aid the tripping patient in *LSD: The Spring Grove Experiment* (1966). One of the few films to consider seriously the therapeutic possibilities of LSD, it was made for television.

Nineteen sixty-eight was another fertile year with the infamous Sid Davis leading off with *LSD: Trip or Trap?*, which tells us that "LSD has already caused more genetic damage than the atomic bomb," and that it is an "almost uniformly bad experience" leading to suicide, homicide, convulsions, leukemia and so on. The U.S. Navy sponsored *Trip to Where?* (1968), in which the sailors involved with acid suffer: (1) a bad trip with flashbacks and psychosis; (2) imprisonment; (3) demotion. Although often preachy and condescending and completely ignoring the pleasurable and therapeutic aspects of this "tragic illusion," *Beyond LSD* (1968) emphasized the importance of trying to communicate across the generation gap. In *He Lived with Us, He Ate with Us, What Else Dear?* (1968), which also emphasized the parent's role, affluent parents pamper their teenage son with little attempt at understanding until they learn that he has stolen lab equipment to make LSD. Lack of communication between parents and children was highlighted again in *The People Next Door* (1969), which originally appeared on the CBS Playhouse. Drugs ignite an already highly combustible situation when: (1) daughter freaks out on acid and father evicts long-haired son; (2) daughter freaks out again and is sent to mental hospital; (3) next-door neighbors discover their son is really the pusher and turn him over to the police; (4) police release the pusher, and the "crazy" girl's father attacks him and is carted away by police. By contrast, *The Trip* (1968) needed only three and one-half minutes to destroy the acid-using teenagers and set the pusher free.

Some welcome comic relief was provided by *The Mad Chemist* (1969), who fed a variety of drugs to his monster while testing it with a "happiness index" machine (none was satisfactory), and by *Curious Alice* (1971) who explores a Wonderland where the caterpillar smokes marijuana, the Mad Hatter takes LSD, and the Dormouse nods out on sleeping pills. Both of these films were aimed at turning the younger crowd away from drugs, but they must have been intrigued at how Alice used drugs to enter Wonderland!

Scare films still remained the drug educator's staple and another half dozen of these films were rushed into print in the next few years. *Drug Decision* (1970) not only used the comments of a

heroin user to describe those "hooked on marijuana," with emphasis on law enforcement as therapy, but also left viewers with the indelible image of a girl on acid screaming about a talking hot dog! *A Parting Shot* (1971) provided a twelve-year-old who freaks out and dies when a friend tries to calm him with an injection of acid. *I'll Be Seeing You* (1970) also deserves a left-handed award for its analogy between Russian roulette and LSD (complete with revolver) and its classic hardhearted pusher who ends the film with: "Some of you will start taking narcotics on a dare, and eventually get hooked for life . . . I play percentages—you see I'm a pusher—I peddle narcotics. And unless you are smart enough to beat the percentages, we'll meet again. I'll be seeing you." The title tells the whole story in the British film *One-Way Ticket* (1971) and in the Australian *The Acid Test* (1970), though both films dealt with other drugs as well.

Although *Acid* (1971) presented a very broad and informative picture, complete with Albert Hoffman describing history's first LSD trip, it gave the impression that bad trips are extremely common and was basically designed to generate fear. The same is true for *Focus on LSD and Other Psychedelics* (1971), which, though it included users claiming increased insight, was replete with warnings about insanity, genetic damage, and death. There never was any significant evidence that any of the psychedelics produced genetic damage and the promulgation of such an idea is good evidence of naiveté, charlatanism, or both.

Tom (1971) is one of the rare films that presents psychedelics in a sympathetic light. The film's twenty-six-year-old subject is warm and sincere in considering psychedelics to be sacramental and desires only to be left alone to manage his own life. In the words of one reviewer, he has "dropped out and dropped everything—LSD, mescaline, psilocybin and some things familiar only to obscure chemists in Berkeley." One of these obscure things is DMT, which surprisingly put in an appearance in another reasonably adequate drug film that year. An episode in *Self-Awareness Film Modules on Drug Abuse for Teachers* (1971) showed a teacher aiding an adventuresome girl who hurt her leg after snorting DMT made in the chemistry lab!

It is fitting, after wading through this morass of largely pathetic and often vulgar anti-drug propaganda, that this discussion should end with a film that presents some of the results of what is probably the only thorough and competent research on the therapeutic use of LSD in a professional setting. *Man Isn't Dying of Thirst* (1972?) shows Dr. Stanislav Grof's LSD treatment of patients in Czechoslovakia. In contrast to almost all other work with LSD, Grof did everything right. He established a warm, trusting relationship with patients, provided therapy before, during, and after the trips, gave high doses as many times (up to 100) as necessary (at one- or two-week intervals) and had the experience himself. Better than 90 percent of Grof's patients followed a generally predictable course of therapy proceeding from childhood traumas through death and rebirth to an ecstatic union with nature. They emerged at the end with permanently improved appreciation of the world and reintegrated personalities. This was also true of the psychotics, though most LSD researchers have long insisted that for them LSD is useless or dangerous.

Drug Films for Medical Personnel

Film started to become a common learning device in medicine and science after World War I, but it was not until the last two decades that drug-abuse films for professionals came into frequent use. The precursors of such films were medical or physiological studies of psychoactive drugs such as W. Miles's *Drug Effects Measured by Acquired Patterns of Response* (1929), which assayed a variety of psychoactive drugs on rats, and Jules Masserman's *Effects of Morphine on Learned Adaptive Behavior and Experimental Neurosis in Cats* (1942) and *Effects of Various Drugs on the Emotional Mimetic Reactions of the Hypothalamus and Cerebral Cortex of the Cat* (1940). *Narcosynthesis* (1944) is a unique record of the "truth serum" technique in which four mental patients are given injections of short-acting barbiturates. After World War II rhesus monkeys were frequently used in studies on psychoactive drugs and drug addiction. *Effect of Serpasil (Reserpine) on Monkeys* (1954) demonstrated the difference between the newly discovered tranquilizers and the barbiturates, whereas morphine *Physical Dependence in the Monkey* (1963) discussed their use in studying addiction.

Overenthusiastic use of the newly introduced tranquilizers was soon found to lead to depression and *Drug-induced Depression—Fact or Fallacy* (1958) explored this issue. Techniques and problems in the use of tranquilizers were again treated in *Drug Management of Schizophrenia*

(1962). Some techniques and prospects for the new science of psychopharmacology were treated in *The Chemistry of Behavior* (1963), *Drug Dialog-Orientation* (1971) and *The Pharmacology of Drug Abuse* (1973). Treatment of toxic side effects resulting from long-term use of tranquilizers was the subject of *Akineton (biperiden) for the Reversal of Drug-induced Extrapyramidal Disorders* (1968). Accidental and suicidal drug overdoses were discussed and treatment shown in *The Diagnosis and Therapy of Sedative Overdose* (1970) and *The Emergency Treatment of Acute Drug Overdose* (1972). *The Patient with Addictive Behavior* (1968) is intended for psychiatric nurses whereas pharmacists are instructed in *The Pharmacist and Drug Abuse* (1971). *Psychohormonal Aspects of the Menopause* (1971) deals with the relationships between the endocrine system and psychic states in women.

A series of pharmacology training films for nurses includes thirty-minute presentations on *Local Anesthetics* (1969), *General Anesthetics* (1969?), *Sedatives, Hypnotics and Alcohol* (1969?), *Narcotic and Nonnarcotic Analgesics* (1970), *Psychopharmacological Drugs* (1972), *Sympathomimetics* (1969?), *Sympathomimetic Blocking Agents* (1970), *Parasympathomimetics* (1969?), and *Parasympathomimetic Blocking Agents* (1969?). *Out of Bounds: The Drug Culture* (1971) was another nursing film.

Ups/Downs

Although countless films have mentioned uppers and downers, some films have focused on these drugs. *Focus on Downers* (1971), for example, shows that addiction, overdose, and death from sudden withdrawal can result from barbiturate abuse. This film strongly emphasizes death in its dramatized vignettes as do two of Sid Davis's films, *Blood Reds* (1973?) and *The Pill Poppers* (1972). The latter includes material on uppers, which are also a feature of *Ups/Downs* (1971), *Drug Abuse: Bennies and Goofballs* (1966), *Let's Talk About Pills* (1972), and *Glass Houses* (1972). These four films are reasonably good, presenting a variety of data on barbiturates and amphetamines, but they tend to overemphasize the "speed kills" theme. *Glass Houses*, which consists of personal testimony of thirteen pill poppers, is quite convincing.

Amphetamines receive special attention in *Speedscene* (1970), *Focus on Speed and Uppers* (1971), *New Drugs, Same Needle* (1968), and *Sports: The Programmed Gladiators* (1971). *Speedscene* presents interesting commentary by users and doctors, and heavily emphasizes the "speed kills" theme. *Focus on Speed and Uppers* likewise tries to scare away users, but mars its otherwise tolerable presentation with inaccuracies. Methedrine addicts in London occupy center stage in the British television production *New Drugs, Same Needle*. The use of amphetamines and anabolic steroids is part of the discussion of contemporary problems in athletics in *Sports: The Programmed Gladiators*.

Tranquilizers are singled out for special attention in *The Age of the Tranquilizer* (1971?), *Tranquilizers* (1964), and *Mother's Little Helpers* (1968), the latter two of which appeared originally on television. Although not usually viewed as a drug-abuse film, *Tranquilizers, a New Idea in Animal Feeds* (1958) may provoke some interesting lines of thought in this context.

The inhalation of volatile solvents has become a significant problem among juveniles and has led to the production of films like *Glue* (1969?), *Inhale-Exhale, the New Terror* (1965), and *Let's Talk About Volatile Chemicals* (1972).

Drug-Abuse Films Grow Up

Most drug-abuse films appearing prior to the late 1960s were rather low-grade propaganda. The situation has been admirably summarized by drug-film expert David Weber (in a University of California Extension Media Center Bulletin):

> Prior to the mid-1960s, the script for a drug education film was simple to rough out. A nice White middle-class kid (like Marty) would be enticed by unsavory acquaintances (perhaps bearded or Latin) to sample marijuana. The instantaneous zombie state imparted by inhalation of marijuana smoke would lead to (check one—or several): marijuana addiction; experimentation with barbiturates; pregnancy out of wedlock; a fatal automobile accident; arrest and public disgrace via screaming headlines. Inevitably, in addition to whichever mishaps from the previous list might befall the protagonist, heroin addiction loomed in the future. At that stage, close-ups of needles would be prominently featured. So would the writhings, moanings, and vomitings of the victims of withdrawal pains. Prostitution lurked as the sure fate of young women who fell afoul of drugs. Imprisonment—with a flickering hope for rehabilitation—awaited young men.

But the situation changed rapidly. To quote Weber once again:

> Bewildered by the phenomenon of a developing counterculture based on bizarre drugs about which little was known, educators and filmmakers adjusted hurriedly. The years 1966 and 1967 saw a sudden upswing in both the production of drug films and market demand for them. News segments beefed up by out-takes and documentary specials that had appeared on prime-time television were quickly recycled by the networks' film outlets as educational instruments. Since in many cases these offered the most objective and comprehensive discussions then available of a highly inflammatory topic, they found a ready audience.

Many film producers merely changed the names of the drugs and generated new scare films with the same old formulas. The next few years saw marijuana smokers and LSD swallowers in the same situations formerly reserved for heroin addicts. In addition to the automobile accidents, LSD films placed much emphasis on the chromosomal damage it was supposed to cause. On of the clearest examples is Sid Davis's *LSD—Trip or Trap?* (1968). Even the federal government entered the drug-film business with *FDA Special Report—Bennies and Goofballs* (1966) and *Mind Benders—LSD and the Hallucinogens* (1968). Faced with the need to evaluate the flood of drug-abuse films, the National Institutes of Mental Health began giving out contracts for such evaluation. The reviews of these films were generally scathing and, as one reviewer remarked, "the strongest reaction invoked in the majority of viewers was a craving to go home, put on the Beatles, and get stoned." The NIMH refused to publish the reviews, and their 1969 guidance manual for teachers contained only bibliographic data on the more than 100 films included. The NIMH funded another evaluation, this time by the National Coordinating Council on Drug Education, which ended in 1970. More than 80 percent of the films were found "inaccurate, unscientific and psychologically unsound," including those produced by the government, and the NIMH again refused to publish the reviews, but the evaluating group managed to do so themselves in 1972. The NIMH funded a third review of new films in 1972, but again refused to publish the review data.

The newer films showed noticeable trends. Whereas most films made prior to the mid-1960s had been moralizing and cautionary, more objective efforts dwelling on sources and pharmacological effects began to appear. The NIMH-sponsored, single-concept series of nine five-minute films, each crammed with facts about one drug are good examples of this. Also, films appeared describing programs available to addicts and heavy drug users such as *Eagleville*, *Marathon*, and *Synanon*. Next came films that moved the therapeutic focus out into the community and emphasized communication and openness as exemplified by *Rapping*, *Community in Quest*, and *Drug Abuse—One Town's Answer*. Some efforts were made to place the drug scene in a broader cultural or cross-cultural context such as the U.S. government's own *Distant Drummer* series.

Although many films of the late 1960s emphasized footage of joint smoking, junkies shooting up, and psychedelic visual and auditory displays, many educators suspected that these films were having effects on their audiences that were opposite to those desired, and few such films were being produced by the mid-1970s. Intimate documentary portraits of drug users began taking their place as typified by *Gale Is Dead*, *Hooked*, and *Guy*. Finally, films began emphasizing self-reliance, decision making, and the importance of relationships, often without specific mention of drugs. *Guidance for the Seventies*, *The Family*, and *Easy Way Out* are a few of many films to be discussed later. Furthermore, it has generally become clear that the biggest problems are not created by psychedelic materials, such as LSD and marijuana, but by the more conventional drugs such as heroin, alcohol, tobacco, tranquilizers, amphetamines, and barbiturates. The main drug problem among all ages is still alcohol, and it is likely that films pertaining to alcohol will continue to be the most relevant.

There is now a general awareness that drug abuse is merely symptomatic and that films on this subject do not generally strike at the core of the problem. A few years ago, present patterns of drug abuse would have generated a spate of films on Quaaludes, Darvon, and cocaine, but none has thus far appeared. Holistic and humanistic approaches emphasizing the positive and productive elements of family and group life have taken their place, and just in time.

We now survey the remaining drug-abuse films, roughly following their evolution as described in this section.

From Chemical Tombs to Other Approaches

The old shock-treatment approach to drug-abuse education continued to characterize many films released in the late 1960s and early 1970s. *Narcotics—The Inside Story* (1967), *Why Must the Flowers Die?* (1968), which stars a grade-school kid who escalates from glue to an overdose on barbiturates, *Agents of Drug Abuse* (1967?), and *The Hangup* (1968) are typical of these films. The last of these was released by the Department of Defense and shows one serviceman having recurring flashbacks after using LSD and another dying from self-inflicted wounds while on drugs. The titles tell the story in *Stop . . . Before You Try Drugs!* (1969), which "includes graphic illustrations of the results of drug abuse," and *Drug Abuse: The Chemical Tomb* (1969), which rehashed the old soft-drugs-lead-to-hard-drugs-lead-to-death formula. People were dropping like flies as a result of associating with careless or violent marijuana and heroin users in *A Crutch for All Seasons* (1969), but *11:59: Last Minute to Choose* (1970) went one step further by including gory emergency-room footage.

High school girls smoke weed, bad-trip on amphetamines, and get hooked on heroin in *The High: Drugs and You* (1970). *Exit* (1970) depicts commune hippies as being hostile to strangers and indifferent to a girl's near-fatal bad trip. *Drug Abuse: Everybody's Hangup* (1970) had yet another overacted withdrawal scene and implied that drug users wind up on heroin, but also stressed the need for communication between parents and children. *Drugs and You* (1971) varied the marijuana-heroin-death story with animation. Former LSD proponent Allen Cohen spoils his otherwise rational chats with students with stereotypes and exaggerations (LSD users sooner or later "flip out permanently") in *Are Drugs the Answer?* (1970). Another NIMH-sponsored film *The Answer Is Understanding* (1971) mixed its information with inaccuracies and was judged to do "little other than reinforce existing fears and prejudices." *Busted* (1971) tried to scare the kiddies by showing a twelve-year-old being arrested.

A flood of drug-abuse films that approached the problem from broader social, cultural, and historical perspectives and which were, in general, more rational and accurate, appeared in the next few years. These are mentioned in roughly alphabetical order. The Australian film *Anyhow* (1971) treated drugs as one of a variety of problems in the student community, whereas *Criminal Man* (1970?) discussed drug abuse in the context of crime. Noted personalities lent their support with such efforts as *Art Linkletter Talks with Parents* (1971), *Art Linkletter Talks With Our Children* (1971), and *A Day with Bill Cosby* (1970?). Alcohol was emphasized in *Can You Take It?* (1969) and *Curious Habits of Man* (1968), the latter comparing wild animals and people at a cocktail party. Films aimed at the younger crowd often resorted to animation as in *Curious Alice* (1971), with the Mad Hatter high on LSD and the Dormouse smashed on reds, and *The Drug Bug* (1972), in which a frog turns to drugs to get his lady's attention! Though it is also aimed at elementary school children, *Dealing with Drugs* (1971) shoots over their heads with pharmacological data and has many inaccuracies, in addition to being boring.

Drug Dialogue—Involvement (1971) was a unique change of pace with its testimony from two undercover narcotics agents on the problems of living simultaneously in two different cultures. Cross-cultural perspectives on the youth scene were the mainstay of *The Distant Drummer* (1968), which also focused on the history of drug abuse. *Drug Age—What Can We Do?* (1969) was one of a series from Catholic filmmakers that tended to be heavily moralistic and even encouraged parents to "eliminate" drug-contaminated children in order to save their siblings! *Drug Age—What Do You Think of Your Father?* (1969) similarly rested on moral platitudes. *Drugs and the Nervous System* (1972) was revised from the 1967 version, but the entertaining animations failed to compensate for the inaccuracies and overgeneralizations.

The joys of life without drugs were emphasized in *Drugs: A Primary Film* (1972), *Drugs Are Not the Problem* (1972), and *Drugs and the Very Young* (1971?). *Drugs and Beyond* (1971) was an ethical inquiry into the areas of learning acceleration, tension control, and stimulation of performance with drugs. *Drugs in Our Culture* (1971?) also took a very broad look at the drug problem and emphasized the need to help children with decision making. A series of films entitled "Questions and Answers" included films on *LSD*, *Barbiturates and Amphetamines*, *Rock Festivals*, *Marijuana*, *Natural Psychoses and Drug Psychoses and What Is Normalcy*, and *Values and Drug Usage* were released in 1971 along with *Recommendations for Individual School and Community Action in Dealing with Drug Problems, and Over 3,000 Bad Trips* (in two parts) in a

package called *The Drug Scene*. *The Drug Scene* (1971) was also available in a half-hour condensed version. *Drugs: Facts Everyone Needs to Know* (1970) was an accurate and informative but somewhat dull lecture. *Choice* (1970) again emphasized the need to develop the ability to make one's own decisions, an increasingly frequent theme in these films, as did *Countdown* (1972?) and *Do You Know Her?* (1972?).

Many films that used the word *drug* in their titles were produced in the early 1970s. Most of these were aimed at juveniles and presented reasonably accurate information along with words of caution. Typical of these are *Drugs Are Like That* (1970), *The Drug Dilemma* (1972), *Drugs: A First Encounter* (1973?), *Drugs: The First Decision* (1971), *Drug Taking: Social Aspects* (1971), *Drug Abuse: It Could Happen to You* (1973?), *Drug Dependency—Stimulants, Depressants and Psychedelics* (1973?), *Drug Problem: People Problem* (1972?), *Drugs and Your Body* (1971), *Drugs in Our World* (1971), and *Drugs—Use or Abuse* (1971).

Escape from Addiction (1969) was a general lecture that emphasized alcohol. Among the many films emphasizing drugs as unsatisfactory escapes are *Escape to Nowhere* (1969, Australian), *Hello America* (1968), *The Sandal Maker* (1969?), *How Much Time?* (1970), *Psychedelics* (1973?), *Up the Ladder Down* (1973?), *Learning About Drugs* (1972?), and *Mind-Altering Drugs* (1969?). *Hooks* (1972) and *Perfect Drug Film* (1972) likewise stress that escape with drugs is deleterious in the long run.

Excellent documentaries that place drug use in a broad cultural perspective are the Canadian *Flip City: The Psychotropics and You* (1971), and the American *A Moveable Scene* (1968). Narrated by Robert Mitchum, the latter film is a generally good survey of the youth culture in the late 1960s from London to Katmandu, but tends to create the feeling that hippies and addiction are synonymous. *A Journey Through Drug Abuse* (1971?) and *The Riddle* (1968) are documentaries that emphasize the negative consequences of drugs.

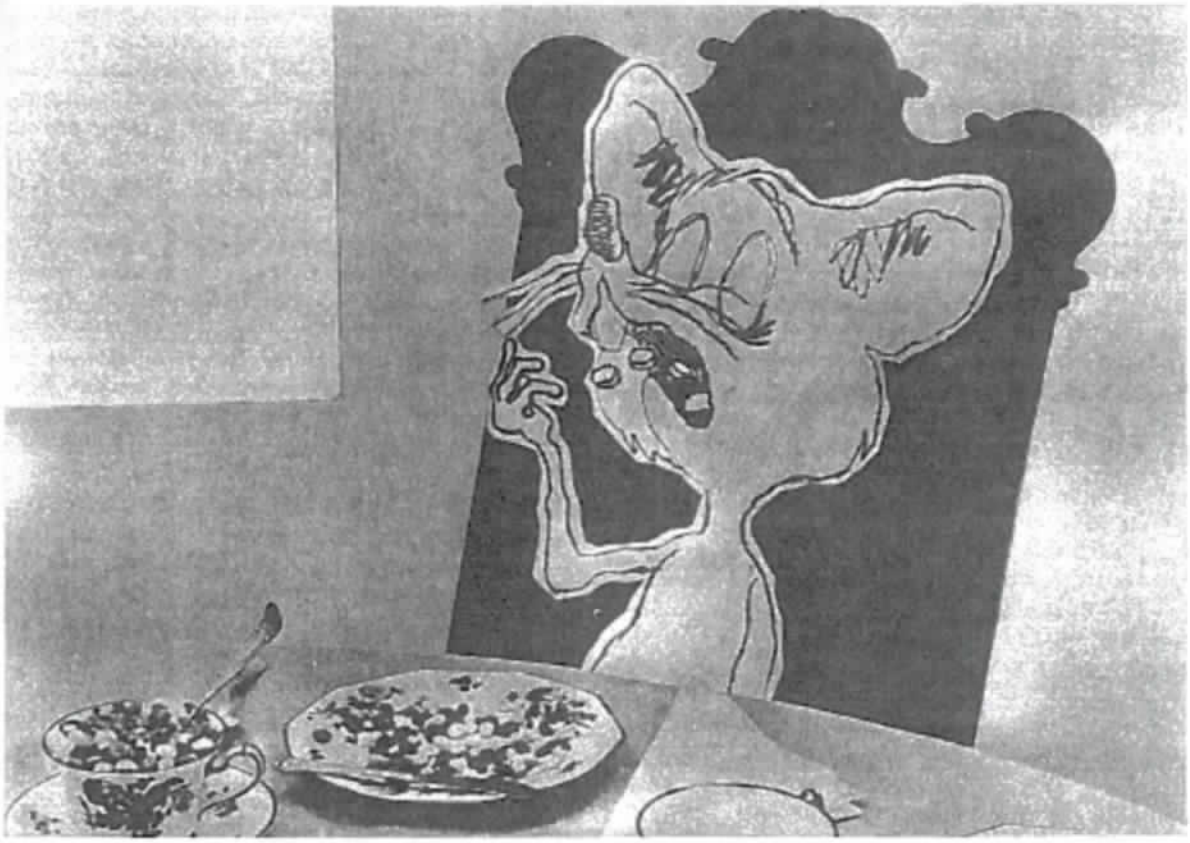
Girl on the Sixteenth Floor (1971) was unique in presenting the dealer of drugs in a favorable light (he likes to turn people on and only sells to get money to live) and suggesting that one can stay with soft drugs, rather than progressing to heroin. Peer-group pressure to try acid and grass is the focal point of *Jump* (1970), which takes place at a teenage pot party. The dealer was presented in a more classical light in *Pusher* (1969?) and *Pusher* (1971?). *For Adults Only* (1970) was an excellent series of dramatized vignettes stressing parent-child communication. *Us* (1971) was another fine film that showed the similarities among drug users from all walks of life.

Pills (1971, British) and *Up Pill, Down Pill* (1970) were primarily concerned with the abuse of prescription drugs by adults. *Tempted* (1971), though rather unrealistic in its presentation, showed the constant exposure to pills, alcohol, and marijuana of a grade-school child. Elementary school children were also the target of the excellent *What Do Drugs Do?* (1971) and the fair *Users-Losers* (1973?), *Who's Afraid?* (1972), and *What Would You Do?* (1971). A wide variety of techniques were used in the nine segments of the *Single Concept Films* (1971), each dealing with a different class of drug. The importance of the undrugged mind in dealing with the modern world was portrayed in *Your Amazing Mind* (1969) and in *Alcohol, Tobacco and Drugs vs. Physical Fitness* (1972). *A World of Dreams* (1967) contained lovely impressionistic sequences displaying the psychic effects of different drugs.

A subset of the modern drug-abuse films emphasized driving problems and most of these were also preoccupied with alcohol. *Alcohol and Drugs versus Safe Driving* (1967), *Alcohol, Drugs and Driving* (1968?), *Alcohol and Drugs* (1958), *Drugs, Drinking and Driving* (1970), *Driving and Drugs* (1968), *Ninety-nine Bottles of Beer* (1972), and *Postmortem* (1967) are typical.

On Prescription Only (1960) and *Rx: Caution* (1960) are early representatives of a large group of films meant to educate the public to the importance of being careful in the use of prescribed medications. *Food and Drugs* (1968), *Prescription for Maryanne* (1971?), *Read the Label and Live* (1971?), *Take as Directed* (1970), *Sniffy Escapes Poisoning* (1967), and *Our Wonderful Body: Medicines, Drugs and Poisons* (1973) are a few of the many subsequent efforts.

Psychoactive drugs have figured in documentaries on the future of mind control. Chemical stimulation of the brain with "smart pills" was postulated in *Miracle of the Mind* (1969?) and chemical stimulation of the brain was featured in *Frontiers of the Mind* (1966). Concern over future brainwashing with chemicals and manipulation of emotions were prominent in *Farthest Frontier* (1967), but *Schizophrenia: Shattered Mirror* (1966) expressed optimism in the use of psychoactive drugs in the understanding and control of mental illness. Drugs were discussed in the



The Dormouse pops downers in *Curious Alice* (1972), a drug abuse film for children. Its careful and honest approach to the subject attempts to emphasize the negative aspects of drugs, but some viewers feel it is more likely to stimulate experimentation.

sophisticated survey of brain research *The Mind of Man* (1971). The use of drugs to control moods was examined in *Biochemedical Revolution: Moods of the Future* (1971).

Psychoactive drugs have also been discussed in such general treatments of drugs as *Drugs Through the Ages* (1967), *Drugs and Conquest* (1964), and *Bridge to Tomorrow* (1969?). An interesting historical account of the passage of the Pure Food and Drug Bill in 1906 is *Triumph without Drums* (1941).

Testimonials from former "addicts" on the horrors of dope have long been a staple of the drug abuse film repertory, but in recent years these have tended to become more balanced and sophisticated. *Anything for Kicks* (1970) has two teenagers rapping about their experiences with marijuana and heroin, and in *Narcotics and Kids* (1969) two females talk about their drug experiences with a class of sixth graders. *Narcotics: Why Not?* (1968) emphasizes heroin and includes scenes of incarcerated teenagers rapping about their reasons for doping. Teens chat about their experiences in *Crisis House* (1970) and *Grooving* (1970) and though much interesting material is presented in these films, like all testimonials these are somewhat biased and most fail to present adequate objective information to counter this bias. *Students Look at Drugs* (1970), *The Drug Scene* (1971), and *Flip Side* (1969) are similarly limited. The last film was released by Gospel Films, which was also responsible for the junkies-for-Jesus testimonial *High on Campus* (1970).

Up Front (1971), *A Nice Kid Like You* (1969), and *The Seekers* (1968) were more insightful and balanced than most offerings of this type. Two British films—*Drug Taking: Health Aspects* (1973) and especially Leacock Pennebaker's ninety-minute documentary *Dope* (1971), also known as *Head* and *Boors at Midnight*, had some excellent footage of young people rationalizing their drug use.

In the late 1960s there began to appear films that contained in-depth studies of individual drug users. *Becky* (1971) and *Tommy the Traveller* (1971) are typical. *Willy* (1971) and the dramatized *Rick* (1971) deal with the aftermath of drug busts and the friends, parents, and probation officers of the drug user. Ex-junkie and New York gang leader Nicky Cruz is featured in *No Need to Hide* (1971). The third of Kate Millett's *Three Lives* (1971) is twenty-one-year-old Robin Mide, who left home at the age of seventeen to get into drugs, sex, and theater. The Social Seminar Series, which includes some dozen films on various aspects of drug abuse, has four such profiles—*Tom*, *Bunny*, *Guy*, and *Teddy* (1971). *Tom* is a sympathetic portrait of a young lad who considers psychedelics a sacrament; *Bunny* is a UCLA junior with casual use of recreational drugs; *Guy* is a Chicano for whom reds, alcohol, and marijuana offer escape from barrio life; and *Teddy* discusses his reasons for not using drugs. *Sean* (1970?) is a four-year-old who talks about life in San Francisco's Haight-Ashbury district. He talks about being busted, speed freaks ("so skinny"), and prefers eating pot to smoking it. Truly a child of his times!

With the burgeoning of drug-treatment centers and rehabilitation programs there arose the need for films that elucidated the setting up and operation of such clinics and programs. *How to Initiate Drug Education Programs* (1970?), *Drug Abuse and Therapy* (1970), *Building a Drug Abuse Program* (1971), and *Here's Help* (1970) are typical. The last included commentary on the effectiveness of the various programs by those who had been treated in them and stressed the need for a variety of approaches. *Meeting* (1971) and *Community in Quest* (1971) emphasize the need to communicate across the generation gap in order to facilitate the functioning of community drug-prevention programs. *It Takes a Lot of Help* (1970), *The Y-riders* (1970), *What Can We Do?* (1971), and *Drug Talk—Some Current Programs* (1971) describe various programs around the United States.

Specific programs are detailed in *Treatment—New Teams* (1971), which displays the use of paraprofessionals for drug-related problems, and *Youth Drug Ward* (1968), which shows group therapy at San Francisco's Langley Porter Neuropsychiatric Institute. The therapeutic approach at Gateway House in Chicago, Illinois, is featured in *Not the Giant Nor the Dwarf* (1971), whereas *Marathon—The Story of the Young Drug Users* (1967) documents the thirty-hour encounter group sessions at New York's Daytop Village. Implementation of programs in individual towns are the subjects of *What Some Communities Are Doing* (1971, Alameda, Calif.), *Drug Abuse: A Call to Action* (1969, Greenwich, Conn.), *Community As Doctor* (1971, Pittsburg, Calif.), *Drug Abuse: One Town's Answer* (1970, Fort Bragg, Calif.), and *Eagleville: You're Not Alone* (1971, Philadelphia).

The operation of crises centers, which often deal with drug emergencies, is the subject of *Help* (1970), *Help Is Here* (1970), *Emergency Treatment of Acute Drug Overdose* (1972), and *What Did You Take?* (1971). The last of these is an excellent film of actual emergencies at the Beth Israel Hospital in New York City. The handling of drug crises by telephone is treated in *Crisis Intervention by Telephone* (1971?), *Crisis Intervention: Part 3—Drugs* (1972), and *Listening* (1971).

Another Approach

With the growing awareness that drug abuse was merely a symptom of social malaise, the emphasis gradually shifted from attacking the drugs as the beginning and end of the problem to attempting to understand and ameliorate the pressures that lead to drug abuse. There is also general acceptance of the psychedelics (LSD, mescalin, marijuana, and so on) as "soft" drugs that are not particularly threatening, and the realization that alcohol, heroin, and tobacco comprise the greatest threats to the individual and society. The following are some of the many films that treat drug abuse in such a context. Some of these films, especially the more recent, do not even mention drugs specifically. Examples of these films in roughly alphabetical order are:

Another Approach (1970?), *Assignment . . . the Future* (1973?), *Anybody Else Who's Listening* (1972?), *The Argument* (1969, *Any Questions, Any Answers?* (1971), *Almost Everyone Does* (1970), *The Better Way—Learning to Care* (1973?) and *Brian at Seventeen* (1971), which does not mention drugs, but instead focuses on the problems and prospects of a high school boy. *Easy Way Out* (1971) also has no drug information but draws an extended analogy between the struggles of chicks to hatch and the necessity for the struggles of adolescents for proper development. Similar themes dominate *Everybody's Going Where I've Been* (1971), *The Family* (1971), *Feeling Bad . . . Feeling Good* (1973?), *Feelings—That's What It's All About* (1971), *Forests of the Night* (1971), *From 5 to 7:30* (1972?), *Getting Through* (1969?), *Guidance*

for the 70's (1971), which is composed of three films in which teenagers talk about: (1) *Kids, Parents, Pressures*, (2) *Self-Esteem*, and (3) *Who's Responsible?*

Get High On Life (1971) also does not show drugs, but emphasizes the positive aspects of family life. *Hip Jean's Jeannie* (1973?), *Heads You Win* (1971), *I Just Can't Help It* (1973?), *The Inner Trip* (1968), and *The House That Jack Built* (1969) push personal responsibility. *I Think* (1970) shows all the influences on a ten-year-old girl's attitudes and behavior and her struggles to think for herself. *Holy Smoke* (1971) and *Is It Always Right to Be Right* (1970, narration by Orson Welles) are animations that encourage kids to create harmonious relationships with those around them.

Other films that emphasize the need to communicate needs and problems to parents and friends, the development of individualism, and ways of getting satisfaction and dealing with frustrations without drugs are *I Am* (1972), *Ivan and His Father* (1971), *Journey in Time* (1971), *Just One* (1973?), *Kick* (1969), *Lady Jane* (1971), *The Mask* (1971?), *The Need for Dialogue* (1971), *One Step Away* (1968), *Of Lemmings and Kings* (1971), *One in 20,000* (1969?), *One Plus One Equals 3* (1970?), *Outside Influences* (1972?), *The Quarry* (1971?), *The Two-Legged Space Ship* (1974?), *The Streets Where You Live* (1974?), *Snow in Summer* (1973?), *Styles* (1974?), *A Step from the Shadows* (1971), *That Which Was Lost* (1969), *Trigger Films* (1971?), *Two Festivals* (1972), *Time Pulls the Trigger* (1970?), *To Be a Man* (1969?), *Too Tough to Care* (1971?), *Up in Smoke* (1969?), *Verdict at 1:32 (1970?)*, *Will You Listen If I Speak?* (1971), *The Woburn Project* (1971), the *Turned on Crisis* series (eight films, 1972), the *Because We Care* series (six films, 1972), the *Nobody But* series (six films, 1972), the *Understanding Films—Social Seminars* series (*Why We Take Drugs*, *Another Viewpoint* and *A New Institution*, 1971), *The Ultimate High* (1971), and *Youth-Communications* (1971?).

Some novel approaches are provided by *Observing Ourselves* (1968) in which Krishnamurti discusses psychedelics; *Perception: Structure or Flow* (1973), in which the variations in perception of the world with culture, age, sex, and drugs are explored, and *Tripping* (1970) in which a group demonstrates gestalt sensory-awareness exercises as a way of turning on without drugs. *The Ringer* (1972) shows how kids are exploited and manipulated by adults and other kids, and stresses the need to develop self-reliance. *Self-Awareness Film Modules on Drug Abuse for Parents* (1971) shows how parents react when confronted with their children's drug use and *Self-Awareness Film Modules on Drug Abuse for High School Students* (1972) demonstrates three emotional situations resulting from drug use: (1) Fear (a drug bust); (2) Humiliation and Anger (a boy smokes marijuana), and (3) Compassion (a bad trip at a high school LSD party).

Self-Awareness Film Modules on Drug Abuse for Teachers (1971) is specifically intended for teachers who are shown confronting students over drug issues. Other films emphasizing the teacher's role are *What Is Teaching?*, *What Is Learning?* (1971), *Mr. Edler's Class: Drug Education at the Elementary Level* (1971), *Adult Awareness and Techer Sensitivity* (1971?), *Jordan Paul: One Teacher's Approach* (1971), and *A News Story* (1971), which is aimed at helping the teacher cope with the flood of drug-abuse information.

16 Television Discovers Drugs

Television sets became commonplace in the 1950s, and though there were a few programs concerned with drugs, such as the Confidential Telepictures programs on lysergic acid, barbiturates, and narcotics, it was not until the mid-1960s that television awoke to the possibilities. Drug topics began appearing frequently on talk shows, news programs, documentaries, and the many fictional serials. Before turning to the drug themes in serials, we deal with the nonfiction programs many of which were widely seen in the 16mm format and are discussed in the chapter on drug-abuse films.

Tea, Horse, and Crime

Most of the early television productions on drugs concentrated on heroin, with occasional reference to marijuana and other drugs. Public television was responsible for *Addiction Among Teenagers* (1956) and *Tea, Horse and Crime* (1957), and CBS produced the two-part program *The Addicted* (1958), and *The Business of Heroin* (1964). *The Chemistry of Behavior* (1963), *Dangerous Drugs* (1964), and *The Losers* (1965) were more general treatments of drug abuse. *Junky* (1964), *Synanon in Prison* (1966), *The Trip Back* (1969), and *The Most Adult Game* (1967) were concerned with rehabilitation, especially the Synanon program. The heroin scene and its relation to crime were featured on *Drugs in the Tenderloin* (1968), *Crime in the Courts* (1971), *Heroes and Heroin* (1971), and *They Get Rich from the Poor* (1970).

In spite of its system of heroin dispensing, Britain was developing a significant problem and its television programming reflected this. *The Opium Trail* (1966) and *Some Grains of Truth* (1967) exposed the heroin traffic, whereas *The Addict Alone* (1967), *I.T.N. Reports—Drugs* (1969?), *The Facts Are These: Fixed for Death* (1969), and *Gale Is Dead* (1970) revealed the problems of addiction. Other types of drugs were featured in *I'm Dependent—You're Addicted* (1972, prescription drugs), *New Drugs—Same Needle* (1968, methedrine), *Mother's Little Helpers* (1968, tranquilizers and amphetamines), and *Alas Poor Hippies, Love Is Dead* (1968, LSD and marijuana).

Talking About Drug Abuse

Drug experts were a natural for talk shows, and in 1967 at least half a dozen appeared to warn the public about the dangers of drugs. Dr. James Goddard, head of the Food and Drug Administration, discoursed on diet pills and other fads on "Your Dollar's Worth," and William Cunningham of the FDA and *Black Market Medicine* author Margaret Kreig occupied a July 1967 episode of "Doctor's News Conference." The same month Dr. Robert Baird discussed campus drug use on the "Mike Douglas Show," and Dr.

Jonathan Cole of the NIMH reviewed the use of drugs in the treatment and investigation of mental illness on "Medicated Society." The developing LSD subculture in San Francisco's Haight-Ashbury district was examined on many news programs such as the July 2, 1967, edition of the "Frank McGee Report," NBC's "From Runaway to Hippie," and CBS's "The Hippie Temptation." There were also showings of films on methods of treatment such as *Marathon* on the "Summer Focus." Timothy Leary gave psychedelics some rare favorable publicity with his appearance on the "Merv Griffin Show."

LSD was also discussed by Leary on a local show "LSD: Lettvin vs. Leary" (1967) and Lettvin carried on with "Professor Lettvin Tuned In" (1968). Leary again appeared on the NBC show "The Pursuit of Pleasure" (1967), and on the NET production "From Pot to Psychedelics" (1968). The public had been introduced to the therapeutic possibilities of LSD the preceding year with the CBS documentary *LSD: The Spring Grove Experiment. LSD: Trip to Where?* (1968), no the other hand, was a scurrilous attack on the substance, with no serious attention to its positive aspects. LSD was taken to task by "Night Gallery" creator Rod Serling on a frequently broadcast spot (one of many antidrug "commercials" seen during this period). Serling assured us that LSD was dangerous because we could never be certain just what it would do, but, of course, that was part of its allure. Serling died of heart disease not long after the last of these spots disappeared from the television screen. Some have speculated that if Serling had turned on, tuned in, and dropped out, he might be alive today.

Marijuana was the focus of attention in *Pot: The Current Scene* (1969), *World of the Weed* (1968), and *Marijuana* (1968)—an hour-long special on CBS News. Other programs began focusing on the drug problem in general. Typical of these were *The Allure of Drugs* (1969), *The Pharmacology of Drugs* (1969), *Drugs: A to Z* (1969?), *Drugs in Middle America* (1970), and *Trip to Nowhere* (1970).

Soon, everyone was getting into the act. In the next few years such diverse personalities as Robert Mitchum and Margaret Mead descanted on marijuana on the "Dick Cavett Show." By 1972, heroin once again began to occupy center stage with "Should We Decriminalize Heroin Addiction" being the topic of debate on "Head On," and "Speak Out" featured Lt. Jack Kerrigan of the San Francisco Police Department Narcotics Detail, and others, talking about heroin dispensing. William Champin, author of *Wasted: Story of My Son's Drug Addiction* was a guest on "San Francisco Today" and attorney Whitney North Seymour discussed his book on the narcotics crisis on "Today." Psychologist Allen Cohen gave his views on the "Phil Donahue Show" and even children's programs, such as "Take a Giant Step" had teenagers regaling the bubble gum set with the problems of kicking the drug habit. Drug abuse among the young was the topic of numerous other programs of 1972 including "What Every Woman Wants to Know" and the religiously oriented "This Is the Life."

We then were provided hot debates on the effects of marijuana and its possible legalization. Rabble-rouser William F. Buckley, Jr., seems to have led the field with a 1970 debate between Deputy Attorney General Richard Kleindienst and John Kaplan, author of *Marijuana: The New Prohibition*. A 1972 episode of "Meet the Press" spotlighted two members of the National commission on Marijuana and Drug Abuse, which ultimately produced a report favorable to the legalization of marijuana. Barbara Walters hosted various drug luminaries on a five-part series on marijuana on "Not for Women Only" in 1975. Later that year, NBC produced a special, *Mary Jane Grows Up*, which attempted to examine objectively the question of marijuana from a variety of viewpoints.

Pregnant junkies and their addicted babies were highlighted on ABC's *The Littlest Junkie* in 1973. Programs directed at very young kids began appearing such as two episodes in the "Fat Albert" cartoon series in 1974, in which Bill Cosby spelled out the evils of narcotics and the gang was tricked into aiding a pusher, and the "New Zoo Review" (with songs "Drugs Help Man" and "Treat 'Em Right") the following year. Barbara Walters hosted a five-part series on the abuse of medical drugs during the 1975 season of her "Not for Women Only." Medically oriented programs on the "Take as Directed" series included several on psychoactive drugs and antidepressants, and tranquilizers and other drugs were discussed on the mental health series "Thin Edge" (1975). Merv Griffin ran a whole show on drugs in 1975 with DEA officials, psychiatrists, and former addicts.

Documentaries began to focus more frequently on dope. A 1974 edition of "Weekend" investigated drug trafficking in Holland and an "ABC News Closeup" of the next year covered the smuggling of aliens and narcotics into the United States from Mexico and Hong Kong. A 1976 program on "International Zone" documented the

flow of dope from Southeast Asia and the Middle East to the United States; another "Weekend" program dwelt on cocaine smuggling from Peru. *The Bronx Is Burning* and *Harlem* both were shown in 1975 and were incidentally concerned with addiction. It has also become possible to include material on drug use in film biographies, such as *I Regret Nothing*, a story of the Parisian chanteuse Edith Piaf.

One of the most interesting of the drug-oriented documentaries appeared in a May, 1976, segment of "David Niven's World." This was an exposé of opium smuggling undertaken by a group of French journalists in the tiny state of Pashtunistan, near the Khyber Pass. Technically a part of Pakistan (or Afghanistan, depending on to whom you are talking), the bullet and the dollar rule there and *everything* is for sale on the open market. Weapons are the biggest money makers next to dope and one tiny village factory turns out 300 pistols and 200 rifles per month, in addition to hand-made Browning machine guns. Stacks of hashish selling for $8 a kilo are shown in one small shop that sells three tons of the substance a year. But the main business of Pashtunistan is opium—200 tons a year from the country—about one-fifth of the total world production. The French team buys five tons of opium and arranges for it to be delivered to France! The cameras follow the opium caravan through the mountains and plains to the port of Dubai, but we are not informed of its fate thereafter. Niven says only: "Join us again next week for another story of real people doing exciting things around the world."

Cops and Robbers and Drugs

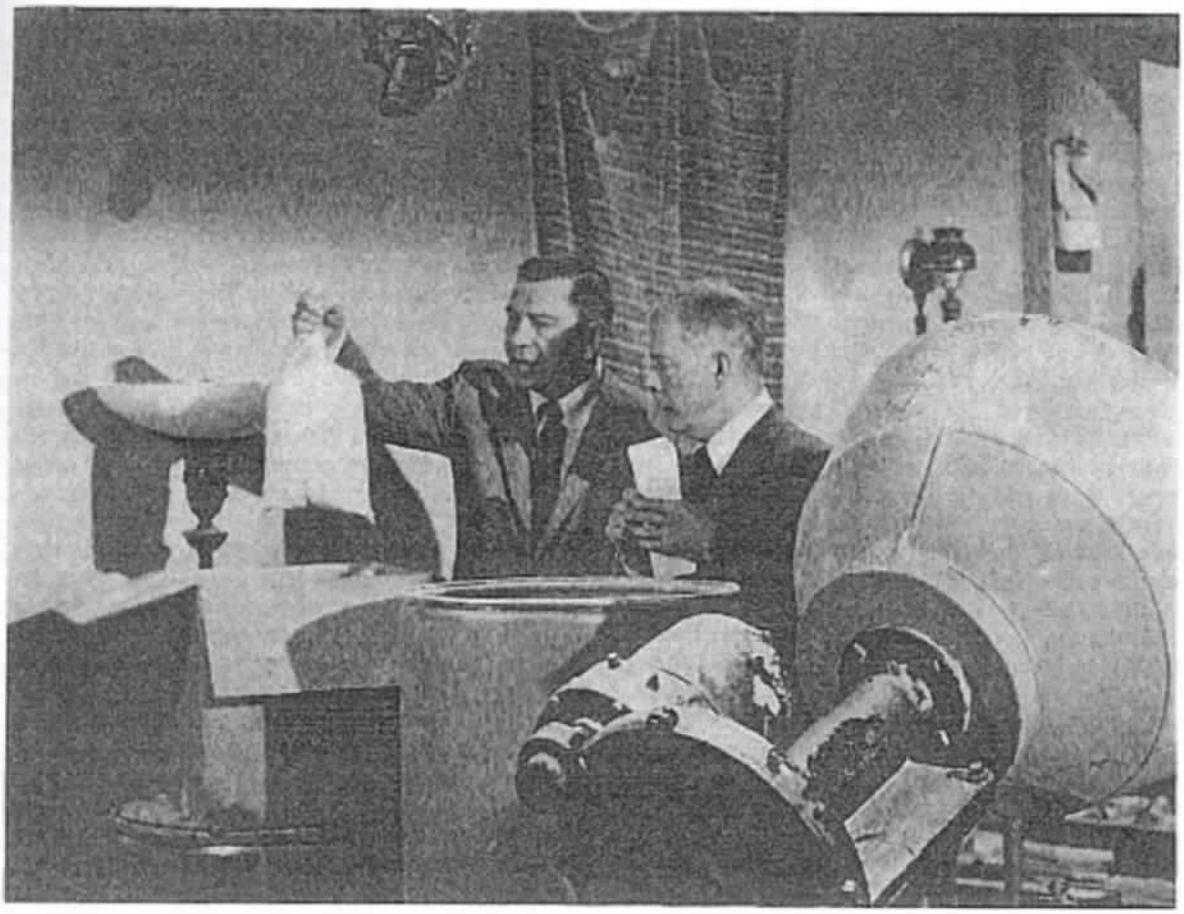
Crime dramas have naturally used drug trafficking and addiction as occasional plot elements, but as the 1970s rolled on, such themes came to be the bread and butter of harried television scriptwriters. We now consider, in alphabetical order, a few of the more popular television series that have had frequent drug episodes.

"Adam-12" is a mid-1970s series featuring a police team (Kent McCord and Martin Milner). Among their drug episodes are: a doped-up suicidal teenager, a neighborhood lad high on drugs, a narcotics theft from a drugstore, two children with their stomachs full of amphetamines, and ex-junkie suspected of robbery, a pilot flying a load of weed in from Mexico, an enterprising chap drying marijuana at a laundromat, and about a dozen cases of heroin dealing.

Jack Webb's "Dragnet" had many episodes on drugs and is specially favored by the contemporary drug crowd because its consistently outdated, narrow-minded, and fascistic approach has now rendered the show high-camp entertainment. The show included cases involving drugs in junior high school, a pot-detecting pooch, an addict-embezzler, a juvenile dealer ("Little Pusher"), a stoned-out teenager, and a whole family that found weed good and the law bad, but the favorite shows seem to be the one in which Sgt. Friday busts a member of his nightschool psychology class for grass, and another entitled "The Prophet," in which Friday gets his chance to debate the LSD issue. Every time the subject of drugs comes up Friday gives his standard spiel which runs something like, "I'm not here to judge whether it's good or bad, but it's against the law and I'm going to bust you for it." Fortunately, lawmen and women in the other series have usually shown more insight and sympathy with drug users. Webb was also responsible for the antihashish film *O'Hara: U.S. Treasury* (1971) with its equally peevish, right-wing propaganda.

"FBI" and "Harry O" were two series whose stars (Efrem Zimbalist, Jr., and David Janssen) were on close terms with the Nixon administration and its hard-line conservativism on drug issues. Among the drug cases on "FBI" were those of a man avenging himself on the syndicate for his daughter's drug overdose, a woman stealing stock certificates to feed her husband's heroin habit, a drug addict allegedly beaten to death by a cop, and a fugitive dope dealer (played by William "Capt. Kirk" Shatner). Janssen's work as private eye "Harry O" involved him at various times with a pregnant teenage addict on the run from killers, a young friend framed for narcotics dealing, a woman in a drugged state being controlled by a faith healer, and a young addict whose addict boyfriend is killed by pushers.

Hawaiian cop McGarrett (Jack Lord) has to contend with junkies ripping off tourists and a succession of nefarious stereotypes who try to slip heroin past customs via sky divers and scuba divers in "Hawaii Five-O." Raymond Burr's struggles with dope on television have been numerous. In his first series, "Perry Mason," Burr was a witness to a truth-serum-induced murder confession, but few other cases involving drugs. The subsequent series, known first as "Raymond Burr" and then as "Ironside" has many drug episodes, most of which concern heroin. One especially fine case featured Joseph Campanella as a heroin addict ("The Happy Dreams of Hollow Men"), and William Shatner was also excellent as a parole officer obsessed with



Jack Webb (*left*) and Harry Morgan raid an illegal drug operation in a 1970 episode of television's long-running *Dragnet*.

dope pushers in another episode. Forrest Tucker is a cop after the pusher who turned his daughter on to grass in one case, and Theodore Bikel finds his nephews using his tobacco shop for the preparation of synthetic marijuana in another show. Other investigations involve the wheelchair-bound Ironside with an elusive heroin dealer, a cop on the spot for killing a dope pusher, the drug scene among musicians, an actress killed with a heroin overdose, narcotics thieves, and youthful dopers.

Like Burr, Telly Savalas has had a very successful series as a cop who frequently tangles with drugs. "Kojak" lives beyond his means to trap a narcotics peddler, poses as a chemist to trap morphine hijackers, bargains to exchange narcotics evidence for a kidnapped woman, tries to clear his junkie nephew of the murder of a pusher, pursues a cop-killing narcotics thief, puzzles out the connections between a murdered police chemist and a cop in jail for removing heroin from the police lockers, and tries to nail an elusive drug dealer.

A 1967 episode of the long-running "Mission: Impossible" starred Martin Landau as a "crazy acid head who'll do anything to get the stuff," but he is just fooling and his LSD sugar cubes contain secret information. Landau is soon in the hands of the bad guys who assure him that "in this age of modern pharmacology, everyone talks," and they proceed to habituate him to a diet of 500 micrograms of LSD and three milligrams of heroin. Further adventures involved the IMF in trying to undermine a narcotics ring by pushing computer-made cocaine, in obtaining the secret of a drug that could enslave mankind, in retrieving a list of undercover narcotics agents, in undermining a dope ring, and in using drugs to brainwash agents.

"Mod Squad" attempted to appeal to the younger market with its hip language, modishly

dressed undercover cops, and contemporary themes, and drug cases were frequently involved. "The Connection" was a two-part sequence about a heroin ring, and Michael Ansara played a narcotics czar in another episode. A trailer park was a drug distribution center in one case and other mod squad cases involved Leslie Nielsen as a war correspondent involved with dope, Sammy Davis, Jr., as an ex-addict, Nehemiah Persoff as a cop after a sly dope pusher, and Bobby Sherman as a stable boy framed on a narcotics rap. Other cases revolved around peddlers who kidnap the girl friend of one of the squad members, and an ex-cop dealing dope.

One episode of "Police Story" follows a junkie's vengeful widow as she tries to smash the Mexican heroin syndicate, and another episode details the lives of three addicts. Drug-linked homicides are featured on two other programs and a third focuses on the problems of an undercover female narc. Another female cop wrestling with pushers is Angie Dickinson in "Police Woman," who at different times, tangles with thieves who steal a case full of heroin from the police, a speed dealer, smugglers selling $100,000 worth of marijuana, and heroin smugglers using commercial airlines. "Police Surgeon" Locke (Sam Groom) also nabs heroin traffickers, and in one case uses truth serum on Eddie Albert to discover whether he had committed a childhood murder.

Several folders in the "Rockford Files" tell of James Garner's pursuit of a murderer whose weapon is heroin and of Garner's being framed for drug possession. Hutch (David Soul) is captured by a mobster who plans to hook him on heroin to get information in a chapter of "Starsky and Hutch." Several other episodes have the pair tracking down narcotics gangs. Frank Gorshin plays a convicted drug dealer with lots of information about syndicate operations in one operation of "S.W.A.T." Karl Malden as tough cop Mike Stone chases up and down the "Streets of San Francisco" after pushers, encountering barrio dealers, dead agents, and countless junkies in half a dozen episodes.

In spite of the fact that Al Capone would not allow anyone in his organization to deal in narcotics, many segments of the "Untouchables," which was set in Prohibition-era Chicago, dragged dope into their plots. The 808 Club, a swank Chicago speakeasy, was depicted as a dope auction room in one chapter, with ten kilograms of pure heroin going for $50,000. Other cases involve a toy manufacturer whose dolls are stuffed with opium, a carnival that sells much stronger stuff than cotton candy, the jazz and dope scene in New Orleans, a respected businessman aiding drug smugglers, a dealer who threatens to blow up an elementary school unless Eliot Ness (Robert Stack) leaves his business alone, a narcotics gang that uses intimidation to keep the dope flowing, and a seizure of one of Frank Nitti's dope shipments. Ness keeps the pressure on in other adventures, disguising himself as a bookie to crack a drug ring, planting agents in another, and using the newspapers to make it hot for the drug ring in a third. All these dope stories are brought off with the competence that made the series a smash hit for a decade.

Drug episodes have occasionally appeared on other crime series, a few of which are catalogued here (in alphabetical order).

"Baretta" (Robert Blake) eludes the vengeance-seeking brother of a pusher he killed in one program, and Paul Williams plays a music store owner pushing heroin that is lethally pure in another. A boy dies when an ambitious father substitutes pep pills for a rival swimmer's medication on "Barnaby Jones," whereas an episode of the "Blue Knight" included a heroin overdose, a cocaine addict, and a pill-pushing parolee. A typical day in the life of the lawyers on the "Bold Ones" included a narcotics possession charge and "Caribe" runs afoul of drug dealers several times. Burt Reynolds fans were treated to an early (1970) view of their hero in the "Love Is a Nickel Bag" chapter of "Dan August." Burt is so enraged at the heroin death of a sixteen-year-old that he forces a young addict through "cold turkey" withdrawal to get the name of the pusher. One of the earlier trip episodes on police dramas was featured in the "Bad Blood" chapter of "Dr. Simon Locke."

Phil Silvers gets in the way of Teresa Graves's attempt to solve a drug case in "Get Christie Love!" Bill Cosby is exchanged for $3 million worth of heroin belonging to Hong Kong smugglers on "I Spy." Lloyd Bridges infiltrates a Mexican narcotics syndicate and pursues a slippery dealer in two episodes of "Joe Forrester." "Madigan" (Richard Widmark) follows a deported gangster with information on the heroin trade to Italy in "The Naples Beat" segment of that series, whereas "Mannix" (Mike Connors) exchanges prisoners with a cornered drug gang. "Matt Lincoln" (Vince Edwards) tries group therapy in an attempt to reach a young addict in a 1970 episode. Blind detective "Longstreet" (James Franciscus) has a stickier problem: someone injects him with a hallucinogen and strands him on a deserted ship.

The straight drama series of the 1970s were also not immune to an occasional bit of dope. Robert Stack, Julie Harris, and Sal Mineo were in a "Name of the Game" story about a troubled teenager trying to kick drugs, and another episode about youthful dopers included June Allyson and Van Johnson. "Kate McShane" defended a former junkie accused of giving a heroin overdose to a teenager and, in another story, a man killed a narc who was raiding the wrong house.

Pete and Mac fly to Casablanca to free a Peace Corps worker framed for smuggling hashish in "Switch." A man sues for custody of his daughter, claiming that her mother is an addict in a 1966 episode of "Divorce Court." Higher-class productions were Faulkner's "Requiem for a Nun" on the "Hollywood Television Theater" and Dorothy Sayers's "Murder Must Advertise" on "Masterpiece Theater." Originally written in the 1930s, the latter piece concerns a cocaine ring.

The various melodramas about hard-working, big-hearted doctors have frequently wrung a few tears with tales of drug-dominated patients. A staff psychiatrist is disturbed by a patient's confession under the influence of drugs in a 1966 episode of "Ben Casey." "Dr. Kildare" and his patient (Suzanne Pleshette) grapple with drug addiction in one of several 1967 stories dealing with dope. A child who has made a meal of phenobarbital was treated on "Emergency!" in 1972, and in 1975 "Dr." George Peppard treated a suicidal coed full of codeine. As with most television plots, those involving drugs have gradually been getting more sophisticated—recent episodes of the "doctor" dramas reflect this trend. "Robert Young, Family Doctor" becomes embroiled with a family torn apart by LSD, and "Medical Center" ran a story about a paroled child molester who must take a libido-inhibiting drug that may make him impotent.

Dope has even penetrated the precincts of Westerns and science fiction thrillers. A 1966 episode of "Rebel" starred Nick Adams as a cowboy who goes to the aid of an old army buddy who has become an addict. Robert Conrad traces a clue in a fortune cookie to smugglers of opium and Chinese on "Wild Wild West" and Barbary Red (Jill St. John) drugs and shanghais Nick Barkley on "Big Valley." "One Step Beyond" had its famous psychedelic mushroom chapter in 1963, and an "Outer Limits" episode a few years later showed a college professor transforming himself into a paranoid superman with a strange drug (very likely based on LSD and Timothy Leary). Gary Conway accidentally swallows toadstool spores and becomes a dangerous paranoid on "Land of the Giants." Even the "Invisible Man" has to tangle with a narcotics agent in one tale.

Psychedelics have also been fertile ground for comedy. In one episode of "Get Smart," Max and Agent 99 try to recover a stolen tranquilizer bomb from KAOS, and in another episode a mad scientist (Vincent Price) sends Washington, D.C., on a hallucinogenic trip. Herman takes a long-acting barbiturate and winds up on display in a museum on the "Munsters." A high school history teacher gets in trouble by joking about marijuana on "Room 222," and a chapter of "We'll Get By" revolved around pot smoking. Youth pills transform Darrin's boss into a child on "Bewitched." The judge arraigns two dentists high on laughing gas on "Sirota's Court," and the officers at the 12th precinct accidentally get smashed on hash brownies on "Barney Miller." "The Practice" manages to pull a few ever-so-feeble laughs from the doctor's treatment of a drug pusher.

Norman Lear successfully brought to the tube the first adult situation comedy, or surreal soap opera, with "Mary Hartman, Mary Hartman" and several episodes contained some honest and amusing drug scenes. Mary catches her teenage daughter Heather with a joint and later she and husband Greg decide to smoke it before going to a faith-healing session conducted by the boy evangelist the Reverend Jimmy Joe Jeeter (they laugh at the "wrong" times). Another episode shows a depressed Mary on pills. "I want my mood to be elevated—I took the Meprobramate and Elavil and Ritalin and Librium. . . . I took the Elavil and a little Desoxyn from Loretta who got it from one of the musicians at the studio and the doctor gave me methedrine . . . . I pity any girl who isn't me tonight." It was a beautiful rap and a joy to watch.

An Overview of Drugs on Television

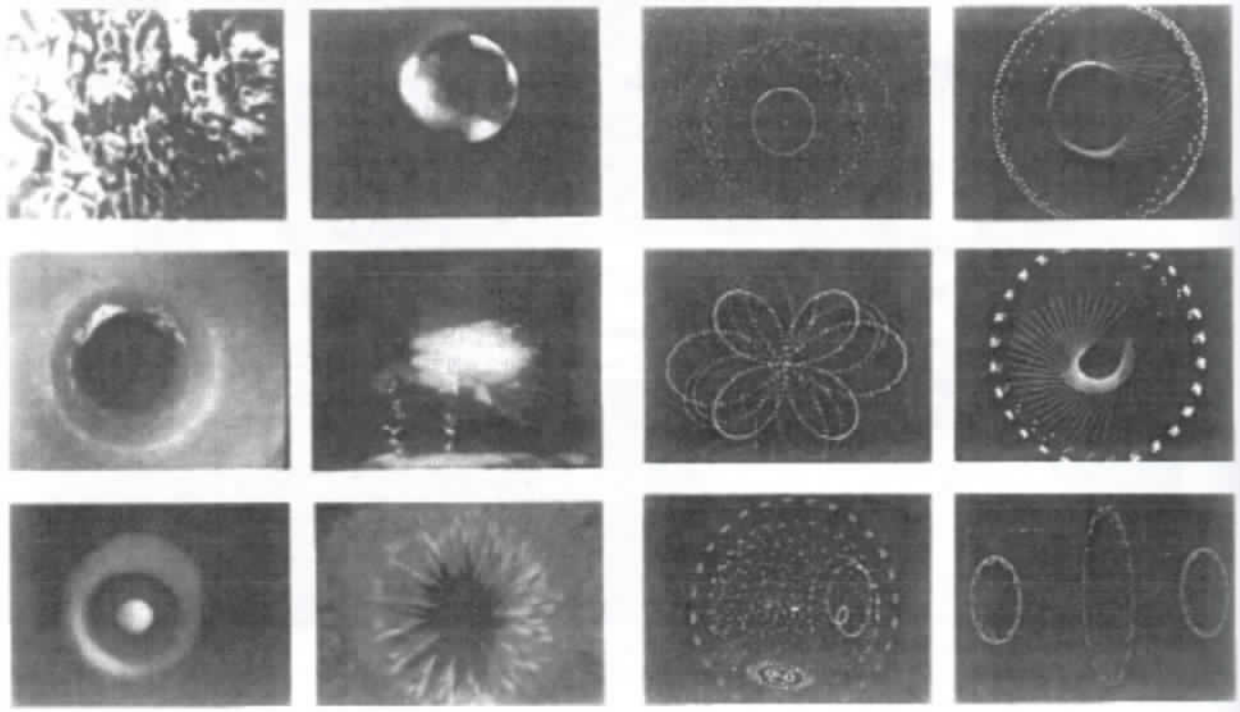
Although the foregoing gives some idea of the extent of drug themes on television it barely scratches the surface. There are at least ten times as many programs that had psychoactive drugs as a significant theme. Futhermore, as with the cinema, art, and music, psychedelics have had such significant effects on television that it is no longer possible to discern their boundaries. From the beginning of the 1960s, psychedelics have been closely associated with pop music and the television pop music shows are still the entertainment form in which their effects are most easily

and consistently discernable. But the flashy clothes, sets, and camerawork are seen with increasing frequency on other types of programs. Also, the stoned humor that was once limited to underground comic strips, comedians, and films has become very common on television. The same applies to many other themes and ideas that were originally the province of the psychedelic generation—ecology, astrology, funky clothes, "spacey music," surrealistic and often intricate visual displays, handcrafts, a striving for informality and naturalness, and an accent on inner awareness and personal development. Of course, these were never the exclusive province of drug users, nor is it implied that psychedelics necessarily generated interest in these areas, but certainly the focus on these themes was an integral part of the psychedelic revolution. Psychedelics will continue to have a profound effect on the world and this will be increasingly evident in the media.

A drugs-and-sex exploitation film of the 1930s, *Cocaine* was the ancestor of hundreds of such films produced in the 1960s and 1970s.

Michael Sarrazin shoots speed to keep up with medical school as squeamish wife Jacqueline Bisset watches in *Speed Is of the Essence* (1971).

Donald Sutherland (*right*) as an LSD voyager in *Alex in Wonderland* (1970). Fellini's association with the film led critics to dub it *1½*.



The first psychedelic cinematography. Stills from Jordan Belson's *Samadhi* (1967, *left column*) and *Momentum* (1969).

Elliott Gould, Natalie Wood, Robert Culp and Dyan Cannon find that grass and mate-swapping mix well in *Bob and Carol and Ted and Alice* (1969).

George Peppard and Leslie Caron as beatnik stereotypes in *The Subterraneans* (1960) another Hollywood attempt to capitalize on the drugs-and-sex aura of the beat generation.

Though presenting heroin addiction in a very unpleasant light, *Dusty and Sweets McGee* (1971) received an R rating, so most of the kids it was supposed to reach couldn't see it.

Nicholson, Fonda, and Hopper arrive at the fatal cafe, in *Easy Rider* (1969). It captured the spirit of alienated, freewheeling youth well enough to be a box-office smash.

Sex and drugs in Russia. The lady lights a joint in *The Kremlin Letter* (1969).

Starlets relaxing with hookahs in Russ Meyer's *Beyond the Valley of the Dolls* (1970). All of Meyer's films are exotic, but this one had an unusual variety of drugs, sex, and perversion, and some consider it his masterpiece.

Cutting heroin with quinine in *The Panic in Needle Park* (1971). The masks are presumably to prevent overdose from heroin dust.

Birds of a feather take drugs and sex together in Russ Meyer's masterpiece, *Beyond the Valley of the Dolls* (1970).

Referring to the actual day of the raid, Leeds told of how Ford called her to ask permission to visit her new quarters. A little while later he called again and wanted permission to bring Mitchum with him. Soon afterward, she told Stanley, a man representing himself as a film reporter phoned her for an interview and she gave him her new address. Early in the evening Ford phoned that he'd be delayed but would be up later.

"'I was putting up Vicki's hair, and I was smoking a marijuana cigarette,' she told Stanley. 'Why didn't the cops who were outside watching, as I found out later, pinch me then? But they didn't. They waited till Mitchum got there. Vicki wasn't smoking that night, and I noticed when Ford and Mitchum came up and were smoking, Vicki kept away from them. I checked all the doors and windows and locked them all before Mitchum arrived.' Leeds added that while she, Mitchum, and Ford were smok-

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Film Index

Silent Films

Aaron's Rod (1923), 29
Absinthe (1913), 31
The Accursed Drug (1915), 22
Acrobatic Pills (1908), 27
The Adventures of Sherlock Holmes (1905), 40
The Affected Detective (1922), 37
After Death (1913), 28
After Many Years (1930), 24
After Midnight (1921), 19
The Air Mail (1925), 24, 34
Alcohol, the Poison of Humanity (1912), 30
Algy Tries for Physical Culture (1910), 27
Alkohol (1919), 31
Always the Woman (1922), 23
Der Andere (1913), 35
Attempted Nobbling of the Derby Favorite (1905), 22

The Battle Royal (1917), 31
The Beryl Coronet (1912), 40
The Bibulous Clothier (1899), 29
Big News (1929), 24
Bits of Life (1921), 19, 26
The Blue Eagle (1926), 24
The Border Sheriff (1926), 24, 34
Broken Blossoms (1919), 19
The Bully's Doom (1914), 27

The Cabinet of Dr. Caligari (1919), 15, 36, 49
The Case of the Doped Actress (1919), 19
Casey's Jumping Toothache (1909),26
Les Chevaliers du Chloroforme (1905), 28
Chicot, Dentiste Américain (1897), 26
China Slaver (1929), 24
Chinese Laundry (1894), 13
Chinese Laundry Scene (1894), 13
Chinese Opium Den (1894), 13
Chloroform Fiends (1905), 28
The Christmas Burglars (1908), 28
La Chute de la Maison Usher (1928), 28
Cigars or Nuts (1911), 28
The City (1926), 24
Il Cloroformio (1911),28
The Cloud Rider (1925), 24, 34
Cocaine (1922), 42, 53
El Cocaine (1930), 42
Cocktails (1928), 42
The Comet's Come Back (1916), 28
Conférence sur l'Alcoolisme (1912), 30
The Copper Beeches (1912), 40
Coppers and Cutups (1915), 43
Crashing Courage (1923), 24, 34
The Crazy Dope (1911), 27
The Crimson Stain Mystery (1916), 26
Cruiskeen Lawn (1922), 22
Crushing the Drug Traffic (1922), 22
Curse of Drink (1922), 31

The Dancing Powder (1908), (1911), 27
Dancing Tabloids (1909), 27
Dangerous Trails (1923), 20
Les Dangers de l'Alcoolisme (1899), 29
Daughters of the Rich (1923), 23
Daughters of Truth (1923), 23
Deceived Slumming Party (1908), 15
Le Delirium Tremens; ou, la Fin d'un Alcoolique (1907), 29
Dentist Scene (1894), 26
Dentiste (1897), 26
Determination (1922), 23
The Devil Within (1921), 20
The Devil's Assistant (1913), (1917), 22
The Devil's Masterpiece (1927), 24
The Devil's Needle (1916), 22, 79
The Devil's Profession (1915), 26
Dirty Work (1933), 29

Distilled Spirits (1915), 31
The Dividend (1916), 19
Dr. Brompton-Watts Adjuster (1912), 29
Dr. Colton (1894), 26
Dr. Jekyll (1917?), 35
Dr. Jekyll and Madam Hyde (1917), 35
Dr. Jekyll and Mr. Hyde (1897?), (1908), (1912), (1913) (1914), (1917), (1920), (1923), (1925)., 19, 35
Dr. Jekyll and Mr. Hyde Done to a Frazzle (1914), 35
Dr. Killem's Dope (1914), 22
The Doctored Beer (1906), 28
Doctor Pyckle and Mr. Pride (1925), 36
Dope Trade in Chinatown (1910?), 22
Dopo La Morte (1913), 28
The Drake Case (1929), 24, 61
I Drammi dell'Alcolismo (1909), 29
Drankersken (1914), 31
The Dream Pill (1910), 28
Dream of an Opium Fiend (1908), 13
Dream Street (1921), 41
Dreamy Dud (1915), 34
The Drifter (1929), 24, 34
Drifting (1923), 20
Drink (1907), 29
A Drink! (1907), 29
Drink!—A Great Temperance Story (1907), 29
Driven from Home (1927), 19
The Drug Monster (1923), 19
The Drug Terror (1914), 22
The Drug Traffic (1914), 22
The Drug Traffic (1923), 49
A Drunkard's Dream (1897), (1908), 29
The Drunkard's Reformation (1909), 29
D.T.'s or the Effect of Drink (1905), 29
The Duality of Man (1910), 35
The Dungeon (1922), 23
Duty First (1922), 20

East of Suez (1925), 22
East Side, West Side (1927), 24
East Street (1917), 22
The Electric Snuff (1913), 27
Elixiere des Teufels (1921), 28
Elixir of Bravery (1910), 27
The Elixir of Dreams (1909), 26
The Elixir of Life (1907), (1911), (1916), 27, 29
The Elixir of Long Life (1912), 29
The Elixir of Strength (1907), 27
The Elixir of Youth (1910), 27
The Enchanted Pills (1913), 28
Energizer (1908), 27
The Evils of Alcohol (1912), 30

Fabricants Clandestins de'Alcool (1908), 29
The Fake (1927), 24
The Fatal Appetiser (1909), 28
The Fatal Hour (1908), 28
The Female Swindler (1916), 28
The Foolish Matrons (1921), 23
For Love of Gold (1908), 28

Les 400 Farces du Diable (1906), 19
Frailty (1921),
Fricot Emulo di Sherlock (1913), 41
Frolicsome Powders (1908), 27
Fumeur d'Opium (1911), 13
Fun in a Chinese Laundry (1894), 13
The Further Mysteries of Dr. Fu Manchu (1924), 19

The Germ (1923), 22, 26
The Girl Who Didn't Care (1916), 22
Gontran Emule de Sherlock Holmes (1912), 40
Goody Goody Jones (1912), 25
The Graft (1915), 31
Grandfather's Pills (1908), 27
Grandma's Sleeping Draught (1912), 28
The Great Turf Mystery (1924), 22
The Great White Trail (1917), 22
The Greatest Menace (1923), 49
The Grey Dame (1909), 40

Halbblut (1913), (1919), 22
An Hallucinated Alchemist (1897), 29
Hallucination de l'Alchemiste (1897), 29
Hallucinations Pharmaceutiques (1908), 29
Ham and the Experiments (1915), 25
The Hand at the Window (1915), 23
Hands Across the Border (1926), 24, 34
Harbor Patrol (1924), 24
Hasher's Delirium (1906), 29
Have It Out My Boy, Have It Out (1911), 26
Heap Fun Laundry (1894), 13
Her First Cigarette (1903), 34
He's Got 'Em (1910), 30
We Went to See the Devil Play (1908), 29
Hexenlied (1919), 28
High on the Range (1929), 32
His Pajama Girl (1921), 24, 34
Histoire d'un Crime (1901), 29
Homlock Shermes (1913), 37
Un Horrible Cauchemar (1901), 13, 31
Horrible Hyde (1915), 35
The Horrors of Drink (1901), 29
The Hound of the Baskervilles (1914), 40
The House of the Lost Court (1915), 28
How Spotted Duff Saved the Squire (1914), 22
Human Wreckage (1923), 48
Der Hund von Baskervilles (1914), (1917), (1929), 41
The Hypnotic Spray (1909), 26

Idle Hands (1921), 19
In the Grip of the Vampire (1912), 26
Instantaneous Nerve Powder (1900), 27
Invisibility (1909), 29
The Isolated House (1915), 40
Les Ivrognes (1896), 29

Jack Spratt and the Scales of Love (1915), 28
Der Januskopf (1920), 36
Die Jagd Nach Der 100 Pfundnote (1912), 14

Java Head (1923), 20
The Jovial Fluid (1913), 27

Kissing Pills (1912), 25
Kleptomania Tablets (1912), 29

The Last Days of Pompeii (1913?), 26
A Late Guest (1910), 22
Laffing Gas (1914), 26
Laughing Gas (1907), 26
Laughing Powder (1911), 27
Leave 'em Laughing (1928), 26
Legally Dead (1923), 28
Lieutenant Daring R.N. and the Water Rats (1924), 24
Lieutenant Lilly and the Splodge of Opium (1913), 19
Lightning Bryce (1919), 28
The Lightning Raider (1919), 19
Liquid Love (1913), 26
The Little Girl Next Door (1916), (1923), 19
The Loaded Door (1922), 24, 34
London Nighthawks (1915), 23
London's Yellow Peril (1915), 19
The Loser's End (1924), 20
Love Charm (1914), 25
The Love Doctor (1917), 25
The Love Dope (1917), 25
Love Drops (1910), 25
Love Germs (1908), 25
Love and Goodfellowship Pills (1910), 25
The Love Microbe (1907), 25
The Love Potion (1911), 25
Love Spots (1914), 25
Love's Potion (1911), 25
Love Versus Science (1909), 28
Lucretia Lombard (1923), 23
Luke's Double (1916), 35
The Lurking Peril (1919), 19
Lust for Gold (1910), 28
The Lying Truth (1922), 24

McGuire of the Mounted (1923), 20
The Magic Jazz Bo (1917), 28
A Man Must Live (1925), 24
The Man Who Came Back (1924), 23
The Man with the Twisted Lip (1921), 19
The Master Key (1914), 15
Le Matelas Alcoolique (1906), 29
The Matrimonial Web (1921), 20
A Merry Night (1914), 31
Midnight Girl (1925), 24
A Midsummer Night's Dream (1909), (1913), (1917), (1925), 25
Miss Jekyl and Madam Hyde (1915?), 35
Miss Sherlock Holmes (1908), 40
Mr. Daly's Wedding Day (1915?), 22
Mr. Henpeck's Revolt (1909), 27
A Modern Cain (1925), 24
A Modern Jekyll and Hyde (1914), 35
Moderne Luster (1924), 22
Modern Love Potion (1910), 25
Modern Times (1936), 41, 176
Moonshiners (1904), 29
The Moonstone (1909), (1911), (1915), 28
La Morfina Indiana (1913), 22
Morfinisten (1911), 21, 53
Morpheus Mike (1917), 34
Morphia, The Death Drug (1914), 22
The Morphinist (1911), 21
Les Morphinomanes (1911), 22
Morphium (1919), 22
Mother Gets the Wrong Tonic (1913), 27
A Mother in Exile (1914), 22
Moulders of Men (1927), 24
Moveite, a New Hustling Powder (1910), 27
The Murder in Baker Street (1910), 40
The Musgrave Ritual (1912), 40
Mysteries of Myra (1916), 46
The Mysteries of New York (1915), 15
The Mystery of Boscombe Vale (1912), 40
The Mystery of Dr. Fu Manchu (1923), 19
The Mystery of Edwin Drood (1909), (1914), 15
The Mystery of the Leaping Fish (1916), 38, 41

The Narcotic Spectre (1914), 22
Narcotico Orientale (1914), 28
The New Exploits of Elaine (1915), 15
The New Pain Killer (1909), 29
Notch Number One (1924), 31

Officer 444 (1926), 26
Oh, My Aunt! (1914), 26
Oh, That Tonic! (1910), 27
One Thing After Another (1914), 26
L'Opium (1908), 13
Opium (1919), 15
The Opium Cigarettes (1914), 15
Opium Den (1894), 13
Opium Joint (1894), 13
The Opium Smoker (1914), 15
Opium Smokers (1894), 13
Opium's Dream (1906), 13
The Opium Smokers' Dream (1906), 13
The Opium Smugglers (1913), 15
Opiumhalen (1911), 14
Opiumkur (1920), 15
I Opiummets Magt (1916), 15
Opiumsdroemmen (1914), 15, 53
Outside the Law (1921), 19
Outwitted by a Child (1910), 28
An Overdose of Love Potion (1907), 25

The Pace That Kills (1928), 24, 42, 79
A Painless Extraction (1907), 26
Pauvre John; ou, les Aventures d'un Buveur de Whiskey (1907), 29
Pawned (1922), 23
Il Piccolo Sherlock Holmes (1909), 40
The Pillmaker's Mistake (1906), 28
Pills of Perils (1916), 28
La Pipe d'Opium (1912), 13
'Pin' Forte di Sherlock Holmes (1913), 40
A Pipe Dream (1905), 34
Pipe Dreams (1907), 34

The Pipe Dream (1915), 34
The Poetic Justice of Omar Khan (1915), 31
Le Poison de l'Humanité (1912), 30
Pompey's Dream (1909), 29
Popsy Wopsy (1913), 31
The Prince of Pep (1925), 24
Princess Nicotine: Or the Smoke Fairy (1909), 34
Professor Pecan's Discovery (1910), 27
Professor Rouff's Great Discovery (1911), 28
The Professor's Great Discovery (1908), 27
The Professor's Love Tonic (1909), 25
The Professor's Strength Tablets (1909), 27
The Professor's Twirly-Whirly Cigarettes (1909), 28
Prohibition (1915), 31
Puppet Love (1934), 31
Purple Dawn (1923), 20

Quarrel in a Chinese Laundry (1894), 13
Quicksands (1923), 24

Randin and Co. (1913), 28
The Rapid Powder (1910), 27
The Reigate Squires (1912), 40
Reputation (1921), 23
Rêve d'un Buveur (1898), 29
Rêves d'un Fumeur d'Opium (1906), 13
Rival Sherlock Holmes (1908), 40
Robert Hyde's Double Life (1910), 35
Robetta and Doretto (1894), 13
Row in a Chinese Laundry (1894), 13
Rube in an Opium Joint (1905), 13

The Sable Lorcha (1915), 28
Salome Craze (1909), 27
Satan (1912), 30
A Scandal in Bohemia (1921), 37
Schlom Vogelod (1921), 36
Setting Back the Hands of Time (1910), 27
Shadows (1922), 19
Shame (1921), 20
Sherlock Holmes (1916), (1922), (1909), 37, 40
Sherlock Holmes Baffled (1903), 40
Sherlock Holmes in the Gas Chamber (1908), 40
The Sherlock Holmes Girl (1913), 40
Sherlock Holmes in the Great Murder Mystery (1908), 40
Sherlock Holmes Par Rigadin (1911), 40
Sherlock Holmes Solves the Sign of the Four (1913), 40
Sight Seeing Through Whiskey (1907), 29
The Sign of the Four (1923), 37
Silver Blaze (1912), 40
Den Skaebnesvangre Opfindelse (1909), 35, 40
Sisters of Eve (1928), 41
Skedaddle Gold (1927), 24, 34
Sleepy Sam's Awakening (1910), 27
A Smart Set (1919), 19
A Smoky Story (1912), 31
Snuffy Stuff, Snuff (1914), 27
Son of the Sheik (1926), 31
Sowing the Wind (1921), 19
The Speckled Band (1912), 40
Speed (1917), 27
The Spy (1909), 28
Squeedunk Sherlock Holmes (1909), 37
The Stolen Heirlooms (1915), 28
The Stolen Papers (1912), 40
The Strange Unknown (1915), 26
The Strength That Failed (1914), 27
A Strong Tonic (1909), 27
A Studio Satire (1916), 26
A Study in Scarlet (1914), 40
Supreme Temptation (1916), 28
A Sure Cure (1914), 27
A Surprising Powder (1909), 25

Tearing Through (1925), 20
That Royle Girl (1925), 23
There Are No Villains (1921), 20
Those Who Dare (1924), 24
Through Thick and Thin (1927), 20
Thundergate (1923), 23
La Timidité Vaincue (1910), 27
The Top of the World (1925), 23
Traffic in Souls (1913), 22
Trailing the Counterfeiter (1911), 40
Les Trois Flacons de Gribouille (1910), 35
A Turkish Cigarette (1911), 34
The Two Powders (1912), 27
The Two Natures Within Him (1915), 36
The Two-Soul Woman (1918), 36

The Unfair Sex (1926), 22
The Untameable (1923), 36

The Valet Who Stole the Tobacco (1906), 28
Valley of Fear (1916), 40
The Vampire (1914), 22
The Vengeance of Edgar Poe (1912), 15, 26
Les Victimes de l'Alcoolisme (1911), 30
Les Victims de l'Alcool (1912), 30
The Visions of an Opium Smoker (1905), 13
Vision d'Ivrogne (1897), 29
Vogelod Castle (1921), 36
Voice of the City (1929), 24

The Warning (1915), 31
The Warning (1927), 20
Watching Eyes (1921), 22
Welcome Danger (1929), 24, 61
When the Mind Sleeps (1915), 26
When Quackel Did Hyde (1920), 36
While London Sleeps (1922), 42, 53
The Whispering Chorus (1918), 36
White Hands (1922), 23
The White Slave (1913), 22
White Slave Traffic (1913), 22
The White Slave Trade (1910), 22
Who Diggeth a Pit (1915), 28
Who Is the Man? (1924), 24
Wild Oats Lane (1926), 24
Wild Women (1918), 31
Winkey's Ruse (1914), 19
Winkle's Great Discovery (1913), 27

The Wise Witch of Fairyland (1912), 25
The Witch Woman (1920), 26
The Woman with Four Faces (1923), 24
A Woman's Vanity (1909), 28
The Wonder Powders (1910?), 27
Wonderful Marrying Mixture (1910), 25
Wonderful Pills (1909), 27
The Worldly Madonna (1922), 23
World Apart (1921), 19

The Yellow Claw (1921), 19
Yellow Contraband (1928), 24
The Yoke (1915), 23

Zandori's Secret (1914), 26
Zigoto et le Narcotique (1912), 30

Sound Films

Aaron Loves Angela (1977), 87
Abbott and Costello Meet Dr. Jekyll and Mr. Hyde (1953), 179,189
Abnormal (1966), 75
L'Abominable Homme des Douanes (1962), 72
Abominable Snowman (1957), 70
Acapulco Gold (1975), 115
Acapulco Gold (1977), 115
Acapulco Uncensored (1968), 122
Account Settled (1948), 71
Acid, Delirio dei Sensi (1968), 159
The Acid Eaters (1968), 157
Acosada (1966), 76
The Adult Version of Jekyll and Hyde (1972), 180
The Adventure of the Missing Rembrandt (1932), 79, 178
Adventures of a Young Man (1962), 81
Affair with a Killer (1967), 66, 67
After Many Years (1930), 71
After the Ball Was Over (1969), 159
Again (1966), 141
Alex in Wonderland (1970), 153
Alias John Preston (1955), 179
Alice in Acidland (1969), 122, 157
Alice's Restaurant (1969), 60, 87, 111, 184
All about Eve (1950), 190
All the Way Down (1968), 122
Altered States (1981), 164
The Ambushers (1967), 190
The Amsterdam Kill (1978), 68
Der Andere (1930), 179
The Anderson Tapes (1971), 70
Angel, Angel, Down We Go (1971), 161
Angel Unchained (1970), 120
Angeli Bianchi. . .Angeli Neri (1969), 115
Angels from Hell (1968), 119
Angels Hard As They Come (1972), 120
An Angel of Love (1968), 76
The Angry Breed (1969), 150
The Animal (1968), 122, 157
Animal House (1978), 119
Animal Love (1969), 76, 120
Annie Hall (1977), 119, 184
Anything Goes (1936), 176
The Ape Man (1943), 186
Appointment with Danger (1970), 75
Assassin of Youth (1935), 51, 102
Assignment Redhead (1957), 71
Asylum (1972), 87
Asylum for a Spy (1967), 149
At Folsom Prison (1973), 160
Atlantic City (1981), 184
Attack of the Mushroom People (1963), 140
A L'Aube d'un Monde (1957), 96

Baby, Light My Fire (1970), 122
The Baby Maker (1970), 111
The Babysitter (1969), 122
The Battle of Algiers (1966), 94
The Beast from 20,000 Fathoms (1953), 104
The Beat Generation (1959), 109
Beauty and the Beast (1946), 96
Bedside (1934), 80
Been Down So Long It Looks Like Up to Me (1971), 112, 151
Behind the Mask (1932), 61
Behind the Mask (1958), 87
Believe in Me (1971), 185
The Best House in London (1969), 93
Beyond the Valley of the Dolls (1970), 120, 163, 184
The Big Broadcast (1932), 176
The Big Cube (1969), 147
Big News (1930), 61
The Big Sleep (1946), 81
Bigger than Life (1956), 56, 163
Bike Boy (1967), 116
Birds Do It (1966), 189
Bite the Bullet (1975), 87, 95
Bitter Rice (1950), 182
Black Angels (1970), 176, 184
The Black Castle (1952), 188
Black Cat (1959), 182
Black Dragons (1942), 189
Black Gunn (1972), 69
Black Revenge (1970), 77
The Black Sleep (1956), 188
Blazing Saddles (1974), 188
The Blind Beast (1969), 187
Blood and Black Lace (1964), 72
The Blood of a Poet (1930), 83, 96, 97
Blood, Sweat and Fear (1975), 73
The Bloody Brood (1959), 64
Bloody Mama (1970), 86
Blow the Man Down (1968), 159
Blow Up (1966), 116
Blue Movie (1969), 116
Blue Sextet (1969), 157
Blue Sunshine (1977), 150
Bob and Carol and Ted and Alice (1969), 116
Bombs for Peace (1959), 186
Booby Trap (1957), 71
Borderline (1950), 106
Border Outlaws (1950), 62

Born to Win (1971), 84, 85
The Bowery at Midnight (1942), 80
A Boy . . . A Girl (1969), 151
The Brain Machine (1955), 71
Brand X (1973?), 118
Breakfast at Tiffany's (1961), 64
Brewster McCloud (1970), 118
The Brides of Fu Manchu (1966), 187
Brief Rapture (1952), 182
Broken Blossoms (1936), 91
The Broken Horseshoe (1952), 71
Bunny O'Hare (1972), 118
Bushido (1963), 174
The Busy Body (1967), 155

Cairo (1963), 81
Cairo Road (1950), 91, 123
The Camels Are Coming (1934), 91, 123
Camille 2,000 (1969), 88
Campus Confidential (1968), 122, 157
Candy (1968), 116
Candy Baby (1969), 159
The Candy Man (1969), 66
Cannabis (1970), 122
Caprice (1967), 154, 187
Captain Apache (1971), 163
Captain Milkshake (1970), 111
Captain Newman, M.D. (1964), 176
The Carey Treatment (1972), 87, 118
Carnal Knowledge (1971), 176
Carry On Nurse (1959), 190
Casino Royale (1967), 95, 123, 153, 190
Castle in the Desert (1941), 188
The Castle of Fu Manchu (1968), 93, 123
Catch-22 (1970), 86
Celebration at Big Sur (1971), 115
Chain Gang Women (1972), 122
Chandu the Magician (1932), 90
Chappaqua (1967), 60, 83, 115, 141
Charas (1975?), 109, 123
Charlie Chan in Shanghai (1935), 91
Chastity (1969), 111
Chelsea Girls (1966), 84, 151, 184
Les Chemins de Katmandou (1970), 89
Cherry, Harry and Raquel (1969), 120
Children of the Lotus Eaters (1970), 114
Chinese and Miniskirts (1968), 186
The Christian Licorice Store (1972), 116
Ciao Manhattan (1970?), 184
Cindy and Donna (1971), 121
Cisco Pike (1971), 57, 86, 114, 184
City of Beasts (1970), 75
City of Fear (1959), 64
Clay Pigeon (1971), 67, 84
Cleopatra Jones (1973), 69, 94
Cleopatra's Daughter (1960), 188
A Clockwork Orange (1971), 161
The Cobra (1967), 94
Cocaine: The Thrill That Kills (1939?), 177
Cocaine Cowboys (1978), 184
Cocaine Fiends (1939), 176, 177
Coffy (1973), 69
Cold Nose (1975), 184
Cold Sweat (1971), 72, 116
Come Back Baby (1968), 111
Come Back, Charleston Blue (1972), 69
Come Dream with Me (1969), 121
La Comédie du Bonheur (1939), 96
The Comic (1969), 182
Confessions of an Opium Eater (1962), 92
Confidential Report (1955), 63
The Connection (1962), 82
Conspiracy (1930), 61
Coogan's Bluff (1968), 116, 149
The Cool and the Crazy (1958), 63, 81
The Cool World (1964), 66, 83, 115
The Cop (1970), 73
Le Corniaud (1965), 72
La Corona Negra (1950), 96
Corridors of Blood (1962), 93, 190
The Creeper (1948), 189
Crescendo (1969), 87
The Crime of Dr. Crespi (1935), 188
The Crime of Dr. Forbes (1936), 80
The Crimson Cult (1968), 148
The Cross and the Switchblade (1970), 57, 72, 87
Crossfire (1975), 67
Crown Trial (1938), 189
La Cucaracha (1934), 102
Cult of the Damned (1971), 163
Customs Agent (1950), 62
The Cycle Savages (1969), 157

A Dandy in Aspic (1968), 87
Dangerous Charter (1962), 65
Dark Dreams (1972), 161
Date Bait (1960), 81
The Daughter—I a Woman, Part III (1970), 123
Daughter of Dr. Jekyll (1957), 179
Daughter of the Dragon (1931), 93
David: Off and On (1972), 85
The Deadly Game (1976), 68
The Deadly Organ (1967), 70
Dealing (1972), 60, 69, 112, 183
The Dean's Wife (1970), 157
Death in Small Doses (1957), 184
Death Is a Woman (1966), 71
The Deathmaster (1970), 115
The Deep (1977), 69
Decoy (1946), 189
Defiance (1976), 119
Depraved! (1967), 156
The Deserter (1971), 73
Le Desordre et la Nuit (1958), 88
Desperate Characters (1971), 150
Destination Fury (1964), 72
Detective Belli (1969), 73
The Devil and the Ten Commandments (1962), 76
The Devil's Daffodil (1961), 71
The Devil's Widow (1971), 163

The Diabolic Duchess (1964), 188
Diamond of the Andes (1968), 75
Diaries, Notes, Sketches (1969), 160
Dick Tracy Meets Gruesome (1947), 188
Dick Tracy's G-Men (1939), 189
The Dirty Hawk (1969), 76
Dirty Money (1972), 73
Dirty Work (1933), 189
Dirtymouth (1970), 84, 118
Discarded Lovers (1932), 79
The Discrete Charm of the Bourgeoisie (1972), 118, 183
Dishonorable Discharge (1958), 72
Disorder and the Night (1960), 72, 88
Doc (1971), ,95
Dr. Crippen (1963), 188
Dr. Frankenstein on Campus (1970), 118
Dr. Jekyll (1964), 180
Dr. Jekyll and Mr. Hyde (1932), (1941), (1973), 179
Dr. Jekyll and Mr. Mouse (1947), 182
Dr. Jekyll and Sister Hyde (1972), 180
Dr. Jekyll's Hide (1932), 182
Dr. Jekyll's Women (1965), 182
Dr. Jerkyl's Hide (1955), 182
Dr. Masher (1969), 123
Dr. Sexual and Mr. Hyde (1971), 180
Doctor's Wives (1971), 87, 188
$ (Dollars) (1971), 69, 154
Don't Just Lay There (1970), 76
Don't Look Back (1967), 115
Il Dottor Jekyll (1951), 180
Dottor Jekyll (1964), 180
Down and Dirty (1969), 122
Down River (1931), 71, 177
The Drake Case (1929), 61
The Dread Persuasion (1958), 63
Dreamy Love Bed (1969), 150
Drive, He Said (1971), 184
Drums of Fu Manchu (1940), 93
Dum Maro (1973), 109
Dumbo (1941), 103
La Duquesa Datholica (1964), 188
Dusty and Sweets McGee (1971), 57, 67, 85, 89, 112

The Eagle Has Two Heads (1947), 96
Easy Rider (1969), 57, 60, 66, 111, 145, 148
The Education of Sonny Carson (1974), 119
Egypte, O Egypte (1964?), 96
Electra Glide in Blue (1973), 118
Electric Ladyland (1972?), 115
The Electronic Monster (1958), 87
Emanuelle (1974?), 95
Embryo (1976), 87
Les Enfants Terribles (1950), 96
The Enormous Midnight (1967), 156
The Erotic Circus (1969), 185
Il Etait une Fois un Flic (1972), 114
Ever Been on a Trip? (1970), 159
The Evil Pleasure (1966), 76, 155
The Evil Weed (1972), 114, 163
Exit the Dragon, Enter the Tiger (1977), 68
The Exotic Ones (1968), 120
Experiment in Evil (1959), 182
The Exterminating Angel (1962), 70, 118

FM (1976), 119
The Face of Fu Manchu (1965), 93
Faces (1968), 174
Fahrenheit 451 (1967), 187
Fall Guy (1930), 61
Fall Guy (1947), 182
The Falling Man (1968), 118
Family Plot (1975), 164
Federal Agents vs. Underworld, Inc. (1948), 186
Federal Man (1950), 62
Feet of Clay (1960), 71
Felicia (1969), 121
Female Animal (1970), 156
The Female Bunch (1972), 77
Le Feu Follet (1963), 88
Fiend of Dope Island (1961), 109
The Filth Shop (1969), 76
The Filthy Five (1968), 76, 147
Fire over Africa (1954), 71
The Fire Within (1963), 88
Flash Gordon's Trip to Mars (1938), 103
Flashpot on 42nd Street (1972), 82
Fly Now, Pay Later (1969), 189
The Flying Squad (1929), (1932), (1940), 71
Fog (1965), 178
Footlight Parade (1933), 90
For a Few Dollars More (1967), 118
For Love and Money (1967), 156
For You Alone (1936), 80
For Your Eyes Only (1981), 73
Forbidden Cargo (1956), 71
Forty-Second Street (1933), 80
Le Fou du Labo 4 (1967), 190
Four for the Morgue (1962), 81
(Four Stars) (1967), 116, 151
Foxy Brown (1973), 69
Fragment of Fear (1970), 87
Franchesca's Sexual Whirlpool (1967), 76
Franchette: Les Intrigues (1969), 77
Frankenstein (1931), 60, 61, 79
Fräulein Doktor (1968),
Free Grass (1969), 130, 149
Free Love Confidential (1967), 122
The French Connection (1971), 67, 182
French Connection 2 (1975), 85
Fritz the Cat (1972), 114
From Istanbul: Orders to Kill (1965), 73

Gang vs. Gang (1962), 74, 92
The Gang's All Here (1943), 101
Gazon (1970), 163
The Gazebo (1959), 188
Das Geheimnis der Gelben Narzissen (1961), 71
Die Geliebten von Dr. Jekyll (1965), 182

The Gene Krupa Story (1959), 57, 106
Gentleman Jekyll and Driver Hyde (1950), 182
Get Christie Love! (1974), 69
Getting Straight (1970), 112
The Giant Spider Invasion (1975), 118
Gigi Goes to Pot (1970), 121
Gimme Shelter (1970), 60, 115
Ginger (1971), 76, 122
The Girl in Cold Boots (1968), 66
Girl in the Headlines (1963), 71
The Girl of Tin (1970), 88
The Gladiator (1938), 189
A Global Affair (1964), 176
Go Ask Alice (1973), 85, 114, 183
The Goddess (1958), 174
The Godfather (1972), 69
The Golden Blade (1953), 123
Gold Diggers of 1933 (1933), 51, 101
Golden Triangle (1975), 95
Goldfever (1965), 159
Good Little Bad Girl (1970), 123
Good Times (1967), 111
Gordon's War (1973), 69
The Grasshopper (1970), 86, 116, 120
Die Graue Dame (1939), 179
Groove Tube (1974), 118
Groupie Girl (1970), 122, 157
Groupies (1970), 115
La Guerre de l'Opium (1941), 91
Guess What Happened to Count Dracula? (1970), 115
Guess What We Learned in School Today? (1971), 121
Gumshoe (1971), 72
Gutter Trash (1969), 122, 158, 184

The H-Man (1959), 73
Hallucination Generation (1966), 116, 141
Hammer (1972), 69
Handle with Care (1935), 189
Hang Loose (1970), 76
The Happiness Cage (1972), 87
Harbor Light Yokohama (1968), 75
The Hard Road (1970), 87, 122, 157
The Harder They Come (1973), 114
Hare Rama, Hare Krishna (1970?), 109
Harold and Maude (1971), 176
Harper (1966), 86
Harry in Your Pocket (1973), 184
Haschich (1967), 123
A Hatful of Rain (1957), 57, 81
Haunts of the Very Rich (1972), 163
Head (1968), 111, 112
The Heart Within (1957), 71
Heat Wave Island (1969), 75
The Heat Wave Lasted Four Days (1974), 67
The Hell with Heroes (1968), 63, 66
The Hellcats (1969), 66, 86, 120, 150
Hell's Angels on Wheels (1969), 119
Hell's Bloody Devils (1971), 120, 150
Help Wanted Female (1968), 158
Hemp for Victory (1942), 104
Hentai (1966), 75
Hercules Pills (1960), 189
A Hero Ain't Nothin' but a Sandwich (1978), 87
Heroes for Sale (1933), 80
Heroina (1965), 66, 83
High (1969), 111
High and Low (1962), 74
The High Powered Rifle (1960), 65
High School Confidential (1958), 57, 63, 77, 81, 105, 107-109
Highly Dangerous (1950), 187
Hip, Hot and 21 (1967), 76
Hippie Hollywood: The Acid-Blasting Freaks (1967), 159
The Hippie Revolt (1967), 115, 159
Hit (1973), 69
Hold That Line (1952), 189
El Hombre y la Bestia (1951), 180
Home to Danger (1951), 71
The Honey Pot (1967), 174
Hong Kong Affair (1958), 92
The Honkers (1972), 118
Honky (1972), 69, 121
The Hooked Generation (1968), 67, 111, 150
Horrors of the Black Museum (1959), 179
La Horse (1969), 72, 89
Hospital (1970?), 164
The Hot Bed (1965), 77
The Hot House (1970), 122
Hot Sex Tramp (1969), 76
The Hound of the Baskervilles (1932), (1939), (1959), 178
House of Fright (1960), 179
House of 1,000 Dolls (1967), 188
The House of the Sleeping Virgins (1968), 189
House of Wax (1953), 176
The House on the Waterfront (1955), 72
How to Make a Monster (1958), 190
Human Target (1971), 75
Humo de Marihuana (1967), 109
Der Hund von Baskervilles (1936), 178
Hungry Wives (1973), 121
The Hunting Party (1971), 118
Hysteria (1965), 163

I'm a Groupie (1970), 120, 157
I Became A Criminal (1947), 71
I Drink Your Blood (1971), 158
I Feel It Coming (1969), 121
I Love You, Alice B. Toklas (1968), 60, 111, 153
I Love You, I Kill You (1971), 186
I Mobster (1959), 64
I Monster (1971), 179
I Want to Live (1958), 81
I Was a Teenage Werewolf (1957), 187
Ice (1970), 87
Imago (1970), 121
Images d'un Monde Visionnaire (1967), 164
The Immoral Mr. Teas (1958), 189
In (1969), 111
In Search of America (1971), 114
El Inab el Mur (1965), 123
Incident at Midnight (1963), 71

Incident in Saigon (1960), 72
Incident on a Dark Street (1973), 70
Infrasexum (1969), 122, 157
The Initiation (1968), 76
International House (1933), 51, 90, 101
The Invincible Brothers Maciste (1964), 186
An Invitation to Jail (1967), 75
Invitation to Ruin (1968), 76
The Invisible Man (1933), 176
Is This Trip Really Necessary? (1970), 158
The Island Monster (1953), 72
Isle of the Snake People (1968), 148
It Won't Rub Off Baby (1967), 83

The Jekyll and Hyde Portfolio (1971), 182
La Jena de Londra (1964), 190
Jennifer on My Mind (1971), 85, 114, 123
The Jesus Trip (1971), 77
Jigsaw (1968), 147
Joe (1970), 114, 116, 184
Johnny Rocco (1958), 63
Johnny Stool Pigeon (1949), 55, 62
Johnny, You're Wanted (1956), 71
Judgment Deferred (1952), 71
Juliette De Sade (1969), 156
Just Once More (1962), 88

Kalabog en Bosyo (1959), 190
Kaleidoscope (1966), 66
Kama Sutra (1969), 122, 157
Kamikaze Cop (1970), 75, 118
Kenshin (1962), 74, 92
Key Witness (1960), 109
The Kill (1968), 76
Kill the Night Rose (1966), 75
Killer Ape (1953),186
Kiss, Kiss, Kill, Kill (1965), 186
Kiss the Dead (1958), 72
Klute (1971), 86, 118
Knockout Drops (1957), 189
Kona Coast (1968), 87
Krakatoa, East of Java (1969), 95
The Kremlin Letter (1970), 123
Kwaheri (1964), 115

The Lady and the Monster (1944), 70
Lady Sings the Blues (1972), 84
The Lady Vanishes (1938), 187
The Last Detail (1973), 118
Last House on the Left (1972), 87, 122
The Last of the Mobile Hotshots (1970), 116
Last of the Red Hot Lovers (1972), 188
Last Summer (1969), 114
Last Summer Won't Happen (1969), 115
The Late Liz (1972), 176
Late Night Final (1954), 71
The Law (1974), 118
Law of the Outlaw (1971), 174
Left-Handed (1973), 122
The Legend of Lylah Clare (1968), 87
Lenny (1975), 84
Lenny Bruce (1967), 84
Lenny Bruce without Tears (1972), 84
Let No Man Write My Epitaph (1960), 65
Let's Play Doctor (1964), 76
The Letter (1940), 91
Libertina 90 (1971), 141
Like It Is (1970), 122
Lila (1968), 157
The Lineup (1958), 63, 64
Lions Love (1969), 111
Little Giant (1933), 176
Live and Let Die (1973), 94
Living Dangerously (1936), 71
The Living Dead (1934), 187
The Living Ghost (1942), 186
The Lizard in Woman's Skin (1971), 148
London in the Raw (1964), 87
A Lone Assassin (1972), 75
Long Day's Journey into Night (1962), 81
Looking for Mr. Goodbar (1977), 119, 184
Love Factory (1965), 122
Love Is a Four Letter Word (1970), 157
The Love-ins (1967), 111, 143
Love Is a Carousel (1970), 151, 159
Love Is a Woman (1967), 71
The Love Robots (1965), 75
The Love Statue (1966), 155
Love Thy Neighbor and His Wife (1970), 122
The Lovemakers (1970), 123
LSD, \$5 Paradise (1968), 159
LSD, Viaje al Terror (1967?), 159
Lupe (1966), 174
The Lusting Hours (1967), 156

Machine Animal (1970), 150
McCabe and Mrs. Miller (1971), 95
McQ (1974), 67
Mad Dogs and Englishmen (1971), 115
The Mad Genius (1931), 79, 176
The Mad Ghoul (1943), 186
Mad Monster Party (1967), 182
Madame Sin (1971), 187
Mädchen für die Mambo Bar (1968), 73
The Magic Christian (1970), 111
The Magic Garden of Stanley Sweetheart (1970), 112, 116, 184
Making It (1971), 114
Mako, the Bad Girl (1971), 114
Malaga (1954), 71
Male and Female Sexuals (1960), 158
Man and Child (1957), 72
The Man and the Beast (1951), 180
A Man from Abashiri Jail (1966), 75
Der Man der Sherlock Holmes War (1937), 178
The Man Who Died Twice (1958), 63, 64
The Man Who Turned to Stone (1957), 189
The Man with the Golden Arm (1955), 56, 60, 81
The Man with the Twisted Lip (1951), 92, 178
Mangu (1955), 186

Manji (1964), 174
Mantis in Lace (1968), 157
The Marcus-Nelson Murders (1973), 86
Mariguana (1936), 102
Marijuana-The Green Monster (1936), 102
Marihuana: Weed with Roots in Hell (1936), 52, 55, 80, 102
Mariposas Negras (1953),
Marjoe (1972), 115, 151
Mark of the Vampire (1957), 189
Maryjane (1968), 81, 109, 111, 123
M●A●S●H (1970), 116
The Mask of Fu Manchu (1932), 90
The Masquerader (1933), 80, 90
The Master Beater (1969), 76
The Master Plan (1954), 186
Matango (1963), 140
Maybe I'll Come Home in the Spring (1970), 114, 151
Medicine Ball Caravan (1971), 115, 184
Miao Year (1968), 95
Mickey's Garden (1935), 186
Mid-day Mistress (1968), 159
Midnight Cowboy (1969), 163
Midnight Express (1978), 125
A Midsummer Night's Dream (1935), (1959), 59, 67, 68, 69
Mighty Mouse Meets Jekyll and Hyde Cat (1951), 182
Millionaire's Woman (1969), 121
Mio Amico Jekyll (1960), 180
Mission Stardust (1968), 123
Mr. Arkadin (1955), 63
Mr. Mari's Girls (1967), 76, 156
Mitchell (1975), 68
The Model Murder Case (1963), 71
Mondo Ballordo (1964), 93, 182
Mondo Hollywood (1967), 115, 159
Mondo Mod (1967), 115, 159
Mondo Teeno (1967), 115, 159
The Money Trap (1966), 66
Monkey Business (1952), 189
Monkey on My Back (1957), 57, 81
The Monkey's Uncle (1965), 189
Monster on the Campus (1958), 104
Moonshiner's Woman (1968), 122, 157
The Moonstone (1934), 190
More (1969), 73, 89, 111, 153
Morire Gratis (1968), 72, 114
Morituri (1965), 86
Moro Witch Doctor (1964), 93
Il Mostro dell'Isole (1953), 72
Mother Goose a Go-Go (1966), 153
Mother, Jugs and Speed (1976), 186
Movie Star American Style, or, LSD, I Hate You (1966), 141
Mozambique (1965), 71
El Mundo de las Drogas (1963), 109
Murder at the Baskervilles (1936), 178
Murder at the Vanities (1934), 51, 101
Murder by an Aristocrat (1936), 80
Murder or Mercy (1974), 70
My Friend Dr. Jekyll (1960), 180
My Name Is Julia Ross (1945), 186
My Sister's Business (1970), 121
My Third Wife George (1968), 157
The Mysterious Dr. Fu Manchu (1929), 93
The Mysterious Mr. M (1946), 186
The Mystery of Edwin Drood (1935), 91

Die Nacht der Zwolf (1945), 174
The Naked Zoo (1970), 77, 157
Narco (1971), 89
The Narco Men (1967), 72, 73
Narcotic (1937), 80
The Narcotic Story (1958), 56
Naso Freddo (1975), 184
Naughty Dr. Jekyll (1973?), 180
The Neanderthal Man (1953), 189
New Orleans After Dark (1958), 63
Next! (1970), 187
Night Affair (1958), 88
Night Call Nurses (1972), 185
Night Crossing (1957), 87
Night of Terror (1933), 101
The Night of the Following Day (1969), 87
Nightmare in Wax (1969), 188
No Drums, No Bugles (1972), 163
None but the Lonely Spy (1964), 72
Not My Daughter (1970), 122
Notorious (1946), 187
The Nude Restaurant (1967), 116
The Nutty Professor (1963), 180

The Oblong Box (1969), 188
The Obscene Couch (1963), 155
The Oblong Couch (1963), 155
Obsessions (1970), 114
Oh, Boy! (1938), 189
O'Hara: U.S. Treasury (1971), 125
Okefenokee (1959), 64, 66
Olga's Girls (1964), 76
Olga's House of Shame (1964), 76
Omar Khayyam (1957), 123
$100 a Night (1968), 73
One Spy Too Many (1966), 141
1,000 Convicts and a Woman (1971), 122
One Way Ticket to Hell (1955), 81, 106
Operation Cobra (1971), 125
Operation Hong Kong (1964), 72
Operation Mad Dog (1964), 74, 75, 93
Operation X-70 (1972), 186
Opio (1949), 91
The Opium War (1941), 91
The Opium War (1978), 95
The Organization (1971), 69
Orgasmo (1968), 145
Orgy Girls '69 (1968), 120
The Orientals (1968), 94
Orpheus (1950), 96
OSS 117: Mission for a Killer (1965), 199, 186
El Otro Fu Manchu (1945), 93

Outland (1981), 186
The Owl and the Pussycat (1970), 116

Pacto Diabolico (1968), 180
Pagal (1941), 190
Palace of Nudes (1964), 72
Pale Flower (1964), 75
The Paleface (1948), 190
Pamela, Pamela You are . . . (1968), 157
The Panic in Needle Park (1971), 57, 67, 84, 85, 119
Panic in the Year Zero (1962), 81
Paranoia (1968), 147
Paris Blues (1961), 182
Paris When It Sizzles (1964), 182
The Party (1968), 116
Peddlers of Sin (1966), 76
Peddlers of Evil (1966), 76
The Penthouse (1967), 122
The People Next Door (1970), 114, 151
Performance (1970), 114
Phaedra (1962), 174
Pickup Alley (1957), 71
Pictures of an Imaginary World (1967), 164
Le Pillole di Ercole (1960), 189
The Pink Panther Strikes Again (1976), 190
The Pink Pussy (1966), 76
Placer Sangriento (1967), 70
Play It Again, Sam (1972), 116
The Playpen Girls (1967), 119
The Pleasure Game (1970), 121
Poison Belt (1935), 178
Police Nurse (1963), 81
The Poppy is also a Flower (1966), 66, 86, 94
Pornografi (1966), 76, 135
Port de Désir (1955), 72
Port of New York (1949), 62
Port of Revenge (1961), 71
Portratt of Jason 1967), 115
El Precio del Demonio (1958), 180
The President's Analyst (1968), 123, 154
Pretty Baby (1978), 95, 184
The Priest's Wife (1970), 176
Prime Cut (1972), 70
Private Duty Nurses (1972), 70
The Private Life of Sherlock Holmes (1970), 179
The Producers (1968), 150
Professor Lust (1967), 161
Prostitution (1959), 88
La Prostitution (1959), 72, 88
Prowl Girls (1968), 76, 120
Psychedelic Sex Kicks (1967), 122, 156
Psych-Out (1968), 111, 144, 145
Puppet on a Chain (1970), 64, 72, 116
Pure Shit (1977), 85
The Pusher (1937), 103
The Pusher (1965), 66, 83
Putney Swope (1969), 118
Puzzle of a Downfall Child (1970), 188

Queen Bee Strikes Again (1971), 75

Rachel, Rachel (1968), 176
Radar Patrol vs. Spy King (1950), 186
The Red Angel (1966), 75
Red Handkerchief (1964), 75
Reefer Madness (1936), 55, 102
Release (1972), 89, 160
Remember? (1939), 190
Report from Millbrook (1966), 160
Report to the Commissioner (1975), 69
Resurrection of the Beast (1969), 75, 174
The Return of Dr. Fu Manchu (1930), 93, 187
Return of Dr. Mabuse (1961), 186
The Return of Monte Cristo (1946), 190
The Return of Sherlock Holmes (1929), 178
Revolution (1968), 115, 159
Rhythm of Africa (1960?), 96
Richard (1972), 118
Ride Hard, Ride Wild (1970), 120
Riff Raff Girls (1959), 72
Du Rififi chez Le Femmes (1950), 72
Riot on Sunset Strip (1967), 111, 116, 143
The Road to Hong Kong (1961), 189
The Road to Morocco (1942), 103
Rollerball (1975), 187
The Romantic Englishwoman (1975), 69
The Rose (1980), 87
Rub Out the Past (1966), 75
The Rubber Gun (1977), 184
La Rupture (1970), 148

A Safe Place (1971), 112
Sanctuary (1961), 65, 81
The Sandal (1969), 189
Sandokan the Great (1964), 188
Sands of Ecstasy (1968), 157
Satan in High Heels (1962), 76
Satanik (1968), 189
Satan's Bed (1965), 77, 83
Satan's Sadists (1971), 120, 150
The Saucy Aussie (1963), 155
Save the Tiger (1973), 118
The Scapegoat (1959), 87
Scarlet Doll (1958), 92
The Scarlet Rose (1964), 75
Schizoid (1971), 148, 163
Schlussakkord (1936), 72
Scorchy (1976), 88
Scorpio 70 (1970), 77
Sebastian (1968), 149
The Second Bullet (1966), 75
Secret Agent Superdragon (1966),
The Secret of the Sacred Forest (1970), 70
The Secret Partner (1961), 187
Secret Service in Darkest Africa (1943), 188
Secrets of Chinatown (1935), 91
Sensations (1977), 184
Serpico (1973), 69
A Session with the Committee (1969), 116
Il Sesso degli Angeli (1968), 156
The Seven-Percent Solution (1976), 179
The Sex of Angels (1968), 76, 156
Sex Phobia (1970), 123

The Sexual Effects of Marijuana (1975), 120
Shada Kalo (1953), 182
Shadows in the Night (1944), 186
Shaft (1971), 69
Shanghai Gesture (1941), 91
Shangri-la (1968?), 115
Sharks (1975), 114
She Beast's Warm Bodies (1972), 75
Spiked Heels and Black Nylons (1967)
Sherlock Holmes (1932), 178
Sherlock Holmes and the Deadly Necklace (1964), 179
Sherlock Holmes and the Secret Weapon (1942), 178
Sherlock Holmes' Fatal Hour (1930), 178
Sherlock Holmes and the Silver Blaze (1936), 178
Sherlock Holmes in Washington (1943), 187
Shikari (1964), 190
Ship of Fools (1965), 86
Shock Treatment (1964), 188
The Shootist (1976), 95
The Shrimp (1930), 189
Sicilian Connection (1975), 73
Sign of Aquarius (1970), 76, 148
The Sign of the Four (1932), 178
The Silent Playground (1963), 176
Simon, King of the Witches (1971), 67, 86
Sing, Baby, Sing (1936), 182
Skezag (1971), 84
The Ski Bum (1971), 116
Skidoo (1968), 116, 154, 160
Slattery's Hurricane (1949), 55, 62, 63
Slaves of Chinatown (1964), 76
Sleeper (1973), 187
The Sleeping City (1950), 62
The Slender Thread (1965), 174
Slither (1973), 184
Slow Dancing in the Big City (1978), 87
The Small World of Sammy Lee (1963), 118
Smiley (1957), 92
Smoke and Flesh (1968), 122, 157
Smoke of Evil (1967), 122
The Smugglers (1969), 118, 154
The Smugglers (1978), 119
Snake People (1968), 148
The Snake Pit (1948), 187
Sol Madrid (1968), 66, 83
Soldiers of the Storm (1933), 61
Something's Happening (1967), 159
Sometimes a Great Notion (1972), 114
The Son of Dr. Jekyll (1951), 179
Son of Samson (1960), 186
Souls For Sale (1962), 92
The Speckled Band (1931), 178
Sparkle (1976), 87
Speed is of the Essence (1971), 185
Spiked Heels and Black Nylons (1967), 76, 121
Spirits of the Dead (1968), 153
The Sporting Club (1971), 120
Stakeout on Dope Street (1958), 63
Stanley (1972), 87
A Star Is Born (1975), 116, 184
The Statue (1966), 155
Step on the Gas (1970), 118
Steppenwolf (1974?), 116, 119, 160, 184
The Stewardesses (1969), 159
Stone Killer (1973), 69
Stop Me Before I Kill! (1961), 186
The Story of Temple Drake (1933), 65, 79
Straight Time (1978), 87
The Strange Affair (1968), 72
The Strange Case of Dr. Jekyll and Mr. Hyde (1967), 180
Strange Impersonation (1964), 190
Strawberry Statement (1970), 185
Street of Darkness (1958), 63
Strike Force (1975), 67
The Student Nurses (1970), 76, 157
A Study in Scarlet (1933), 178
A Study in Terror (1965), 178
The Subterraneans (1960), 109
Suburban Roulette (1968), 174
Suburbia Confidential (1966), 122
Subway in the Sky (1959), 71
The Sucker (1965), 72
Sugar Daddy (1968), 121
Super Fly (1972), 61, 183
Superman (1960), 189
Surfside Sex (1967), 122, 156
Sweet Bird of Youth (1962), 123
Sweet Love Bitter (1967), 83
Sweet Savior (1971), 122, 158
The Sweet Smell of Success (1972), 70
Sweet Sugar (1972), 122
Swinging the Lead (1935), 186
Sympathy for the Devil (1970), 115
Symphony for a Massacre (1963), 72
Synanon (1965), 83, 196

THX-1138 (1971), 187
Taboos of the World (1963), 88
Taking Off (1971), 60, 118
Tam Lin (1971), 163
Tango Notturno (1937), 177
Taxi Driver (1977), 87
Teenage Jekyll and Hyde (1963), 182
Teenage Mother (1968), 122
Teenage Rebellion (1967), 115, 159
Teenage Zombies (1960), 141, 186
The Tell-Tale Heart (1960), 87
Terminal Island (1973), 163
Terror of the Tongs (1961), 93
The Testament of Orpheus (1959), 96, 98, 99, 100
Le Testament du Dr. Cordelier (1959), 182
That Cold Day in the Park (1969), 116
There Is Still Room In Hell (1963), 73
There Was a Crooked Man (1970), 118
There's Always Vanilla (1972), 116
They All Died Laughing (1963), 119
They Call Me Mr. Tibbs (1970), 69
They Made Me a Fugitive (1947), 71
This Rebel Breed (1960), 64
Three Forbidden Stories (1952), 72, 87
Three in the Attic (1968), 116
Threesome (1969), 89

Tiger Force (1975), 75
The Tijuana Story (1957), 106
The Tingler (1959), 139
Tip on a Dead Jockey (1957), 63
To Be a Woman (1968), 88
To Die of Love (1970), 176
To Find Our Life (1969), 164
To The Ends of the Earth (1948), 55, 61, 91
To Turn a Trick (1967), 76
Tokyo Bad Girls (1970), 75
The Tomb of Ligeia (1965), 81
Tommy (1976), 154
Tony Rome (1967), 86, 187
Too Young, Too Immoral (1962), 65, 81
Top of the Heap (1972), 69
Toughest Man Alive (1955),
Touch of Evil (1958), 64, 106
Trans-Europ-Express (1967), 182
Trapped in Tangiers (1960), 72
Trash (1970), 84, 151
Travels with My Aunt (1972), 118
Tribes (1970), 176
Tricks of the Trade (1968), 121
The Trip (1967), 60, 143
The Triumph of Sherlock Holmes (1935), 178
Tromba the Tiger Man (1949), 186
The Trouble With 2B (1972), 163
Tse-Hsu (1978), 95
The Tunnel of Love (1958), 188
Turn Me On! (1968), 120
Turn on to Love (1969), 120
Turn on, Tune in, Drop Out (1967), 160
Twelve Plus One (1970), 180
The Twenty-Seventh Day (1957), 187
Two a Penny (1967), 72, 87, 150
The Two Faces of Dr. Jekyll (1961), 179
200 Motels (1971), 153, 176
Two Mules for Sister Sara (1970), 118, 182
Two People (1973), 112
Two Weeks to Live (1942), 182
2001: A Space Odyssey (1968), 187
The Ugly Duckling (1959), 179
The Ultimate Degenerate (1969), 189
Undercover Girl (1958), 71
The Underground Syndicate (1970), 75
Underneath the Arches (1937), 141, 186
Underworld U.S.A. (1961), 64
Unholy Matrimony (1966), 155
Unkissed Bride (1966), 153
Up in Smoke (1978), 119
La Valle (1972), 153
Valley Obscured by Clouds (1972), 153
Valley of Fear (1964), 179
Valley of the Dolls (1967), 174, 184
Vanishing Point (1971), 184
The Venetian Affair (1966), 186
Villa-Vennely: Home of Copenhagen Call Girls (1964), 76
The Viscount (1966), 93
Vivre à la Folie (1967), 114
Volcano (1969), 95
A Voyage to Arcturus (1971), 161
Wait until Dark (1967), 63, 66
Walk the Walk (1970), 76, 84
Wanda (the Sadistic Hypnotist) (1969), 157
War of the Colossal Beast (1958), 187
Warning Shot (1967), 66
Waterfront Blues (1970), 174
Way Out (1966), 83
We All Go Down (1969), 123
Web of Violence (1966), 72, 73
Weed (1972), 115
Weed (1976), 118
The Weed of Crime (1964), 73
Weekend with the Babysitter (1970), 77, 122
The Weird World of LSD (1967), 148
Der Weisse Daemon (1932), 177
Welcome Danger (1929), 61, 90
Werewolves on Wheels (1971), 120
West Side Story (1961), 116
What the Hell, Jack (1977), 125
What's So Bad about Feeling So Good? (1968), 163
What's Up, Doc? (1972), 188
What's Up Tiger Lily? (1966), 86
When We Look Back (1936), 190
Where Sin Lives (1966), 76
Where Were You When the Lights Went Out? (1968), 176
The White Slavers (1959), 72
White Slaves (1964), 76
White Slaves of Chinatown (1964), 76, 122
White Zombie (1932), 186
Who Killed Jessie? (1965), 190
Who'll Stop the Rain? (1978), 68
Why Russians Are Revolting (1970), 182
Wild Angels (1966), 119
The Wild Eye (1967), 93
Wild in the Streets (1968), 144, 145, 163
Wild Weed (1949), 53, 81, 104
Wild Wheels (1969), 120
Wild, Wild Girl (1965), 76
Wild, Wild World (1965), 93
Wild Youth (1960), 64, 81
Witchcraft '70 (1970), 115
The Wiz (1978), 91
The Wizard of Oz (1939), 60, 91
Wolfen (1981), 184
The Woman from Headquarters (1950), 82
The Woman in Green (1945), 104
Women of the Night (1948), 73
Women . . . Oh, Women (1963), 73
Wonders of Aladdin (1961), 123
Woodstock (1970), 115
Work Is a Four Letter Word (1968), 160
The World of Drugs (1963), 109
The Worm Turns (1936), 186
Wozzeck (1948), 190
W.U.S.A. (1970), 118
X-the Man with the X-ray Eyes (1963), 163

Yanomama (1970), 164
The Yellow Cab Man (1950), 187
Yellow Submarine (1968), 153
You Are What You Eat (1968), 115, 159
The Young Graduates (1971), 123, 150
The Young Runaways (1968), 87

Zabriskie Point (1970), 112, 116
Zex (1958), 87
Zombies on Broadway (1945), 186

Underground Films

Acid Camp (1964?), 170
Acid Man (1966), 169
Acid Mantra (1968), 170
Airplane Glue, I Love You (1969?), 172
Allures (1961), 166
Amanita Pestilans (1963), 172
Amphetamine (1966), 171
Approach: Innocence (1969?), 169
Arms and Needles (1971?), 171

Bag (1971?), 171
Bardo Follies (1967), 169
Belladonna (1968?), 170

Cavabus (1968), 172
Chumlum (1964), 172
Coke (1968?), 172
The Color of Ritual, the Color of Thought (1967?), 170
Cosmos (1971?), 166
Customs and Immigration (1971), 172

Dave's Fantastic Fifties Rock Group (1968), 172
Divinations (1964), 170

End of the War in Vietnam (1969?), 172
Euphoria (1970?), 172

Fireworks (1947), 166
Foundation of the Revelation (1975), 172
Hamjat Asar (1965), 168
Hanoi Gold (1969?), 172
Hipmatized (1970), 172
How I Dumped My Dope and Started Picking for Gold (1971?), 172
Imagination (1970?), 172
Inauguration of the Pleasure Dome (1954–66), 166
Inside Dope (1971), 171
Intrepid Traveler and His Merry Band of Frankster Search for a Cool Place, Part I (1964–74), 170
Invasion of the Thunderbolt Pagoda (1968?), 169
Invocation of My Demon Brother (1969), 166

The Joint (1969?), 172
Journey to the Far Side of the Sun (1969), 166
Junkies Island (1968), 166

Lapis (1967–69), 168
Light, Sound, Diffused (1966), 169
Looking for Mushrooms (1961–67), 170
LSD (1954), 166
LSD Wall (1964–65), 169

Mme. Curie (1967?), 172
Momentum (1969), 166, 168
Mozo (1969?), 172
Multiple Maniacs (1969?), 171

Naked Zodiac (1969), 170
Narcose (1967), 166
Night Light and Day Hi's (1965), 170
Nothing (1968), 169
Numbers 1 to 14 (1939–66), 165, 168

Oldsmobile (1965), 170
1 X 1 = Infinity (1970?), 172
Orgie (1968?), 169

Permutations (1967), 173
Peyote Queen (1965), 170
Phenomena (1965), 166
Poeme (1968?), 169
Potpourri (1968), 169
The Psychedelics (1968?), 169
Psychedelic Wet (1967), 170
Pulse (1969), 169

Queen of Sheba Meets the Atom Man (1963), 172

Ray Gun Virus (1966), 169
Reefer Man (1932), 172
Re-Entry (1964), 166, 167
Rituals (1966), 171

Samadhi (1967), 166
Scorpio Rising (1964), 166
Senseless (1962), 172
Set Your Chickens Free (1964), 170
Sgts. Banned (1968?), 172
Shaman (1967), 170
Snorting Speed in the Bennet Hall John (1969?), 170
Soul Trip Number 9 (1969?), 170
Stoned Adventure (1967), 170
A Taste of Sister Morphine (1968?), 172
Theoria (1970), 170
Things to Come (1953), 169
Tom's Film (1973?), 172
Towers Open Fire (1963), 171
Tree (1968), 169

White Rabbit (1969), 172

The Year the Universe Lost the Pennant (1961), 172

Television Programs

Series

"Adam-12", 210

"Baretta", 212
"Barnaby Jones", 212
"Barney Miller", 213
"Ben Casey", 213
"Bewitched", 213
"Big Valley", 213
"Blue Knight", 212
"Bold Ones", 212

"Caribe", 212

"Dan August", 212
"David Niven's World", 210
"Dick Cavett Show", 209
"Divorce Court", 213
"Dragnet", 210
"Dr. Kildare", 213
"Doctors News Conference", 208

"Emergency!", 213

"Fat Albert", 209
"F.B.I.", 210
"Frank McGee Report", 209

"Get Christie Love!", 212
"Get Smart", 213

"Harry O", 210
"Hawaii Five-0", 210
"Head On", 209
"Hollywood Television Theater", 213

"I Spy", 212
"Invisible Man", 213
"Ironside", 210

"Joe Forrester", 212
"Kate McShane", 213
"Kojak", 211

"Land of the Giants", 213
"Longstreet", 212

"Madigan", 212
"Mannix", 212
"Mary Hartman, Mary Hartman", 213
"Masterpiece Theater", 213
"Matt Lincoln", 212
"Medical Center", 213
"Medicated Society", 209
"Meet the Press", 209
"Merv Griffin", 209
"Mike Douglas", 208

"Mission: Impossible", 211
"Mod Squad", 211
"Munsters", 213

"Name of the Game", 213
"New Zoo Revue", 209
"Not for Women Only", 209

"One Step Beyond", 139, 213
"Outer Limits", 213

"Perry Mason", 210
"Phil Donahue Show", 209
"Police Story", 212
"Police Surgeon", 212
"Police Woman", 212
"The Practice", 213

"Raymond Burr", 210
"Rebel", 213
"Robert Young, Family Doctor", 213
"Rockford Files", 212
"Room 222", 213

"San Francisco Today", 209
"Simon Locke", 212
"Sirota's Court", 213
"Speak Out", 209
"Starsky and Hutch", 212
"Streets of San Francisco", 212
"S.W.A.T.", 212
"Switch", 213

"Take a Giant Step", 209
"Take As Directed", 209
"Thin Edge", 209
"This Is the Life", 209
"Today", 209

"Untouchables", 212

"We'll Get By", 213
"What Every Woman Wants to Know", 209
"Wild, Wild West", 213
"William F. Buckley", 209

Single Programs

The Addict Alone (1967), 208
The Addicted (1958), 208
Alas Poor Hippies, Love Is Dead (1968), 208
The Allure of Drugs (1969), 209

The Business of Heroin (1964), 208

The Chemistry of Behavior (1963), 208
Crime in the Courts (1971), 208

Dangerous Drugs (1964), 208

Drugs: A to Z (1969?), 209
Drugs in Middle America (1970), 209
Drugs in the Tenderloin (1968), 208

The Facts Are These: Fixed for Death (1969), 208
From Pot to Psychedelics (1968), 209
From Runaway to Hippie (1967), 209

Gale is Dead (1970), 208

Heroes and Heroin (1971), 208
The Hippie Temptation (1967), 209

I'm Dependent, You're Addicted (1972), 208
I.T.N. Reports—Drugs (1969?), 208

Junky (1964), 208

The Littlest Junkie (1973), 209
The Losers (1965), 208
LSD: Lettvin vs. Leary (1967), 209
LSD.: The Spring Grove Experiment (1966), 209
LSD.: Trip to Where? (1968), 209
Lysergic Acid (1956), 139

Marijuana (1968), 209
Mary Jane Grows Up (1975), 209
The Most Adult Game (1967), 208
Mother's Little Helpers (1968), 208

New Drugs, Same Needle (1968), 208

The Opium Trail (1966), 208

The Pharmacology of Drugs (1969), 209
Pot: The Current Scene (1969), 209
Professor Lettvin Tuned In (1968), 209
The Pursuit of Pleasure (1967), 209

Some Grains of Truth (1967), 208
Synanon in Prison (1966), 208

Tea, Horse and Crime (1957), 208
They Get Rich from the Poor (1970), 208
The Trip Back (1969), 208
Trip to Nowhere (1970), 209

World of the Weed (1968), 209

Drug Abuse Films

About Addiction (1965?), 193
Acid (1971), 200
The Acid Test (1970), 200
The Addict Alone (1967), 196
The Addicted (1958), 195
Addiction Among Teenagers (1956), 193
Adult Awareness and Techer Sensitivity (1971?), 207
The Age of the Tranquilizer (1965?), 201
Agents of Drug Abuse (1967?), 203
Akineton (Biperiden) for the Reversal of Drug-Induced Disorders (1968), 201
Alcohol and Drugs (1958), 204
Alcohol and Drugs versus Safe Driving (1967), 204
Alcohol, Drugs and Driving (1969?), 204
Alcohol, Tobacco and Drugs vs. Physical Fitness (1972), 204
Almost Everyone Does (1970), 206
Another Approach (1970?), 206
The Answer Is Understanding (1971), 203
Antidote for Addiction (1961?), 193
Any Questions, Any Answers? (1971), 206
Anybody Else Who's Listening (1972?), 206
Anyhow (1971), 203
Anything for Kicks (1969), 205
Arcade (1968), 195
Are Drugs the Answer? (1970), 203
The Argument (1969), 206
Art Linkletter Talks with Parents (1971), 203
Art Linkletter Talks with Our Children (1971), 203
Assassin of Youth (1957), 193, 197
Assignment . . . the Future (1973?), 206

The Baby Race (1966), 195
The Ballad of Mary Jane (1970), 197
Because We Care (1972), 207
Becky (1971), 206
Better Dead (1972), 196
The Better Way—Learning to Care (1973?), 206
Beyond LSD (1968), 199
Biochemedical Revolution (1971), 205
Bitter Dust (1965?), 195
Blood Reds (1973?), 201
Blue (1970), 196
Boors at Midnight (1971), 205
Brian at Seventeen (1971), 206
Bridge from Noplace (1968), 197
Bridge to Tomorrow (1969?), 205
The Business of Heroin (1964), 195
Building a Drug Abuse Program (1971), 206
Bunny (1971), 206
Busted (1971), 203

Can You Take It? (1969), 203
Changing (1971), 198
Chasing the Dragon (1970?), 195
Chemistry of Behavior (1963), 201
Children of Synanon (1969), 196
Choice (1970), 204
The Choice (1971), 198
Circle (1968), 196
Communication Gap (1969?), 198
Community as Doctor (1971), 206
Community in Quest (1971), 202, 206
Confrontation—A Nurse and a Drug Addict (1971), 197
Coping—the New Haven Story (1971), 197
Counseling—A Critical Incident (1971), 198
Counseling Techniques for Interviewing Addicts (1973), 197
Countdown (1973?), 204
Crime in the Courts (1971),
Criminal Man (1968?), 203
Crisis Intervention (1972), 206

Crisis Intervention by Telephone (1971?), 206
Crisis House (1970), 205
A Crutch for All Seasons (1969), 203
Cultivo y Commercializacion de la Coca (1965?), 195
Curious Alice (1971), 199, 203
Curious Habits of Man (1968), 203

Dangerous Drugs (1957), 193
Darkness, Darkness (1970), 196
David (1965), 196
A Day in the Death of Donnie B. (1970), 196
A Day with Bill Cosby (1970?), 203
Dealing with Drugs (1971), 203
Death, Drugs and Walter (1970), 196
Diagnosis and Therapy of Sedative Overdose (1970), 201
The Distant Drummer (1968), 202, 203
Do You Know Her? (1972?), 204
Do Your Own Thing (1970), 197
Dope (1971), 205
Dream Flowers (1930), 90, 192
Driving and Drugs (1968), 204
Drug Abuse: A Call to Action (1969), 206
Drug Abuse and Therapy (1970), 206
Drug Abuse: Bennies and Goofballs (1966), 201
Drug Abuse: Everybody's Hangup (1970), 203
Drug Abuse: It Could Happen to You (1973?), 204
Drug Abuse: One Town's Answer (1970), 202, 206
Drug Abuse: The Chemical Tomb (1969), 203
Drug Addict (1948), 192, 195
Drug Addict (1956), 193
Drug Addiction (1951), 192, 193
Drug Addiction (1966), 193
Drug Addiction—A Medical Hazard (1956), 193
Drug Addiction: Rehabilitation (1973), 197
Drug Age—What Can We Do? (1969), 203
Drug Age—What Do You Think of Your Father? (1969), 203
Drug Age—Why Marijuana? (1969), 198
The Drug Bug (1972), 203
Drug Decision (1970), 199
Drug Dependency (1973?), 204
Drug Dialogue—Involvement (1971), 203
Drug Dialogue—Orientation (1971), 201
The Drug Dilemma (1972), 204
Drug Effects Measured by Acquired Patterns of Response (1929), 200
Drug-Induced Depression (1956), 200
Drug Management of Schizophrenia (1962), 200
Drug Problem: People Problem (1972?), 204
The Drug Scene (1971), 203
The Drug Scene (1971), 204, 205
Drug Taking: Health Aspects (1973), 205
Drug Taking: Social Aspects (1971), 204
Drug Talk—Some Current Programs (1971), 206
Drugs: A First Encounter (1973?), 204
Drugs and Beyond (1971), 203
Drugs and Conquest (1964), 205
Drugs and the Nervous System (1967), 203
Drugs and the Very Young (1971?), 203
Drugs and You (1971), 203
Drugs and Your Body (1971), 204
Drugs: A Primary Film (1972), 203
Drugs Are Like That (1970), 204
Drugs Are Not the Problem (1972), 203
Drugs, Drinking and Driving (1970), 204
Drugs: Facts Everyone Needs to Know (1970), 204
Drugs in Our Culture (1971), 203
Drugs in Our World (1971), 204
Drugs in the Tenderloin (1968), 195
Drugs: The First Decision (1971), 204
Drugs Through the Ages (1967), 205
Drugs—Use or Abuse (1971), 204

Eagleville: You're Not Alone (1971), 202, 206
Easy Way Out (1971), 202, 206
Effect of Serpasil (Reserpine) on Monkeys (1954), 200
Effects of Morphine on Learned Adaptive Behavior and Experimental Neurosis in Cats (1942), 200
The Effects of Various Drugs on the Emotional Mimetic Response of the Hypothalamus and Cerebral Cortex of the Cat (1940), 200
11:59: Last Minute to Choose (1970), 203
The Emergency Treatment of Acute Drug Overdose (1972), 201, 206
The End (1969), 198
Enforcement Measures and the Destruction of Illicit Crops (1967?), 195
Escape from Addiction (1969), 204
Escape to Nowhere (1969), 204
Escape to Nowhere (1968), 195
Everybody's Going Where I've Been (1971), 206
Exit (1970), 203

FDA Special Report-Bennies and Goofballs (1966), 202
Face of an Addict (1961), 193
Faces of Boredom (1971), 195
The Facts Are These: Fixed for Death (1969), 196
False Friends (1967), 195
The Family (1971), 202, 206
The Farthest Frontier (1967), 204
Feeling Bad . . . Feeling Good (1973?), 206
Feelings—That's What It's All About (1971), 206
Fight or Flight? (1967), 195
Flip City (1971), 204
Flip Side (1969), 205
Flowers of Darkness (1969), 195
Focus on Downers (1971), 201
Focus on Heroin (1971), 195
Focus on LSD and Other Psychedelics (1971), 200
Focus on Marijuana (1971), 198
Focus on Speed and Uppers (1971), 201
Food and Drugs (1968), 204
For Adults Only (1970), 204
Forests of the Night (1971?), 206
From 5 to 7:30 (1972?), 206
From Runaway to Hippie (1967), 198
Frontiers of the Mind (1965), 204

Gale Is Dead (1970), 196, 202
General Anesthetics (1969?), 201
Get High on Life (1971), 207
Getting Through (1968?), 206
Girl on the Sixteenth Floor (1971), 204

Glass Houses (1972), 201
Glue (1971?), 201
Got My Own (1974), 196
Grooving (1970), 205
Guidance for the '70's (1971), 202, 206
Guy (1971), 202, 206

H.A.V.E.N. in Hell (1965), 196
H + 2, Concerning Two Heroin Addicts (1970), 196
H—The Story of a Teenage Drug Addict (1951), 192, 193
Half a Lifetime (1970), 196
Hallucinogens (1964), 198
Hallucinogens and other Nonnarcotic Drugs (1967), 199
The Hangup (1968), 203
He Lived with Us, He Ate with Us, What Else Dear? (1968), 199
Head (1971), 205
Heads You Win (1971), 207
Hell Flower (1967?), 195
Hello America (1968), 204
Help (1970), 206
Help Is Here (1970), 206
Here's Help (1970), 206
Heroes and Heroin (1971), 195
Heroin (1970), 196
Heroin (1971), 195
Heroin Addiction—Living Death (1957?), 193
Hide and Seek (1966), 196
High on Campus (1970), 205
The High: Drugs and You (1970), 203
Hill Tribes of Northern Thailand (1967?), 195
Hip Jean's Jeannie (1973?), 207
The Hippie Temptation (1967), 199
Holy Smoke (1971), 207
Hooked (1966), 195, 202
Hooks (1972), 204
House on the Beach (1968), 196
The House That Jack Built (1969), 207
How Much Time (1970), 204
How to Initiate Drug Education Programs (1970?), 206

I Am (1972), 207
I Just Can't Help It (1973?), 207
I Think (1970), 207
I'll Be Seeing You (1970), 200
Inhale-Exhale—the New Terror (1965), 201
The Inner Trip (1968), 207
Investigation of Narcotic Offenses (1958), 193
Is It Always Right to Be Right (1970), 207
I.T.N. Reports—Drugs (1967?), 195
It Takes a Lot of Help (1970), 206
Ivan and His Father (1971), 207

Jordan Paul (1971), 207
Journey in Time (1971), 207
A Journey Through Drug Abuse (1972?), 204
Jump (1970), 204
Junkies Are People (1972), 197
Junky (1964), 196
Just One (1970?), 207

Keep Off the Grass (1969), 197
Kick (1969), 207
Le Kif (1966?), 198

Lady Jane (1971), 207
The Last Fix (1963?), 193
The Law (1968), 197
Learning about Drugs (1973?), 204
Let's Talk about Marijuana (1972), 197
Let's Talk about Pills (1972), 201
Let's Talk about Volatile Chemicals (1972), 201
The Lexington Experience (1971), 197
Life in New York (1970), 195, 198
Listening (1971), 206
Little Pusher (1967?), 195
Local Anesthetics (1969), 201
Love, Love, Love (1967), 197
LSD (1967), 199
LSD: A Trip to Where? (1968), 199
LSD: Insight or Insanity? (1968), 199
LSD: Lettvin vs. Leary (1967), 198
The LSD Story (1967), 199
LSD: The Spring Grove Experiment (1966), 198
LSD: Trip or Trap? (1968), 199, 202

The Mad Chemist (1969), 199
Man Isn't Dying of Thirst (1971?), 200
Marathon (1967), 202, 206
Marihuana (1968), 197
Marihuana (1972?), 198
Marihuana, LSD and the Mind (1968), 197
Marijuana (1968), 197
Marijuana (1973?), 198
Marijuana and You (1974?), 198
Marijuana: The Great Escape (1970), 198
The Mask (1971?), 207
The Maze (1967), 199
Meeting (1971), 206
Methadone: An American Way of Dealing (1975), 197
Methadone: Escape from Heroin (1971), 197
A Methadone Treatment Program (1973), 197
Mind Altering Drugs (1968?), 204
The Mind of Man (1971), 205
The Mindbenders (1967), 199, 202
Mindscape (1967), 199
Miracle of the Mind (1968?), 204
Miracle on Broad Street (1968), 196
Mr. Edler's Clan (1970?), 207
Mr. Smith, Your Kid's Taking Drugs (1971), 198
Moderne Laster (1924), 192
Monkey on the Back (1955), 193
Morphine Physical Dependence in the Monkey (1963), 200
The Most Adult Game (1967), 196
Mother's Little Helpers (1968), 201
A Movable Scene (1968), 204

Narcosis (1954), (1958), (1965), 193
Narcosynthesis (1944), 200
Narcotic Addiction: Its Medical Management (1963), 193
Narcotic and Nonnarcotic Analgesics (1970), 201
Narcotic Deaths (1970), 195

Narcotic Evils (1955), 193
Narcotics (1959), 193
Narcotics: A Challenge to Teachers (1968?), 195
Narcotics and Kids (1969), 205
Narcotics: Pit of Despair (1967), 195
Narcotics: The Decision (1960), 193
Narcotics—the Inside Story (1967), 203
The Narcotics Trade (1964), 195
Narcotics Traffic (1956), 193
Narcotics: Why Not? (1968), 205
The Need for Dialogue (1971?), 207
New Drugs, Same Needle (1968), 201
A News Story (1971), 207
A Nice Kid Like You (1969), 205
Ninety-nine Bottles of Beer (1972), 204
No Expectations (1971), 196
No Need to Hide (1971), 206
Nobody But (1972), 207
Not Me (1971), 196
Not the Giant Nor the Dwarf (1971), 206

Observing Ourselves (1968), 207
Of Lemmings and Kings (1971), 207
On Prescription Only (1960), 204
One Approach (1972), 196
One Day Is Like Another (1967), 197
One in 20,000 (1969?), 207
One Plus One Equals 3 (1970?), 207
One Step Away (1968), 207
One Way Ticket (1971), 200
Opium Addiction (1967?), 195
Opium Growing in Thailand (1967?), 195
The Opium Trail (1966), 195
Or Die (1966), 196
Our Wonderful Body: Medicines, Drugs, and Poisons (1973), 204
Out of Bounds: The Drug Culture (1971), 201
Outreaching Today's Addicts (1971?), 195
Outside Influences (1972?), 207
Parasympathomimetics (1969?), 201
Parasympathomimetic Blocking Agents (1969?), 201
A Farting Shot (1971), 200
The Patient with Addictive Behavior (1968), 201
Payoff in Pain (1948), 192
The People Next Door (1969), 199
The People vs. Pot (1970), 198
Perception: Structure or Flow (1973), 207
Perfect Drug Film (1972), 204
The Pharmacist and Drug Abuse (1971), 201
The Pharmacology of Drug Abuse (1973), 201
Pill Poppers (1972?), 201
Pills (1971), 204
Polvo Amargo (1964?), 195
Portrait of Jason (1967), 195
Post-mortem (1967), 204
Pot: The Current Scene (1969), 197
Pot's a Put-on (1969), 198
The Potheads in Let's Get Nice (1969), 198
Prescription for Maryanne (1971?), 204
Professor Lettvin Tuned In (1968), 198
Psychedelics (1973?), 204
Psychohormonal Aspects of the Menopause (1971), 201
Psychopharmacological Drugs (1972), 201
The Pursuit of Pleasure (1967), 198
Pusher (1972), (1973?), 204

The Quarry (1971?), 207

Rapping (1969), 196, 202
Read the Label and Live (1971?), 204
Report: Phoenix House (1971), 197
Research Report: THC, the Chemistry of Marijuana (1968), 197
Residence Investigation No. 1 (1970), 193
Rick (1971), 206
The Riddle (1968), 204
The Ringer (1972), 207
Run Up and Down These Streets (1972), 197
Rx: Caution (1960), 204

The Sandalmaker (1968), 203
Scag (1971), 197
Scent of Danger (1962), 197
Schizophrenia (1966), 204
Sean (1970?), 206
Sedatives, Hypnotics and Alcohol (1969?), 201
Seduction of the Innocent (1961), 193
The Seekers (1968), 205
Self-Awareness Film Modules on Drug Abuse for High School Students (1972), 207
Self-Awareness Film Modules on Drug Abuse for Parents (1971), 207
Self-Awareness Film Modules on Drug Abuse for Teachers (1971), 200, 207
Single Concept Films (1971), 204
Sinister Menace (1931?), 192
Slow Death (1971), 196
Sniffy Escapes Poisoning (1967), 204
Snow in Summer (1974?), 207
Some Grains of Truth (1967), 195
Someone Is Watching (1958), 193
Speedscene (1970), 201
Sports: The Programmed Gladiators (1971), 201
A Step from the Shadows (1971), 207
Stop . . . Before You Try Drugs! (1969), 203
The Story of a Prisoner (1965), 195
The Streets Where You Live (1974?), 207
Students Look at Drugs (1970), 205
Styles (1974?), 207
Subject: Narcotics (1952), 193
Sympathomimetics (1969?), 201
Sympathomimetic Blocking Agents (1970), 201
Synanon (1965), 196, 202
Synanon in Prison (1966), 196

Take As Directed (1970), 204
Tea, Horse and Crime (1957), 193
Teddy (1971), 206
Teen Squad (1969), 198
Teenage Menace (1953), 193
Tempted (1971), 204
The Terrible Truth (1951), 192

That Which Was Lost (1969), 207
They Get Rich from the Poor (1970), 195
This Week: Half a Lifetime (1970),
Three (1967), 196
Three Lives (1971), 206
Time Pulls the Trigger (1970?), 207
To Be a Man (1970?), 207
To Your Health (1956),
Tom (1971), 200, 206
Tommy the Traveler (1971), 206
Tomorrow Never Comes (1969), 198
Tomorrow May Be Dying (1959), 193
Too Tough to Care (1970?), 207
Tranquilizers (1964), 201
Tranquilizers, a New Idea in Animal Feeds (1958), 201
Treatment—New Teams (1971), 206
Trick Bag (1971), 196
Trigger Films (1971?), 207
The Trip (1968), 199
The Trip Back (1969), 197
Trip to Where? (1968), 199
Tripping (1970), 207
Triumph without Drums (1941), 205
Turned on Crisis (1972), 207
Two Festivals (1972), 207
The Two-Legged Spaceship (1974?), 207

The Ultimate High (1971), 207
Understanding Films (1971), 207
Up Front (1971), 205
Up in Smoke (1971?), 207
Up Pill, Down Pill (1970), 204
Up the Ladder Down (1973?), 204
Ups/Downs (1971), 201
Us (1971), 204
Users-Losers (1973?), 204

Verdict at 1:32 (1972?), 207

A Walk in the Park (1970), 198
Wastage of Human Resources (1947), 192
We Have an Addict in the House (1972), 196
What About Pot? (1974?), 197
What Can We Do? (1971), 206
What Did You Take? (1971), 206
What Do Drugs Do? (1971), 204
What Is Teaching, What Is Learning? (1971), 207
What Some Communities Are Doing (1971), 206
What Would You Do? (1971), 204
Who's Afraid? (1972), 204
Why Must the Flowers Die? (1968), 203
Will You Listen If I Speak? (1971), 207
Willy (1971), 206
The Woburn Project (1971), 207
A World of Dreams (1967), 204
World of the Weed (1968), 197
The World of Piri Thomas (1968), 195

You Can't Grow a Green Plant in a Closet (1970), 197
Young Filmmakers Talk About Drugs (1969), 198
Your Amazing Mind (1969), 204
Youth-Communications (1971?), 207
The Youth Drug Scene (1969), 196
Youth Drug Ward (1968), 206
The Y-riders (1970), 206

Drug Index

Absinthe, 30, 31
Alcohol, 29-31, 200-13
Amphetamine, 137, 170, 171, 184-86, 201, 203-13

Barbiturates, 27, 28, 137, 174-76, 200, 203-17

Chloroform, 28
Cocaine, 15, 21, 24, 35-45, 46, 54, 94, 111, 137, 166, 172, 176-84, 210
Cortisone, 57

DMT, 163, 170, 200
Downers, 27, 28, 201

Epena, 164

Hashish, 123-25, 166, 172, 213
Harrison Narcotics Act, 21, 41

Heroin, 24, 45, 49, 57, 59, 60, 61, 63-89, 108, 109, 111, 112, 165, 171, 192-97, 200-13

Ketamine, 164

Laughing gas, 16, 27
Loco weed, 163
Love potions, 25, 26
LSD, 58-60, 76, 111, 122, 137, 139-60, 165, 166, 168-73, 198-200, 202-13

Madness inducers, 26
Mind control, 186-90
Marijuana, 31-34, 51, 52, 54, 55, 57-60, 81, 100-31, 170-72, 193, 194, 197, 198, 202, 203-13
Marijuana Tax Act, 52, 102
Mescaline, 164, 172
Methadone, 137, 197

Morphine, 20-24, 57, 61, 69, 70-73, 75, 80, 86-88, 109, 118, 132, 133, 137, 172, 200
Mushrooms, 140, 160, 166, 170, 186

Narcotics, 20-24, 46-89, 192-97

Opium, 13-24, 38-40, 44, 45, 53, 54, 74, 90-100, 131, 132

Peyote, 120, 141, 163, 164, 170
Pure Food and Drugs Act, 21

Solvents, 201
STP, 111, 145, 158

Tobacco, 28, 31, 33, 34
Tranquilizers, 188, 200, 201

Uppers, 27

Country Index

Argentina, 70, 76, 109, 159
Australia, 92, 195, 198, 200, 203
Austria, 15, 28, 32, 192

Bolivia, 195

China, 94
Czechoslovakia, 190

Denmark, 14-16, 21, 22, 31, 35, 40, 53, 60, 73, 120

Egypt, 42, 123, 192

Finland, 29
France, 13-15, 22, 25-31, 35, 40, 53, 72, 76, 88, 96-100, 114, 118, 119, 122, 123, 141, 148, 154, 163, 164, 176, 190

Germany, 14, 15, 22, 28, 31, 36, 71, 72, 76, 91, 93, 122, 123, 141, 156, 174, 190

Great Britain, 13, 15, 17-19, 22-31, 34-42, 53, 70-72, 87, 92, 93, 114, 118, 119, 122, 123, 124, 141, 148, 153, 157, 158, 160-161, 174, 182, 186-190, 192, 195, 200

Hong Kong, 92

India, 109, 182, 186, 189, 190
Italy, 22, 25, 28, 30, 40, 41, 72, 76, 87, 88, 93, 94, 114, 115, 122, 123, 141, 148, 156, 159, 163, 174, 176, 182, 184, 189, 190

Japan, 73-75, 92, 93, 114, 118, 119, 123, 140, 141, 150, 174, 189

Luxembourg, 73

Mexico, 62, 66, 77, 91, 102, 109, 147, 148, 195

Netherlands, 114

Philippines, 70, 93, 190

Spain, 72, 141, 148, 156, 159, 163
Sweden, 14, 22, 88, 114

Thailand, 95, 195

Name Index

As Kuhle, Lily, and Kai Van der, 21
Adrian, Marc, 170
Allen Woody, 86, 95, 116, 184, 187, 190
Allman, Greg, 137
Alpert, Richard, 159
Anderson, Robert, 192
Anger, Kenneth, 46, 166
Anslinger, H. J., 55, 91, 102, 193, 197
Antonioni, Michelangelo, 116
Arbuckle, Fatty, 46
Arkin, Alan, 66, 117, 118
Avildsen, John, 120, 121, 169

Babbs, Ken, 170
Bacall, Lauren, 188
Baggot, King, 30
Baillie, Bruce, 165
Baker, Carroll, 147
Bankhead, Tallulah, 49, 50
Barrault, Jean-Louis, 143, 179
Barrymore, Diana, 134
Barrymore, John, 35, 40, 79, 176
Barrymore, John Drew, 107
Barthelmess, Richard, 18, 19, 80
Baxter, Ann, 190
Baxter, Warner, 24
Beatty, Warren, 66, 154
Beery, Wallace, 20
Belson, Jordan, 165-68
Berkeley, Busby, 51, 80, 101
Birkin, Jane, 122
Bisset, Jacqueline, 68, 86, 120, 185
Blyth, Betty, 41
Bogarde, Dirk, 149
Bogart, Humphrey, 81, 86
Boone, Pat, 60, 72
Boyd, Stephen, 94
Bradbury, Ray, 187
Brakhage, Stan, 169
Branaman, Robert, 170
Brando, Marlon, 69, 87, 116
Bronson, Charles, 69, 72
Brooks, Mel, 118
Browning, Tod, 20, 38
Bruce, Lenny, 84, 118
Brynner, Yul, 62, 86, 94
Buñuel, Luis, 118, 183
Burckhardt, Jacob, 170
Burke, Thomas, 41
Burr, Raymond, 106, 210
Burroughs, William, 141, 171, 172

Cagney, James, 90
Calloway, Cab, 51, 90, 101, 172, 176
Cameron, Rod, 64
Cannon, Dyan, 64, 137
Canutt, Yakima, 32-34
Carlson, Richard, 63
Carradine, John, 174, 150, 158, 178
Cassavetes, John, 174
Chaktris, George, 147
Chambers, Marilyn, 116
Chaney, Lon, 19, 20, 26, 40
Chaney, Lon, jr., 77
Chaplin, Charlie, 22, 26, 41
Chaplin, Charlie, Jr., 107
Cherry, J., 172
Cher, 111
Chevalier, Maurice, 21
Christie, Julie, 95, 187
Clark, Dick, 145
Clarke, Shirley, 66, 82, 115, 195
Coburn, James 87, 116, 123, 154
Cocteau, Jean, 60, 83, 96-100
Cohen, Ira, 169
Cohl, Emil, 29, 30
Coleman, Ornette, 141
Collins, Wilkie, 28
Conner, Bruce, 170
Connery, Sean, 70, 186
Connors, Chuck, 184, 185
Conte, Richard, 62
Coogan, Jackie, 63
Coolidge, Martha, 85
Corman, Roger, 60, 64, 119, 120, 143, 150, 157, 158, 162, 185
Cosby, Bill, 186, 209
Cotten, Joseph, 64, 66
Crist, Judith, 85, 112, 143, 145
Crosby, Gary, 125
Crowley, Aleister, 46, 166
Culp, Robert, 117
Curtis, Tony, 70
Cutsis, Jon, 171

Darren, James, 65, 106
Davis, Bette, 87, 91, 116, 187
Davis, Sid, 192, 193, 197, 199, 202
Day, Doris, 154, 155, 187
De Hirsch, Storm, 170
De Quincey, Thomas, 92
Dickens, Charles, 15
Dickson, W. K. L., 13
Dillman, Bradford, 65, 147
Dinesen, Robert, 15
Disney, Walt, 101, 103, 186, 189
Dixon, Wheeler, 172
Driscoll, Bobby, 137
Duke, Patty, 174, 175
Duvivier, Eric, 164

Eastwood, Clint, 118, 148
Eclair Company, 13
Edison, Thomas, 13, 14, 34, 37, 189
Edwards, Blake, 65, 116
Edwards, Vince, 64, 212
Elvey, Maurice, 19
Esper, Dwain, 80, 102, 192

Fabian, 81, 109, 111
Fagin, Larry, 171
Fairbanks, Douglas, 38-40, 46
Falk, Peter, 64
Farina, Richard, 151
Farmer, Mimsy, 144, 152
Faulkner, William, 81
Fellini, Federico, 153
Field, Sally, 151
Fields, W. C., 24
Finney, Albert, 71
Fishman, George, 170
Flynn, Errol, 129-133
Fonda, Jane, 113, 118
Fonda, Peter, 58, 66, 111, 112, 119, 143, 145
Ford, Glenn, 66
Fugs, 141

Gardner, Ava, 163
Garland, Judy, 134
Gaumont, 13
Gibson, Hoot, 24
Gilbert, Arthur, 15
Gilbert, John, 20
Ginsberg, Allen, 141, 197
Gish, Lillian, 18, 19
Glaser, Len, 172
Gleason, Jackie, 154
Gortner, Marjoe, 86, 115, 151
Graham, Billy, 72, 87, 150
Grant, Cary, 64, 137, 189
Greenberg, Bob, 169
Greene, Graham, 118
Grey, J., 172
Griffith, D. W., 24, 29, 41, 42, 91
Groening, Homer, 170
Grof, Stanislav, 200
Gruenberger, Joh, 170
Grunberg, Klaus, 152
Guardino, Harry, 147
Guerrero, Eduardo, 171

Hackman, Gene, 67, 85, 95, 114, 182
Hall, Ella, 15
Hall, Huntz, 135
Hansen, Juanita, 50
Hardy, Oliver, 26, 29, 189
Harris, Julie, 86
Harvey, Laurence, 87, 91, 123, 124
Hawkins, Jack, 71, 94
Hawkins, John, 169
Hawn, Goldie, 154
Hays, Will, 47, 48, 52, 54
Hayward, Susan, 81, 134, 174
Hayworth, Rita, 66, 77, 86, 94, 157
Hepburn, Audrey, 64, 66
Hepburn, Katharine, 81, 82
Hepworth, Cecil, 19, 22
Hershey, Barbara, 114
Heston, Charlton, 64
Hitchcock, Alfred, 184, 187
Hoberman, Jim, 172
Hoffman, Albert, 200
Holger-Madsen, 15
Holiday, Billie, 84
Holmes, Sherlock, 19, 37-41, 92, 103, 178, 179
Hope, Bob, 103, 176
Hopper, Dennis, 109, 111, 143, 145
Hudson, Rock, 123

Ives, Burl, 65

Jagger, Mick, 153
Janssen, David, 66, 125, 210
Jordan, Larry, 168
Jourdan, Louis, 92
Joy, Leatrice, 20

Karloff, Boris, 61, 79, 80, 90, 91, 93, 148, 176, 179, 186, 189, 190, 191
Keach, Stacy, 95
Keaton, Diane, 119, 184
Keeler, Ruby, 101
Kellerman, Sally, 154
Kesey, Ken, 114, 170
Kimball, Joh, 172
Kinder, Stuart, 15
Kirk, Tommy, 153
Kotto, Yaphet, 94
Krauss, Werner, 15
Kristofferson, Kris, 114, 116
Kubrick, Stanley, 161, 187

La Marr, Barbara, 50
Ladd, Alan, 137
Laemmle, Carl, 22
Lake, Veronica, 62
Lancaster, Burt, 70, 184
Landau, Martin, 211
Landon, Michael, 107
Landow, George, 169
Lasser, Louise, 137, 184, 213
Laughton, Charles, 177
Laurel, Stan, 26, 29, 36, 189
Leary, Timothy, 89, 143, 152, 154, 159, 160, 165, 188, 209, 213
Lee, Christopher, 71, 93, 179, 180, 187
Leeds, Lila, 81, 104, 126-29, 134
Lemmon, Jack, 118
Lennon, John, 153
Leonard, George, 114, 163
Lilly, John, 164
Lions, Michael, 172
Lipton, Lenny, 160, 172
Lloyd, Harold, 90
Lombard, Carole, 61
Lorre, Peter, 177
Love, Bessie, 38, 48, 61
Lucas, George, 187, 188
Lugosi, Bela, 24, 80, 90, 101, 137, 186, 188

Maas, Willard, 169
MacArthur, James, 150
McClure, Michael, 199
MacLaine, Shirley, 118
McLaughlin, David,170
McLean, John, 172
Malle, Louis, 88
Manchu, Fu, 17-19, 93
Marshall, E. G., 94
Marshall, Herbert, 91
Marvin, Lee, 70
Marx, Groucho, 154
Marx, Harpo, 103
Marx, Patricia, 169
Mason, James, 57, 72, 116, 163
Maugham, Somerset, 91
Maysles, David, 115
Melendez, Jeronimo, 66
Melies, Georges, 13, 20, 28, 29
Meredith, Burgess, 118
Metzner, Ralph, 160
Meyer, Russ, 163
Michael, Gertrude, 101
Milland, Ray, 163
Mineo, Sal, 106
Mishkin, William, 158
Mitchum, Robert, 68, 104, 126-129, 134, 209
Mix, Tom, 24
Monroe, Marilyn, 137
Montalban, Ricardo, 65, 66
Montand, Yves, 65
Montgomery, George, 141, 144
Moore, Grace, 80
Moreau, Jeanne, 88
Morrissey, Paul, 84
Mueller, F. Thomas, 193
Murnau, F. W., 36
Mutrux, Floyd, 85

Near, Holly, 163
Negri, Pola, 22, 177

Nelson, Rob, 171
Newland, John, 139
Newman, Paul, 86, 123, 124, 182
Nicholson, Jack, 58, 111, 112, 118, 119, 142, 144, 145
Niven, David, 153, 210
Nixon, Richard, 118, 125
Nolan, Mary, 134, 135
Normand, Mabel, 47, 49
Norwood, Ellie, 37

O'Brien, Edmund, 83, 93
O'Brien, Willis, 34
Odetta, 65, 81
Oland, Warner, 19, 187
O'Neal, Ron, 183
O'Neal, Ryan, 137
Ono, Yoko, 77

Pacino, Al, 84
Page, Geraldine, 123, 124
Parker, Charlie, 83
Pathé, 13
Paul, R.W., 13, 29
Peck, Gregory, 176
Peppard, George, 163, 213
Perez, Severo, 172
Pickford, Mary, 46
Poe, Edgar Allan, 15, 26, 87, 153
Poitier, Sidney, 69, 174
Pollard, Michael, 147
Porter, Cole, 51
Powell, Dick, 56, 91, 101
Preminger, Otto, 56, 81, 116, 154
Prentiss, Paula, 117, 118
Price, B. C., 81, 106
Price, Vincent, 81, 88, 92, 139, 140, 186, 188
Rains, Claude, 90, 176
Ray, Charles, 16, 19
Reagan, Ronald, 193
Reid, Wallace, 47, 48
Reinert, Robert, 15
Reisman, Glen, 172
Rettig, Tommy, 137
Reubens, Alma, 38, 50, 51
Rey, Fernando, 67, 183
Rice, Ron, 172
Robards, Jason, Jr., 82
Roe, Tommy, 198
Rohmer, Sax, 19, 93
Rooks, Conrad, 60, 83, 115, 141, 143
Rooney, Mickey, 118, 134
Ross, Barney, 57, 81
Roundtree, Richard, 69
Rule, Janice, 87
Russell, Ken, 164

Sadoul, Georges, 13, 21, 29
Sanders, George, 66, 81
Sarrazin, Michael, 185
Savalas, Telly, 66, 67, 211
Schary, Dore, 134
Schmidt, Albrecht, 22
Segal, Erich, 85, 114
Segal, George, 84, 116
Sellers, Peter, 110, 111, 116, 153, 190
Servais, James, 172
Servais, Raoul, 186
Serling, Rod, 109
Shankar, Ravi, 141
Sharits, Paul, 169
Shatner, William, 114, 210
Shearer, Norma, 23
Shelton, Gilbert, 170, 171, 194
Shields, Brooke, 95
Sinatra, Frank, 57, 81
Skelton, Red, 187
Smith, Harry, 165, 168
Sonbert, Warren, 171
Southern, Terry, 116
Spector, Phil, 145, 146
Spoecker, Peter, 169
Stack, Robert, 149, 212
Starr, Ringo, 111
Stevens, Stella, 83
Stevenson, R. L., 35
Stewart, Bhob, 172
Strasberg, Susan, 144
Streisand, Barbra, 116
Sutherland, Donald, 113, 153

Talbot, Lyle, 62, 64, 106, 107
Talmade, Norma, 22
Talmadge, Richard, 20
Tamblyn, Russ, 63, 77, 107, 149, 150
Taylor, Robert, 63
Taylor, Rod, 66
Taylor, W. D., 46, 47
Tarantino, Jimmy, 133-137
Thomas, Olive, 46
Thomas, Piri, 195
Toomey, Regis, 61
Tryon, Tom, 73
Turner, Lana, 147
Turner, Tina, 154

Ullman, Ethel, 16

Van Der Beek, Stan, 169
Van Doren, Mamie, 107, 109
Van Meter, Ben, 170, 171
Veidt, Konrad, 15, 36
Von Sydow, Max, 116, 123

Wadleigh, Michael, 115
Wagner, Lindsay, 112
Wakuluk, Jon, 172
Wallace, Edgar, 70, 71
Wallach, Eli, 63, 94
Walters, Barbara, 209
Warhol, Andy, 116, 151, 174
Waters, John, 171
Wayne, John, 67, 95
Webb, Jack, 125, 210, 211
Wegge, Stig, 172
Weise, Michael, 169
Welles, Orson, 62, 64, 112
White, Pearl, 37
Whitney, James, 168
Widmark, Richard, 55, 62, 188, 212
Williams, Tennessee, 116, 123
Winn, Kitty, 84
Winters, Shelley, 65, 86, 94
Wiseman, Frederick, 83
Wong, Anna May, 20
Wood, Natalie, 117
Woodward, Joanne, 176
Worthing, Helen Lee, 133, 135

Yeaworth, Irvin, 82, 83
York, Susannah, 66, 175
Young, Clara Kimball, 22, 23

Zappa, Frank, 153
Zecca, Ferdinand, 13, 29, 30
Zuckerman, Michael, 170
Zugsmith, Albert, 92, 107-109, 141

Michael Starks majored in zoology at University of Illinois and UC Santa Barbara and went to graduate school in physiology at UC Berkeley where he researched energy transfer in mitochondria and chloroplasts. Subsequently he became an author, medical technologist, inventor, entrepreneur, psychedelic voyager, world traveler, stereoscopic videographer and philosopher. Starks has authored four books, fifty book reviews, a dozen scientific articles and several patents. One patent was the basis for the only widely used commercial 3DTV and computer graphic system in 80's and 90's, while another is the basis for all the 2D to 3D conversion methods used on 3D films, 3DTV sets and BlueRay players and is worth billions but was sold for a pittance to a company that went bankrupt. Now Michael Starks is a retired philosopher.

Michael Starks is an avid fan of old and strange films and the history of cultural change and this book is one of the consequences. Many were seen at the Pacific Film Archive in Berkeley and small cinemas in the Bay Area, but mostly by searching TV Guide and staying up late, as there were no internet and no home video recorders at the time. Hundreds of hours were spent in the film section of the UCB library. Countless letters by snail mail were sent to film archives and studios to get info and to obtain stills. In other cases some of the early stills were made from copies of the old public domain titles that Starks was able to purchase.

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History of Drugs in the Movies
1894 - 1978

Michael Starks

COCAINE FIENDS AND REEFER MADNESS is an exhaustive exploration of the history of the depiction of psychoactive drugs in motion pictures from Thomas Edison's *Opium Smoker* (1894) to *Cocaine Cowboys* (1978), Included are over 400 silent and 1,000 sound films as well as nearly 500 drug-abuse films, 85 experimental films, and 135 television programs. More than 150 stills, most never before published and many extremely rare, illustrate the text.

The book is arranged chronologically as well as by drug type and often by country. The use of drugs by film people, censorship of drug themes in films, and the influence of drugs on the content and style of films are discussed.

Some of the films have only trifling references to drugs — "What's he been smoking?" in *Gold Diggers of 1933*, while others are concerned with little else such as *Cocaine Fiends* and *The Trip.*

COCAINE FIENDS AND REEFER MADNESS shows that drug films were made in nearly every country and period that produced a significant body of films. In searching them out, the reader visits Edison's first film studio, reflect on the filmic consequences of Cocteau's opium addiction with Kenneth Anger's early experiences with magic mushrooms, see Charles Laughton smuggling cocaine inside a statute of the Buddha, and watch Douglas Fairbanks, Sr., consuming vast quantities of opium and cocaine in a World War I Sherlock Holmes parody. Heroin makes junkies writhe and scream in *The Panic in Needle Park* (1971) and the *Devil's Needle* (1916), and LSD leads to murder in *Mantis in Lace* (1968) and to spiritual rebirth in *Turn On, Tune In, Drop Out* (1967).

From the very beginning, filmmakers have struggled to free themselves from censorship and manipulation by special-interest groups, and this struggle is clearly evident in the history of drug films. Only recently has it been possible to portray drug users and drug effects candidly, and the increasing accuracy and power of such films is examined.

Pop Culture
Film History

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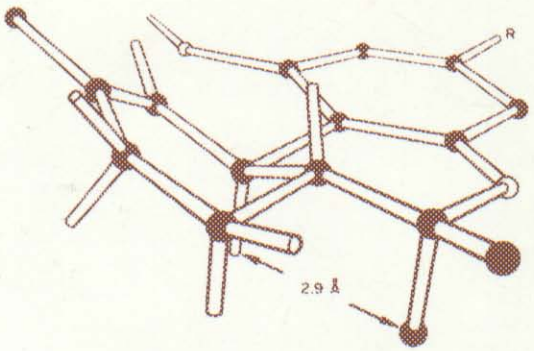
MARIJUANA CHEMISTRY

Genetics, Processing & Potency

by Michael Starks



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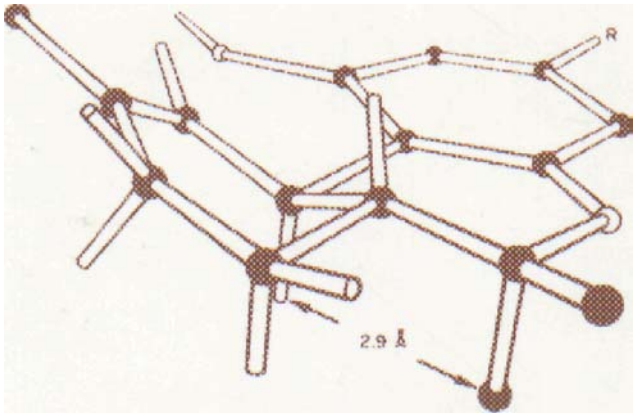

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Introduction to Second Edition

Reviewing the work *on* the botany and chemistry of marijuana which has appeared in the twelve years since the publication of the first edition of this work is both gratifying and dismaying. It is gratifying in that the conclusions reached earlier are in need of no significant re vision and dismaying in that they have been largely ignored. It is amazing that so little work has been done on such a fundamental issue as the effect of cannabidiol on the high and other actions of THC and that when studies on the high finally appeared they were done by Brazilians! Probably the red tape involved in doing research on humans with psychedelics is a major barrier. I am reminded of the failure of nearly thirty years of research to determine the influence of iso-LSD on the LSD experience. Likewise, only a few of the hundreds of THC and LSD homologs and analogs have been adequately tested for psychoactivity. Only a trickle of work has appeared on the promising marijuana clones. Also, no attempt seems to have been made to reinstate hemp fiber as a significant source of paper, rope and doth, in spite of the beautiful examples of

hemp and hemp-cotton cloth still available from Japan. The history and *use* of hemp fiber has hardly been touched upon in the modem English literature and all the great classic works in other languages remain untranslated. Finally, my suggestions on the necessity of measuring the total cannabinoid content of plants in order to eliminate the spurious fluctuations due to other constituents have gone unheeded.

Clearly, there remains a considerable amount of work for researchers.

I have chosen to place the new material as an addendum so as bo enable the many readers of the first edition to immediately acquaint themselves with the progress in the field.

Michael Starks
Berkeley, California
January, 1990

Preface

In the list few years it has become possible to approach the question of marijuana potency in a rational manner for the first time. This is mainly due to the widespread application of modern analytical techniques such as thin layer and gai chromatography to plant analysis. 1 have attempted here the first general survey of the scientific results relative to the high produced by sjnoking or eating various marijuana preparations, Sophisticated users can now gauge roughly what effects a given sample will have simply by learning its tettaliydrocannibinol and cannabidiol contents. Furthermore, if they know the origin of the seeds, they will know a great deal about the probable potency of the resulting plants.

I have tried to summarise a vast amount of complicated data in a fashion comprehensible to the general reader. Consequently, f have sometimes simplified the information and hive included only a few key references of the hundreds examined. Nevertheless, I have tried to be accurate and would appreciate any corrections or comments from readers.

The author wishes to thank Candice Jacobson for an exhaustive job of copy editing.

Contents

Preface vii

Introduction 3

1. Marijuana Constituents and Their Effects 5

Cannabinoids-the Active Chemicals *of* Marijuana 5
The Cannabidiol Story 6 Smoking Versus Eating
11 Deterioration 13

2. Growth Conditions and Potency 17

Species 17
Seeds 20
Functions of Cannabinoids in Marijuana 22
Cellular Origin of Cannabinoids 23
Heredity and Environment 26
Bonsai Marijuana 29
Grafting and Cloning 29
Pruning Branches and Manipulating Stems 31
Potency and Color 32
Some Growing Techniques 33
Sinsemilla 35
Polyploidy 37
Potency and Cannabinoid Content 38

3. Variations in THC and CBD Content 41

Introduction 41
Age Variation 42

Cannabinoid Phenotypes 45
Relative Potency of Mile and Female Plants 48
Monoecious Strains 53
Can nabino id Cont ent of Has h is h 58
Cannabinoid Content of Various Plant Parts 63
Propyl Cannabinoids 69
Cannabi noi d Co nte nt of Female Flowering Tops 72
Thai and Other Southeast Asian Delicacies 74
Wild Weed in the U.S. 81
Recent Observations on Environmental Effects 81
Hybrids 86

4, Variations in Content of Noncannabinoids 89

Essential Oils 89
Saturated Hydrocarbons 90
Alkaloids 91
Variation in the Opiate Content of Poppies 91

5, Harvesting and Preparing Marijuana and Hashish 93

Scientific Foundations 93 Harvesting and Hashmaking in India 94 Hashmaking in Lebanon 101 Hashmaking in China 102 Hashmaking in Greece 102 Hashmaking in Mexico 104 Potent Preparations for Smoking, Drinking and Eating 109

6, Extraction of THC and Preparation of Hash Oil 111

Sample Preparation 111
Solvents 111
Apparatus and Procedure 1 1 3
Purification 116
Special Extraction Apparatus 117

The DBA Comments on Hash Oil 117
THC Content of Hash Oil 122

7. Isomerization 123

Principles 123
Procedure 123
Automation 125
Deciding When to Isometize 125

8. Testing for THC and CBD Content 127

Color imc try 127
Fluorimetr^ 128
Chromatography 129

Appendix 131

Journalof Abbreviations 131
Chemical Hints 132 Is it
Legal? 135
Structure-Activity Relationships 136
Sy ntheses of THC and Anal ogs 138
Precursots for THC Synthesis 145

Notes 165

Glossary 169

Bibliography 171

MARIJUANA CHEMISTRY
Genetics, *Processing, Si* ***Potency***

Abbreviations

CBD cannabidiol
CBDA cannab idiotic acid
CBN caimabinul
CBDV cannabidivjirei]
THCV tetrahydrocannabivarol
THC tetrahydrutiinnabinol
THCA tetrahydrocann;ibinolic acid

Introduction

Psyche-active plants have had an extremely important position in most societies. Consumption of such plants tens or even hundreds of thousands of years ago may have been responsible for generating much of the mythology and religion, indeed, much of the very fabric of culture which so strikingly distinguishes man from even the most advanced of the great apes. Could it be that these plants provided sparks to kindle the flame of intellect which now shines so brightly it threatens to destroy the world? Countless millions of times priests, elders and sages consumed potent preparations of psychoactive plants in order to attune themselves to nature and act in accordance with natural or divine law. This is still done in many *of* the less technologically evolved societies. The almost universal occurrence of such practices (or their substitutes such as meditation, yoga, trance, hypnosis) testifies to their effectiveness. Western Europe, however, was largely devoid of such plants and consequently of traditions for using them to put oneself in harmony with the surroundings, American traditions have mostly evolved from those of Western Europe and this is one reason for considerable resistance to the use of psychedelic drugs,

Most of the psychoactive plants contain large amounts of alkaloids. These are bitter tasting, nitrogen containing bases which have a wide variety of effects on animals. Why do so many plants contain chemicals that have striking actions on animal nervous systems? Surely the chemicals or some closely related chemicals found in the plants must play important roles in the economy of the plant or else the many genes required for their synthesis would be eliminated by natural selection. In view of the fundamental similarity of all living organisms, it is not surprising that all of them contain chemicals which are ac-

tive on all the others. Nevertheless, the relatively high concentrations of many psych cacti ve substances are still puzzling and their precise functions in the plants remain a mystery.

The active chemicals of marijuana, though they are unusual in that they ate not alkaloids, do not contain nitrogen and arc relatively insoluble in water, likewise have no known reason for being in the plant. However, rhe psychoactive constituents of *Cannabis* are unusual, in fact unique, in that they are largely produced in specialized groups of cells termed lactifers, stalked glands and sessile (i.e., not stalked) glands, and in their being released from these cells to form a sticky coating. This will be discussed in more detail later in chapter one.

Before delving into the basic chemistry of *Cannabis, A* few words of explanation for those unfamiliar with organic chemistry are appropriate. C, H, Q, and N refer respectively to atoms of carbon, hydrogen, oxygen and nitrogen. R indicates that a number of different chemical groups (radicals) may occur at this position- In accordance with common conventions, carbon and hydrogen atoms are often omitted in structural formulas. Thus, delta-one-tetrahydrocannabinol shown in figure one actually has 21 carbon atoms and 30 hydrogen atoms. A single line between two atoms indicates a single bond (single pair of shared electrons) while a double line indicates a double bond (two pairs of shared electrons). A double bond is said to he unsatur-ated because hydrogen or other atoms can be added to it, as when cannabidiol is converted by the plant to THC. Conversely, atoms may he removed from single bonds to produce double bonds as when THC converts to CBN (sec figure one). Carbon always has four bonds.

Do not be put off by the chemical formulas and detailed cables in this book—chey are absolutely necessary for an adequate understanding of marijuana pocency and can be understood by anyone willing to spend a few hours reading. The rewards for making the effort are substantial-you will have a rational, scientific basis for buying, growing, liar vesting, storing, preparing, testing and using marijuana and hashish.

Marijuana Constituents and Their Effects

Cannab inoids— **The Active** Chemicals of Marijuana

Although chemical research on marijuana began over 150 years ago, it wasn't until 1964 that the first authenticated isolation of *a.* pure, active principle delta-one tetrahydrocannabinol (A'-THC) WAS achieved, and not until 1970 that it was determined to be the only major psychoactive component. Even though dozens of cannabinoids have been isolated since then, none have been found to be significantly psych oactive,

Cannabinoids are the compounds with 21 carbon atoms; they and their car boxy lie acids, analogs and transformation products are some of the chemical components of marijuana. Figures 1, 2 and 3 give the structures of a few of these compounds and their probable bio-synthetic relationships. Most can-nabinoids are extremely insoluble in water, and in the living cell they are probably present entirely as their carboxylic acids- When isolated from fresh marijuana they are usually in their acid form until aging, drying and heat decar boxy late them. The data usually give [he percentage of weight of cannabinoids in their neutral form, decar bo xylated. The acids are not biologically active, but this is only important if marijuana is eaten or injected, since smoking decarboxylateu thern. Most marijuana seems to contain largely or exclusively the "A" form of the acids (shown in figure 2), but variants have been observed which have some of the "B" form. One Indian variant contained ten times as much *'A" as "B" and one haihish sample had very little "A," These positional isomers have no: been investigated much and their significance is unknown.

£l <*'-THC (shown in figure 2) is a minor constituent of

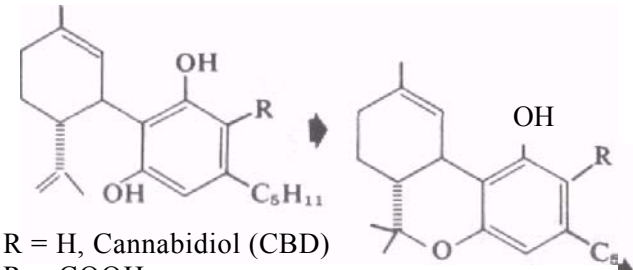
marijuana, seldom exceeding more than a few percent of the A^1 - THC content and having about the same biological activity. It has been suspected of being an artifact of marijuana extraction and analysis.

The bio-synthetic route of the cannabinoids (the biochemical pathways by which they are synthesized in the living plant) has not been fully worked out, but the most probable routes Eire given in figure 3. Starting from precursors such *us* isoprene or mevalonic acid, compounds of the olivetolic acid and geranyl pyrophosphate type are condensed via intermediates such as cannabigerolic acid to give cannabidiolic acid, which is cyclized to give tetrahydrocannabinolic acid. Time and heat will subsequently cause a certain amount of the THC acid to be dehydrogenated to cannabmolic acid or tannabinol (CBN), At some point, THC and /or cannabidiol (CBD) arc extruded through the cell membrane. Whether :his happens continually or only after a critical concentration has been reached has not been established: polymers of THC may be formed at this time, but their amounts and possible contribution to marijuana, activity have not been investigated.

A great deal of research has been directed at determining the activity of the various chemical constituents of marijuana. One study used the three main compounds, THC, CBD (the bio-synthetic precursor to THC) and CBN (the immediate degradation product of THC). The researchers injected measured amounts of each of the compounds in pure form intravenously in human subjects. For THC, it was found that 20 meg per kilogram of body weight was the average minimum amount perceived to induce a high, while 50 meg per kilogram was the average maximum amount desired. For CBN these figures were 200 and 270 meg per kilogram respectively, while for CBD, no high was reported even at 270 meg per kilogram. However, recent studies show that CBD, while having no direct effecc by itself, can have a significant interaction with THC.[1]

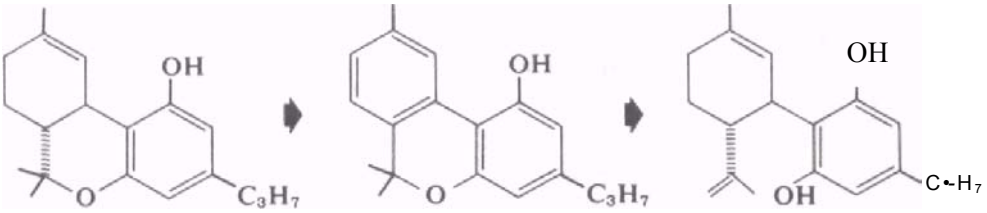
The Cannabidiol Story

The widely varying effects of marijuana and hashish have long



R = H, Cannabidiol (CBD)
R = COOH,
Cannabidiolic acid

R = H, Cannabinol (CBN) i' R = COOH, Cannabinolic acid J'-Tetrahydrocannabinol.CR = H) ^'-THC (J^8-THC) A^1 -Tetrahydrocannabinolic acid (R = COOH)

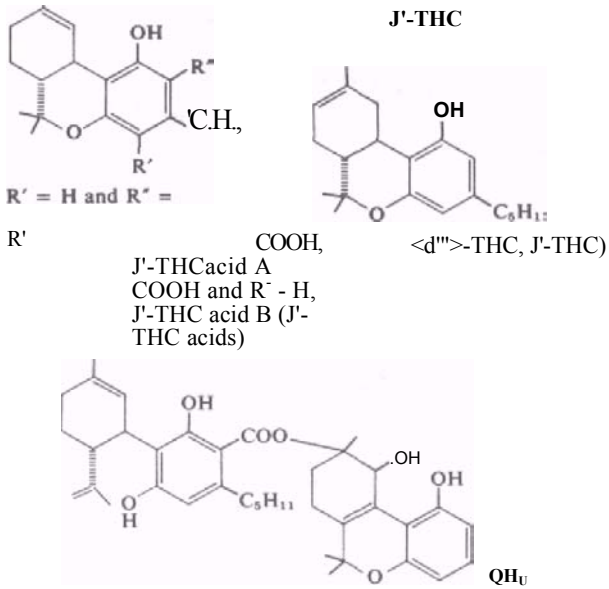


il'-Tetrahydrocannabivarol {tetrahydrocannabidivarot, tetrahydrocannabivarin, propyl-THC)

Cannabivarol (cannabidivarol, cannabivarin, propyl cannabinol)

Cannabidivarol (cannabidivarin, propyl Cannabidiol)

Fig. 1. Some naturally occurring cannabinoids. The top three compounds are by far the most important, with the set of three compounds below being identical except that the side chain is shortened by 2 carbon atoms in the cannabidivarol series. Later in the text took for a discussion of the series with the propyl side chain, and see the Appendix for the numbering system used. (Reprinted, by permission, from R, Mechoulam, *Marijuana,* 1973.)



R' COOH, <d'">-THC, J'-THC)

J'-THCacid A COOH and R - H, J'-THC acid B (J'-THC acids)

Fig. 2. Other naturally occurring cannabinoids. (Reprinted, by permission, from R. Mechoulam, *Marijuana,* 1973.)

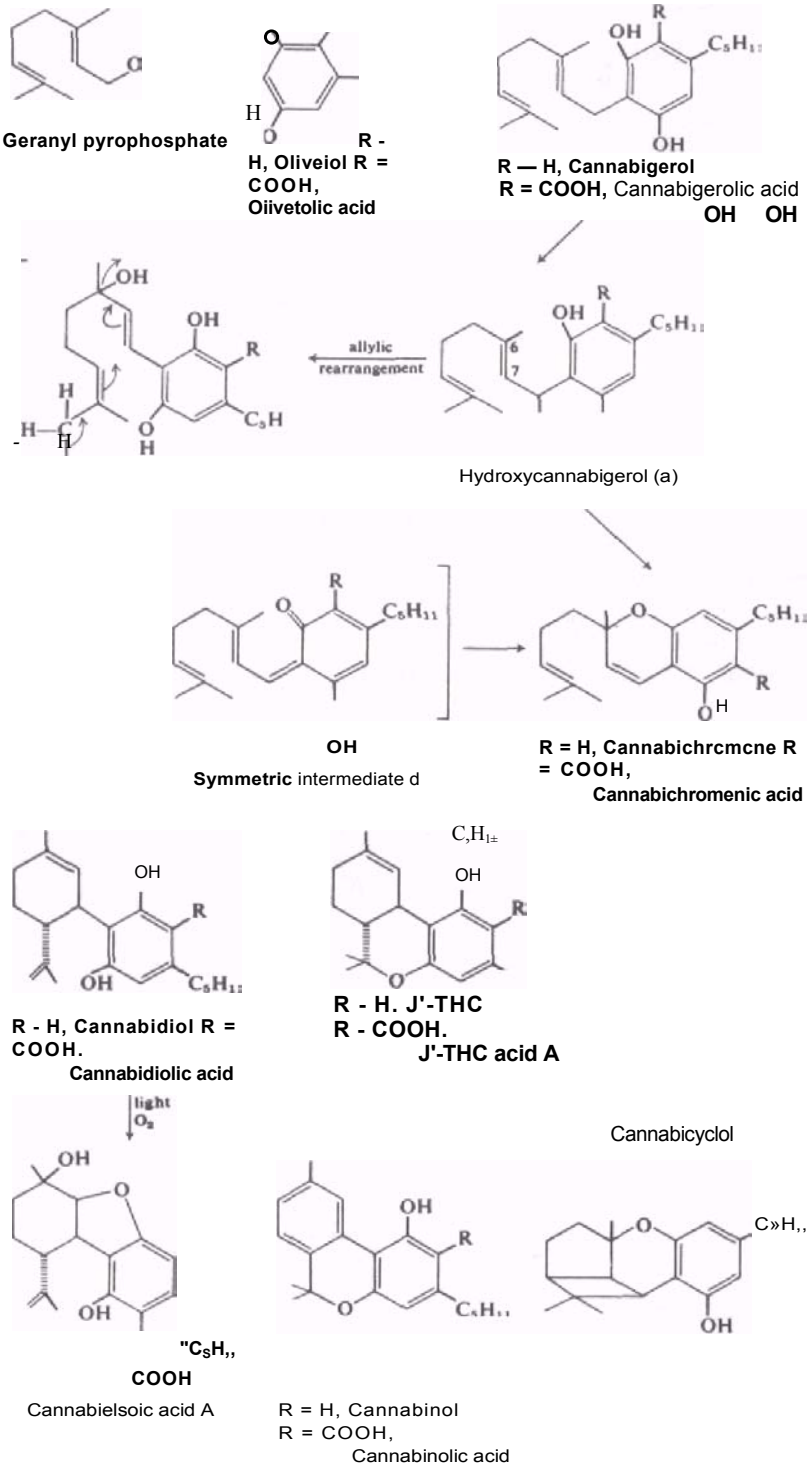
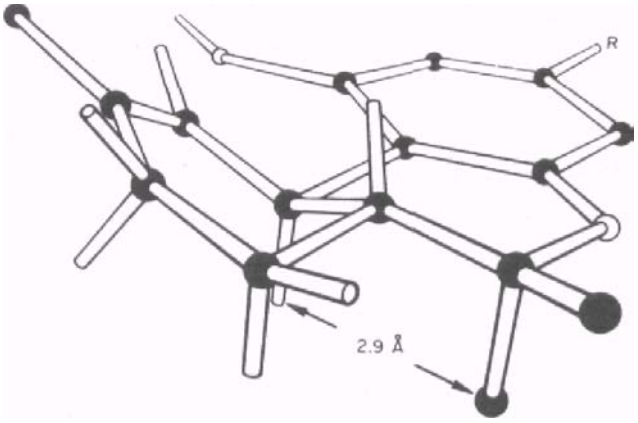
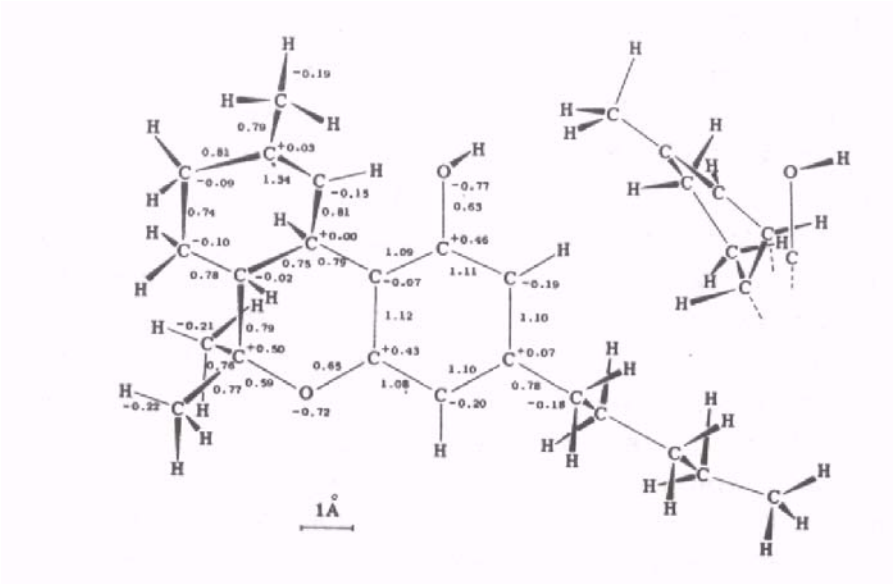


Fig. 3. Probable biosynthetic relationships of the major cannabinoids. (Reprinted, by permission, from R. Mechoulam, *Marijuana.* 1973.)





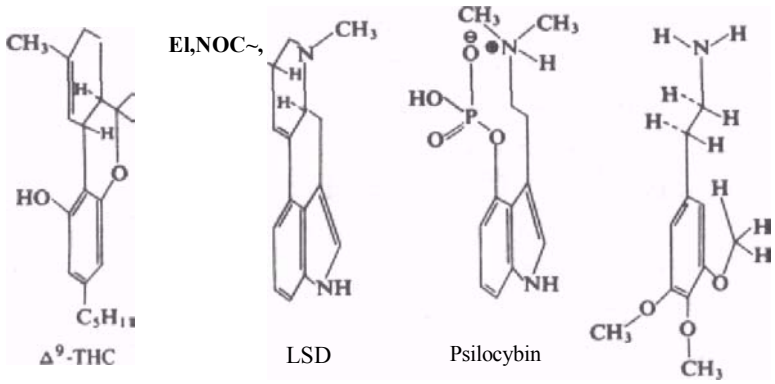


Fig. 4. Structural aspects of THC. (Reprinted, by permission, from R. Mechoulam. *Marijuana,* 1973.)

puzzled researchers, if THC is the only psychoactive component, one should get high in proportion to the percentage of THC, especially since studies have shown that pare THC produces essentially the same effects as marijuana. However, the fact is that different samples produce a qualitatively different type of high and that heavy THC content (as in many samples of hashish) does not guarantee a good high, Recent scientific research is helping us to make sense out of this.

The only compounds that miy have effects themselves or may affect the response to THC are CBD and CBN, These two compounds have relatively minor sedative effects in the amounts in which they are likely to be ingested or smoked by ordinary users. Recent studies have shown that they tend to increase the depressant effects of THC while blocking its excitant effects. That is, they tend to mate the user sleepy and block the high, The actual situation is more subtle: C&N can synergise with THC to increase mental effects, but CBN will seldom be of consequence in natural situations since it is not usually present in high concentrations and has low potency. Another possibility is that CBD may decrease the depressant effects of THC as well as the excitant effects. Usually, however, as in a recent experiment in which subjects smoked THC with and without CBD (at six times the THC amount) the CBD significantly decreased the euphoria of THC while having no effect itself. When CBD was taken with THC orally at two times the THC amount, it delayed the onset but extended the duration of the high.

The practical conclusions of these findings seem to be: (1) the CBD content of marijuana and hashish should be as low as possible in order to get a good high; (2) a high THC content only means a good high if accompanied by a low CBD content; (3) any grass containing lots of CBD should be extracted and the CBD isomerizcd to THC; (4) careful evaluation of grass requires quantitative testing for THC and CBD content.

The effects of CBD on the THC high need further investigation, however. It is possible that when present in large amounts, CBD is involved in some of the interesting and pleasurable aspects of the high. It may well be that marijuana that has lots of CBD and THC can be more desirable than that with THC alone. This may be why hashish, though it normally has much less THC

than CBD, is frequently a better high than one would expect on [he basis of THC content alone.

This could also explain some of the striking differences in subjective e A peri e nee afforded by different marijuana, As the CBD content increases relative to that of THC, the high will be weakened and delayed. Thus, grass which has an adequate THC content (say 1%) but significant amounts of CBD (say 0.5%J will tend to be very mild, but will slowly creep up on the user and may have him more stoned four liours later than if there were no CBD present. Sometimes this is advantageous; in a recent experiment naive subjects reported that joints containing CBD witii THC were more pleasant than with THC alone. The CBD attenuated the high enough to rid them of anxiety and the jitters,[1]

Hopefully, it is now clear why the various tables include both THC and CBD, Getting high is becoming a science as well as an art. By paying careful attention to the tables and correlating them with personal experience, it may eventually be possible to judge fairly closely the nature of the high obtainable from a given marijuana, sample. Simple, rapid chemical tests for home use will soon be available for the determination of THC and CBD content, Merely knowing the origin of the seeds can also give a good gauge for evaluating the quality of the resulting marijuana crop, regardless of where it is being grown. Of course, differences in seeds, growth conditions and age will still produce considerable variation, but seeds from high THC plants will usually grow into high THC plants.

To summarise, the cannabidiol story is confusing because of the complex nature of its interaction 15 with THC and because relatively little research has been done. Meanwhile, it seems reasonable to assume that as CBD content approaches that of THC, the high will be diminished in intensity, but prolonged.

Smoking Versus Eating

It's more efficient to smoke than eat—at least if you are trying to get high. Most of the data on smoking is derived from analysis of condensates from cigarette smoking machines, and it is unclear whether the results are equivalent to what one would get

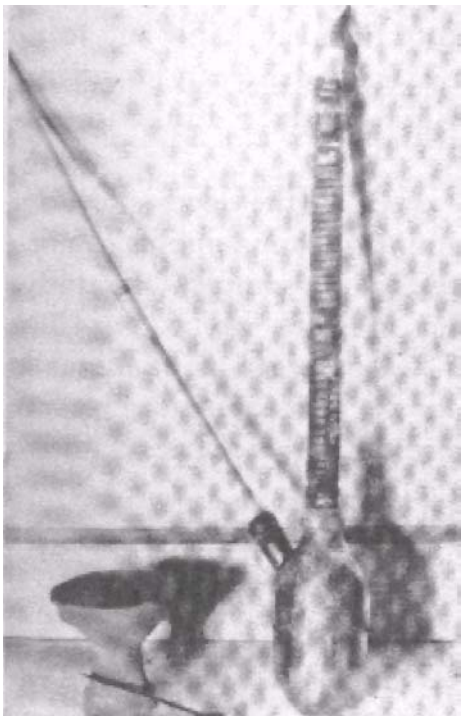
from people smoking. But the results indicate at least 20% {and a maximum of 60%) of the THC present in a joint reaches the lungs, with the amount increasing to perhaps 45% when the same substance is smoked in a pipe. An experienced smoker who inhales deeply and holds it in a long time will retain up to 80% of the cannabinoids inhaled.

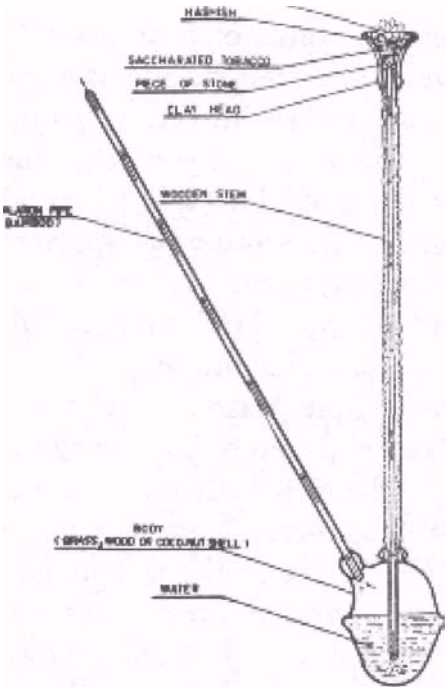
The main chemical change upon smoking seems to be decarboxylation of THC acid to THC, This is particularly important for fresh, moist samples in which the THC will not be active and will need decarboxylation. Other samples which have been heated or stored awhile normally have had the THC deearboxylated already. Smoking also converts some of the THC into the inactive CBN and produces in small amounts a number of other compounds of minor significance. Smoking does not cause much cyclization of CfcD to THC unless the marijuana is mixed with tobacco (common in most areas except the U.S.), and even then only a small amount of such cyclization may occur.

When pure, THC is roughly three times more potent when smoked than when eaten. Smoking about 6 mg, or eating about 15 mg, of THC will feel like a minimal high to most people; whereas smoking 30 mg or eating 75 mg will tend to produce very intense effects, comparable to those from LSD. However, when hashish or marijuana is eaten, it may be five or ten times less potent than smoking due to incomplete absorption from the intenstine. In terms of average marijuana containing 1% THC, this would mean that smoking roughly 1 gram would provide a minimal high, a condition also obtainable by eating 3 grams. Don't forget that most THC is present in the orally inactive acid form. Consequently it should first be finely pulverized and well-baked in an oven in order to dccar boxy late the acid.

What about water pipes? A recent experiment showed that the water soluble substances absorbed in the water pipe were inactive. This is as expected, since cannabinoids arc insoluble in water, However, the insoluble material that collected on the top of the water and on the walls of the pipe was very active. Relative to a condensate of the smoke which reaches the lungs, it contained 1/3 the THC, 1/4 the CBD, and slightly more CBN. Some water pipe devotees use wine in their pipes (cherry wine is my favorite) and a small percentage of cannabinoids may be

expected to dissolve in the alcohol. However, as the pipe is used, the alcohol will gradually steam distill. When the alcoholic content drops, the cannabinoids will precipitate on the bottom and walls. Water pipes have the advantage of cooling the smoke; while there is greater efficiency in smoking a joint, water pipes also Filter out large particles and are probably easier on the lungs,[5]





Fffl. *5,* Middle Pattern water pipe. Typical of EOVPT and adjSMnt countries «at*r pipe; of ltiis sort hgwe b#*n *uttd* for about 400 year*. Tha hashish typically rests on a layer uf tobacco [saccharated, sugared in this ax ample l and is ignited *ith live coals from trip chafing dish, The smokt pawing down tho tt«m it cooled and filtered by the water. 1 Reprinted from M. Souair, *Bulletin an Narcotic*,* 1967.)

Deterioration

Hashish deteriorates with time. In India it is stored only for about three years. After that, it loses its dark brown or greenish color and resinous quality, becoming brownish-grey, ha±d and crumbly. This loss of potency is due to oxidation; the center of a chunk will remain potent longer than the outside, Raphael

Mechoulam, the pioneer marijuana experimenter, found one chunk of hash with 2% THC on the outside, but 8% inside. Twenty years earlier, marijuana researcher Levine found that after three years a 100-pound lump of *charaf* (hashish) had retained its potency in the center, while the crust contained 1/20 of its former potency.

In India,£<jnfti (flowering tops) is generally considered useless by the end of two years, while the *bhang* [leaves), which have a lower THC content, arc said to be Fairly stable and may keep for three or four years. During the fourth year, however, they are prized mainly as a cooling and soothing drink rather than for their intoxicating Duality.

The ratio between the amount of CBN (the decomposition product of THC} and the total amount of cannabinoids can be used to determine the approximate age of a sample. One study found that under tropical conditions in India, the ratio of CBN to CBN plus THC increased about 12% per year for *charas* and 3.5% per year forjfan/d. The smaller the ratio, the more recent the sample. Hashish deteriorates faster thanjffm/fl because it is more exposed to air during manufacture.

The importance of the intact ness was shown in a recent British study. There was about twice as much loss of THC over a year's time if the marijuana was passed through a 0.33 mm mesh than if a 1 mm mesh was used; the experiment was conducted in a dark room kept at 20* C. Even so, the yearly loss in the more finely powdered samples varied from 16 to 43%, for unknown reasons. The effect of light was also significant over a one-year period. The decrease in THC was 36% in the light versus 13% in the dark. Light has a greater effect on manicured marijuana than on intact material.

One of the best studies on the deterioration of marijuana with time was reported in 1973 by University of Mississippi researchers. They put dried, manicured marijuana in amber glass bottles which were not airtight and observed cannabinoid content at various temperatures for 100 weeks. The following table gives the results. Note that 76* F is approximately room temperature and 98° F is near normal body temperature of 98.6° F.

Table 1 shows that if marijuana is stored for a year at room temperature in the dark, it should not lose more than about

10% in potency. The CDD content was constant at all temperatures, *A&* is usually the case with fresh marijuana, most of the THC (nbour 95%) was actually present as THC acid. Significant decarboxylation of THC acid to THC occurred only at 98° F, when it decarboxylated about 50% during die year period. An experiment on hashish showed that one minute at 50* C (122°FJ de car boxy la ted about 50% of the THC acid. Thus, a few minutes in a 200* F oven would suffice for complete conversion, and would render all the THC in the sample orally active.

Clearly, the more the plant structure is disrupted, the more rapid the THC loss will be. If rhc plant is harvested without being manicured [seeds and stems removed), expect somewhat less THC loss than indicated in table 1. If it is finely crushed or run through a sieve, somewhat more loss can be expected. Also, there is no need to store marijuana in the refrigerator unless you live in an area where the temperature wilf consistently exceed 90* F *and* you plan to store it longer than a year. It is true that if not dried properly, marijuana might get moldy, especially if kept in plastic bags, and that in rime the cannabinoids will break down and potency decrease. Contrary to popular belief, moldy marijuana is less potent than dry. But, like the myths of potency increase with dry ice treatment, speed in acid, and brain damage from DMT, this belief will probably never die,

If you arc concerned with achieving the least potency loss, it is best to store your marijuana, uncleaned, in an airtight container in a dark, cool place. Since it takes a considerable amount of time for the potency to decrease, this will give you the option of not smoking certain marijuana for a period of time and then returning to it assured that its potency is un diminished,[4]

TABLE 1

MARIJUANA
POTENCY DECREASE
WITH AGE

TEMPERATURE	YEARLY %THC LOST
0	3.3
39	5.4
76	6,9
98	X20.0
-18	
4	
22	
37	

Growth Conditions **and Potency**

Species

There is currently much confusion about the number of species in the gen us *Caandbis.* Some botanists hold that, on the basis of morphological criteria, there are three species: *satina, indica* and *Tvderalis.* These are characterized as follows: (Note that *akenes*—often spelled *achenes-iz* the technically correct name for seeds. The abscission layer is the site where the seed is attached.)

C. *sativa:* Plants usually tall (five to eighteen feet), laxly branched. Akenes smooth, usually lacking marbled pattern of outer coat, firmly attached to stalk and without definite articulation.

C *indica:* Plants usually small (four feet or less), not laxly branched. Akenes usually marbled on outer coat, with definite abscission layer, dropping off at maturity. Plants very densely branched, more or less conical, usually four feet tall or less, Abscission layer a simple articulation at base of akene.

C *nideralis:* Plants not branched or very sparsely so, usually one or two feet at maturity. Abscission layer forms a fleshy caruncle-like growth at base of akene.

C. ntderalis is a wild species which occurs as a weed in cultivated fields in southeastern Russia and central Asia, and is spreading westward into Europe, ft docs not occur in the USA. It is also distinguished by its extremely short leaves and seeds that tend to be smaller than C, *saliva* seeds (akenesj, C. *indica* tends to have small, almost spherical seeds, averaging smaller than those of C *ruderalis* and generally has alternate leaves, in contrast to C. *sativa,* which tends to have opposite leaves- *C,*

seeds are often highly compressed longitudinally so that when pressure is applied to the peripheral ridges, they easily fall apart, in contrast to those of *C, indica.* C. *sativa* seeds are the largest of the three species, often exceeding 5 mm in length. C. *sativa* tends to have very narrow leaflets, while *C. indica* jsually has much broader ones.

Crossing experiments with 38 different strains from around the world showed normal meiosis, completely strainable pollen, high pollen fertility, and no chromosomal aberrations. This indicates that there are no fertility barriers between the species. However, *C. ruderalis* and the true wild ancestral populations from central Asia (the putative "home" *ofCannabis)* have not been tested. Regardless of the results, fertility barriers are not the criterion for species determination; rather the criteria lie in the delineation of consistent (hereditary) morphological or physiological variations. Much further study of wild ancestral populations from central Asia (if they exist) is needed to settle this question. In view of the prolonged viability of frozen seeds, it may be possible to germinate seeds frozen in the arctic for thousands of years and get a look at truly wild ancestral hemp.

Fig. 6. Type specimens of the names *Cannabis sativa* L. (left) and *C. indica* Lam. (center) and putative type of the name C. *ruderalis* Jan. (right). A type specimen is the original specimen on which the scientific description of a species is based. The "L" after *Cannabis sativa* stands for Linnaeus, whose *Systems Plantarum* (1753) is the starting point for scientific names of plants. (Reprinted from Small, *Plant Science Bulletin,* vol. 35. 1975.)

It would be of special interest to find out whether a particular chemical, especially a cannabinoid, occurs in one of the putative species, but not in the others. The limited data thus far available do not afford much hope in this respect. Four or five stocks designated *ruderalis* have all been of the high CBD, low THC type, but further investigation will probably reveal, as with the other two supposed species, that high, low and intermediate levels of each cannabinoid can be discovered in some stocks. Thus far nobody has been able to correlate any morphological difference with a chemical difference between species.[1]

The cultivation of marijuana may extend back 10,000 years or more, but unlike many other cultivated plants {e.g., tomatoes, potatoes, corn), it has never been totally domesticated. It easily escapes to become a naturalized weed. The effects of breeding for oil, fiber and THC content, coupled with continual escape and crossing with wild or naturalized populations has led to extreme variability which blurs specific differences.

Finally, it should be noted that some botanists, and the law, maintain that there is only one species, if this view prevails, the above "species" will have the status of subspecies or cultivated varieties (cultivars).

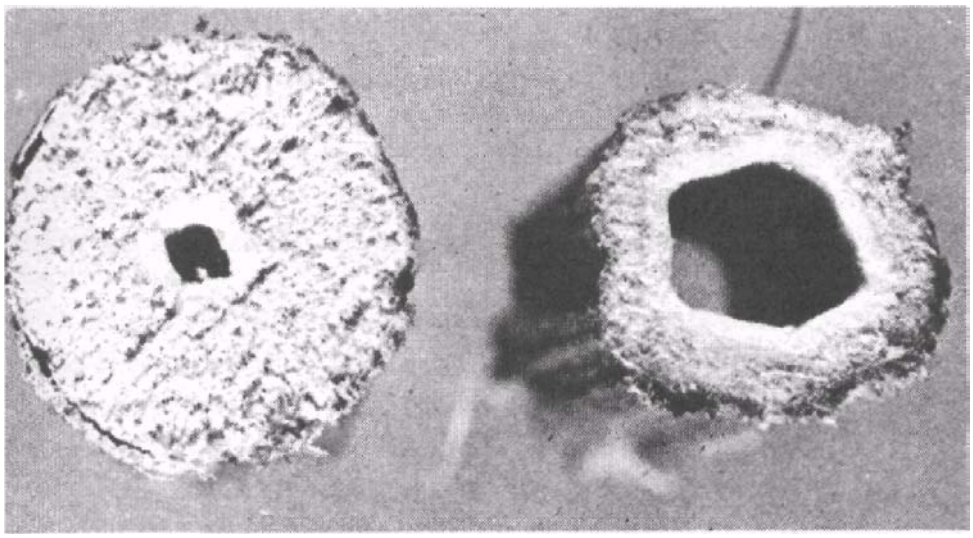


fig. 7. **Cross sections of stems at internodes of a low THC fiber variant (left) and of a high THC variant (right). Fiber varieties have hollower stems at the internodes, allowing more energy to be directed into the production of fibers in the phloem. (Reprinted from Small, *Plant Science Bulletin,* vol. 35, 1975.)**

Seeds

In addition to the differences between the seeds of the "species" noted above, there seem to be consistent differences between wild and cultivated seeds of each type. Wild seeds tend to be smaller, with comparatively well-developed abscission zones, narrow bases, and a papery layer (perianth) of marbled or mottled appearance. Germination is slow and irregular. All these characteristics are thought to be of survival value in nature. Wild plants will often have minimal energy for seed production, making numerous small seeds an obvious selective advantage. Likewise, the narrow bases and well-developed abscission zones help to facilitate dispersal, while the marbled coat might provide protection or camouflage against seed eaters. Slow, erratic germination will be desirable where water availability may be irregular, particularly during the first months of the growing season. Many, if not most, wild populations have only recently escaped from cultivation. They show the above characteristics to varying degrees, influenced by the continual escape of drug and fiber strains to interbreed with them.

It should be pointed out, however, that there is also considerable variation among seeds of both cultivated and wild strains, A recent study found that wild populations in southern Asia, especially India, were largely lacking the marbled perianth, while most wild Chinese seeds were rather large and had no adhering perianth or base elongation-thus resembling the cultivated seeds. Many cultivated seeds have the marbled perianth, but it usually sloughs off easily and seldom persists on the mature seed.

One generalization which *can* be made about marijuana seeds is that they can survive for extremely long periods if conditions are right. And there are a variety of "right" conditions- One Japanese scientist found high germination rates in seeds kept dry with calcium chloride for 14 years. Another (American) study of fiber type hemp seeds found that low temperatures were the most important factor: better than 95% of seeds kept for eight years, stored in cloth bags or sealed jars, germinated when the temperature was maintained at 10* C or less. Seeds kept in a freezer maintain viability quite well.

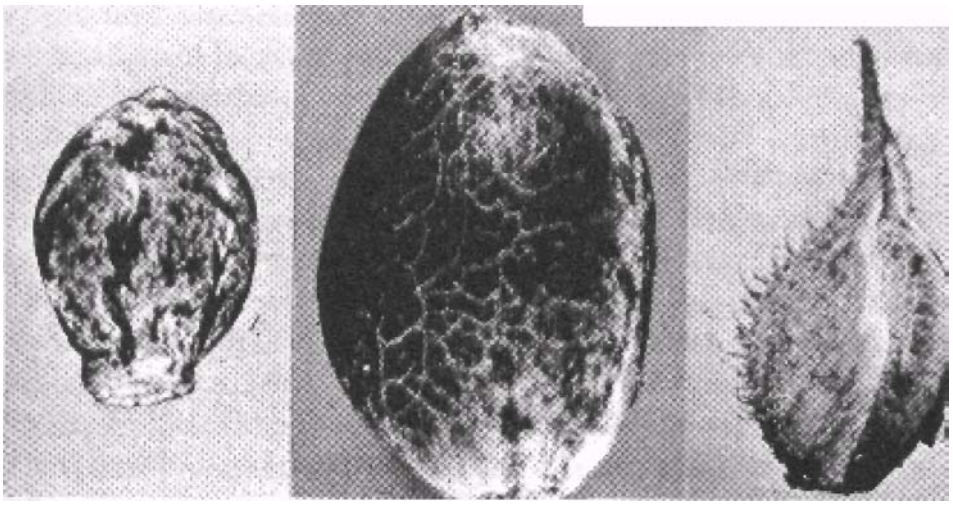


Fig. B, S*od of *Ciftnabli.* At extreme right, • feed still hooded by hi bract is tnovm. (X6K At extreme left It the seed of B wild plant, and in the Center, of 1 domesticatEd plant (both X9|. Not* that tht wild JHfd ittmallar, hat an atten-UStid (MM, art obviout abtciltlori lone at the base, and *is* covered with a marbled lKiuery material (perianth!. (Reprinted from Erne 11, *Pisrtt Science Bulletin,* vol. 35. 1976-1

Drying of seeds seems to make very little difference until higher temperatures are reached. At 21* C (70^{s} F), seeds conditioned to 6.2% moisture showed no decreased germination after five years, but seeds conditioned to 9,5% (about the normal moisture content) showed only 5% germination after two years, However, when exposed to normal ambient temperatures in unheated buildings, seeds do not survive as well. When stored in sea Jed jars in Kentucky or Maryland, germination was down to about 40% after three years, but in the cooler climate of Washington, there was no significant drop in six years. It seems quite possible that if seeds were kept frozen or at low temperatures, they might last for centuries. This would be especially true for wild seeds, which kst much longer on the average, than the cultivated varieties. (All of the above data were gathered on seeds of the cultivated fiber type of C, *$a.tiva$$_{t}$)*

To sum up, seeds will keep very well in sealed jars if the jars are stored in a cool place such as a refrigerator or freezer. But even in sealed jars, if they are frequently exposed to temperatures above 50° or 60" F, they will show a marked decline in germination within two years and will be mostly or entirely sterile within four; at least this is true for the high CBD type

seeds in northern latitudes. These germination rates cannot, however, be expected for seeds from commercial marijuana, where the seeds have often been crushed or not allowed to fully ripen.[3]

It is possible, by selective pollination, to obtain seeds which yield all (or nearly all) males or females. This, can be done by crossing with certain monoecious strains, ot by a simp let method available to almost anyone. If the male flowers that arise on a female plant are used as the pollen source, the resulting seeds will all be females. If the plant does not do this naturally, thete ate various techniques for inducing the monoecious conditions, such as low light, low night temperatures, stress, and spraying with Ethrel. These techniques will be discussed in more detail in future chapters.

Function of Cannabinoids in Marijuana

It is commonly believed that the function of the resin secreted by marijuana is to prevent desiccation (drying) and to protect the seeds. However, marijuana grown in northern latitudes often lacks any obvious resin, yet its seeds mature and it does not desiccate. In areas where the plants produce abundant resin, it doesn't seem to be stimulated by drought; the resin usually becomes abundant late in the plant's development and it is the young plants which are the most susceptible to drought. There also does not seem to be any correlation between high resin production and high THC or CBD content. Plants often have a high cannabinoid content without being especially resinous of sticky. For these reasons it seems that the real explanations for resin production and cannabinoid content lie elsewhere.

As with vittually all othei psychoactive compounds occurring in plants, the function of cannabinoids is unknown. In order to have evolved the many genes necessary for the synthesis of such complex molecules, they or their precursors probably serve an important purpose. This makes the failure to have a ready explanation for their presence all the more frustrating, especially in view of the ttemendous advances in plant biochemistry, It seems likely that the cannabinoids are an important constituent of tesin, which serves to protect the plant from patho-

gens or herbivores such as bacteria, viruses, fungi, insects and cows. It has been shown that cannabidolic and cannabigerolic acids are antibiotic to gram-positive bacteria in vitro,[3] Pathogenic attack is probably more of a problem in the wet, warm tropks {which may account for the greater resin production there). But it remains a mystery as to why THC predominates in southern latitudes and CBD in northern ones.

Humans have selected marijuana for perhaps 10,000 years for use as fiber, food and medicine. The varieties producing much resin have been carefully bred and widely distributed, and this characteristic is probably much more prominent than in ancestral hemp populations. Thus, the abundance of cannabinoids in marijuana may be due to selection by our ancestors.

Cellular Origins of Cannabinoids

Until they are about to flower, the plants have only two types of hairs, The unicellular covering hairs (triehomes) are long and thin and end in *A* point (see figure 9e), These are few until the plant is one month (in warm climates) or two months (in temperate climates) old. They subsequently show a gradual increase in number and are especially common on flower-bearing branches where they form a silky down. The second type of hair (cystolith) is short, swollen a: the base and set into the surrounding epidermal cells (see figure 9a). Their end is blunt and they usually contain calcium carbonate crystals. They arc found mostly on the upper surface of the leaves and bracts (small specialized leaves surrounding the flowers), and sometimes on :hc lower surface of the branches.

When the females are about to flower, their tops become covered with multicellular glandular hairs, which appear to the eye as tiny brilliant points. When the female flower first matures, these hairs form a base of two cubical cells supported by two wedge-shaped epidermal cells and a globular head of four cells, all covered by a thin cuticle (waxy non-cellular layer). (See figure 9f). A[maturity, the head may contain as many as 16 radially arranged cells, which secrete the cannabinoid containing oil that accumulates between the cells and the cuticle

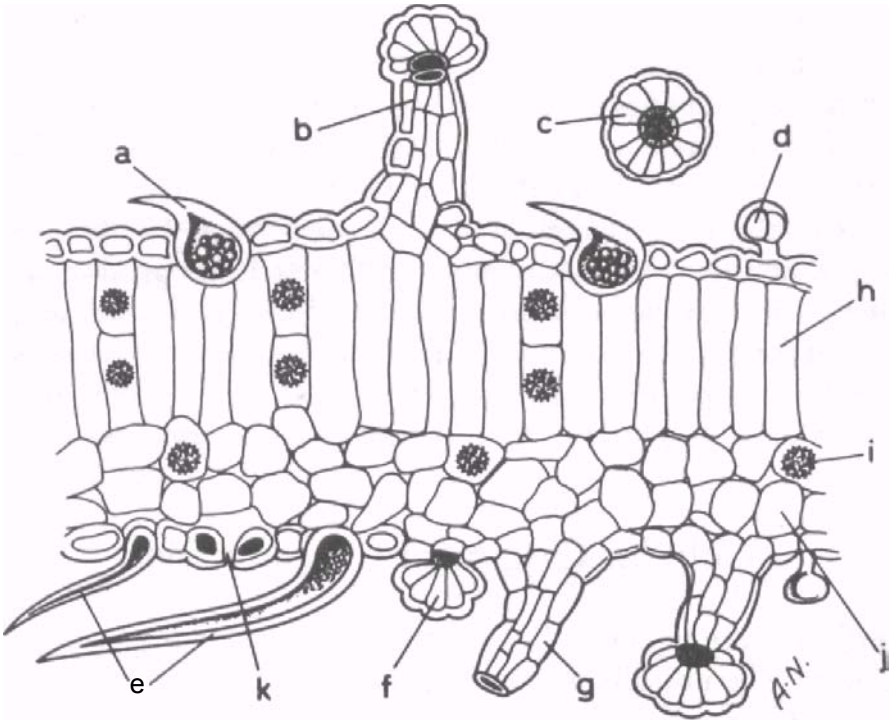


Fig. 9. Cross section of a bract from the fruiting plant: *a,* cystolith hair; A, large granctular hair with several cells in head and stalk; *c,* head of one of the large glandular hairs; *d,* small glandular hair with bicellular head and unicellular stalk; *e,* thick walled conical trichomes; *f,* large developing glandular hair; *g,* stalk of a large glandular hair; *h.* palisade cell; /. cluster crystal;;, parenchymal cell; *k,* rtomate. (Reprinted by permission, from Joyce and Curry, *The Botany and Chemistry of Cannabis.* 1970. Drawn by D. Erasmus.)

(see figures 9b and 9c). When sufficient oil has accumulated, the cuticle may burst, releasing the oil (composed of about 50% cannabinoids), which quickly dries to form the sticky resin. Another view is that the cuticle is composed of oxidized resin.

These hairs vary in appearance: those of the bracts and axes of the female flowers develop an elongated stem and resemble a tiny mushroom, while others (especially on the lower surface of the top leaves) lack the stem and have a flat, round head with a masimum often cells (sessile glands). There is reason to believe that sessile glands are a distinct type and not an early stage of the stalked glands. All these cells lack chloroplasts and are colorless except for the amber oil produced in the head. Lesser amounts of cannabinoids are also produced by cells generally distributed throughout the epidermis of the plant (lactifers).[4]

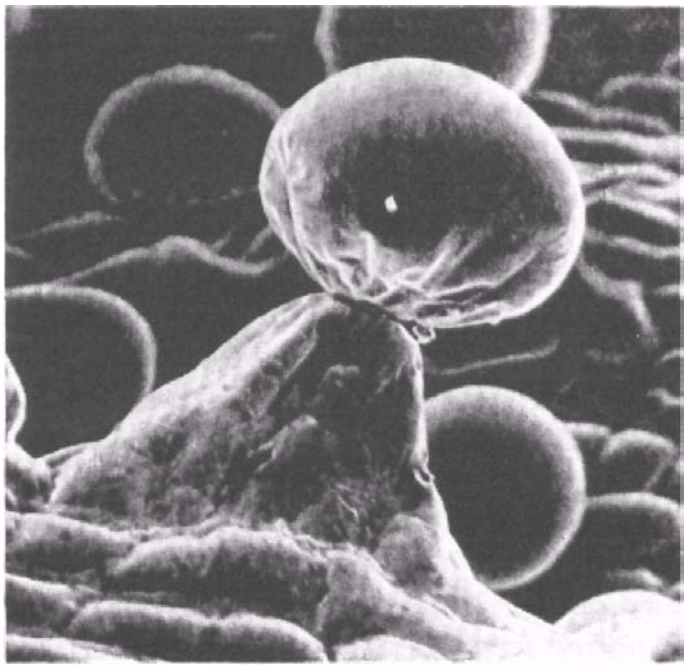


Fig. 10. Scanning electron microscope picture of the lower surface of a bracteole (seed covering) magnified 100 times. The stalked glandular hairs are seen in various stages of development. Two simple covering hairs are shown at the upper right. (Reprinted from Fairbairn, *Bulletin on Narcotics,* Vol. 24,1972.)

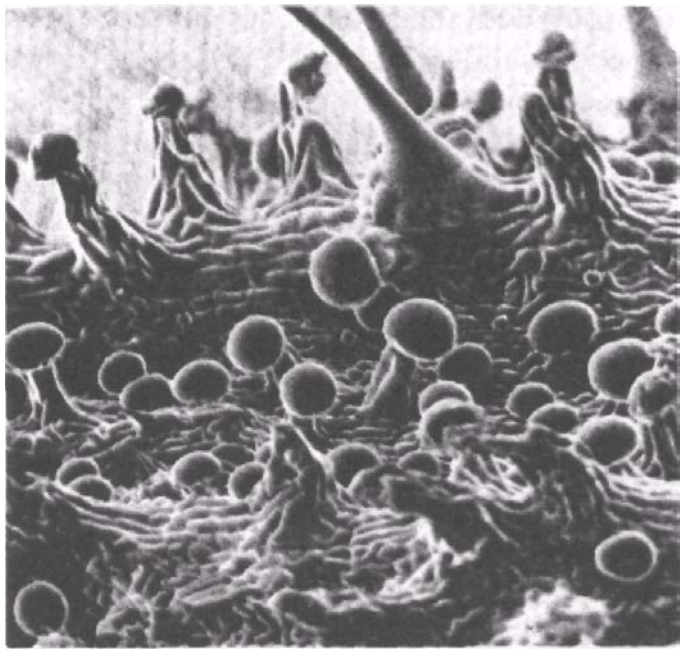


Fig. 11. Scanning electron microscope picture of a stalked glandular hair from a bracteole (seed covering) magnified 400 times. Cannabinoids are concentrated in the round head. The rectangular lumpy "bricks" are cells. (Reprinted from Fairbairn, *Bulletin on Narcotics,* Vol. 24, 1972.)

Heredity and Environment

Regardless of seed origin, several generations in a new location will produce a plant resembling those native to the area where it is being grown. This fact has been known for centuries. In 1712, Kaempfer observed that seeds of Persian *Can-nabis* failed to produce significant quantities of intoxicating resin when grown in Europe for several generations. Similarly, in the early nineteenth century, the Egyptian Viceroy, Mehe-met Ali, found that the French hemp seeds he imported to provide fiber for rope were useless for that purpose. After a few growing seasons the plants became short and bushy, producing large quantities of resin. (Part of the explanation undoubtedly lies in the shorter days of Egypt.) In that same century, Christison at Edinburgh, Hope in England and Hus-son in Cairo observed the same phenomenon when they planted imported seeds. In a report published in 1912, pioneer marijuana researcher, J. Bouquet, described the nature of the change that can occur in only a single generation. He said that seeds from India (Guaza) and Greece (Tripolis) planted at Lyon in France produced plants about two meters tails. They were robust and bushy with many branches and large, deep-green leaves with sharply indented edges and (in the Indian variety) distinct furrows on the upper surface of the petioles (leaf stems). The petioles of the Indian variety were reddish-brown but lost their color with age. The flowers were concentrated in clusters of cymes (main and secondary branches always terminate in a single flower) and the groups of clusters were separated from one another by leaves and well-developed bracts nearly hid the flowers from view. (Bracts are modified leaves which surround and protect the flowers and, later, the seeds.) The large, vigorous flowers gave off an intense mint-like odor which was perceptible more than two meters away. At maturity, the flowering tops were covered with shiny points which were tiny reddish droplets of resin in the glandular hairs.

When the seeds from the above plants were grown the next year at Moulin-sur-Allier, the plants were little different from those commonly cultivated in France for fiber. They were only slightly bushier, and of a somewhat deeper green than the native fiber plants, but did not have the bushy flowering tops or the

furrowed, colored petioles and resin production of their ancestors, The tops were not even sticky. But seeds from the same batch were planted the same year at Beja in Tunisia (altitude: 330 meters). The resulting plants were very similar to the first generation Indian and Greek plants grown at Lyon, with their bushy odiferous flowers and intense resin production.

The second generation plants at Mouh'n-sur-Allier may have cross pollinated with the French fiber strains of marijuana or may have been the result of natural selection. It is likely that if the same 100 seeds of Indian marijuana were planted in India and in France, we would find differences in the number of seeds germinating. The plants which grew to adulthood would probably represent a different range of seeds in the two cases. Also, the average generic makeup of their seeds, even if inbred, would probably differ, depending on the selective forces acting on the developing seeds and pollen. The longer days of the northern latitudes probably contribute to lengthening the internodes and altering other characteristics of the growing plant.* Some experiments on the effect of day length on resin production are discussed later.

In relation to the role of a hot, dry environment in the production of the THC containing resin, observations made by Bouquet some 40 years ago on an aberrant variety which arose in 1935 in Tunisian crops are of great interest.

In Tunisia, it arose independently in plantations at Tabarka and Sedjenane, located some 40 kilometers apart in the mountainous region. The seeds originated as usual from the previous year's crop, and the resulting abnormal seeds may have derived from a very few plants of the previous year and ultimately from a mutation occurring in a single plant.

The most striking characteristic of these plants was their very slow maturation. Whereas the usual variety flowered and set seed in some 14 weeks and was harvested at the beginning of July, the new type did not set seed for 22 weeks and was collected at the middle of September. Of major importance is the fact that its characteristics were fully heritable and phmts grown the following year in Tunis and the United States were essentially identical. There were other striking differences from normal plants. They were slightly over a meter tail, which height, though

differing little from the usual Tunisian plants, was maintained in the U.S.A. plantings, where they were markedly shorter than the rest of the crop. The plants were branched almost to their base with an extremely bushy, compact aspect, The stems are generally larger (up to 9.S cm in circumference at the base) and sturdier than normal with longer, stronger fibers and being more deeply ribbed or fluted, though feeling smoother to the touch. The taproot was turnip-shaped (napiform) some 12,2 cm around and 12 cm long, then tapering off to a total length of 32 cm, while the ordinary type was not napiform and generally shorter. The new variety had much more numerous adventitious roots.

The leaves were always opposite from the base of the stem to the top (always imparipinnate) while the normal variety is sometimes alternate. The leaves rarely reach 10 cm from the point of insertion on the petiole to the end of the longest median leaflet, whereas the typical leaves average 20 cm. All the leaves have seven or nine leaflets with 12 to 16 teeth on each edge compared to five, seven, nine, or 11 leaflets and 14 to 22 teeth normally, The plant has a deeper green color on upper leaf surfaces but the underside of the leaves is light green at first, becoming almost white at maturity, and thus resembling the wormwood *{Artemisia vulgaris}* leaves, The leaf veins ate deeper than normal, giving the impression of regular folds in the leaflets, and being noticeably more visible on the inferior face than usual. The threadlike (filiform) stipules at the base of the petioles of the upper leaves are a deeper yellow-orange than normal. The bracts (specialized leaves surrounding the flowers) are better developed, longer and more numerous than usual, forming little tufts. The flowering tops are less numerous, more elongate or less compact than typical with 0 to 8 seeds per inflorescence compared with the normal of 40 to 60. The tops are not sticky and the minty odor is absent even when the plant is crushed between the fingerv

Microscopically, the powder from the edge of the leaflets and the bracts is gronze-green rather than yellow-green, and again lacks the characteristic odor of fresh powder. The microstructure appears normal, with double calcium oxalate crystals, and the various types of hairs—unicellular pointed, short cystolithic (containing calcium carbonate crystals), conical, swollen

with blurt extremity, etc., but the clubbed, stalked (pedicellate*j* secretory hairs are rare, poorly developed, and for the most part devoid of the clear amber oily resin. Both male and female flowering tops give positive reactions for cannabidiol with the male reaction being weaker, as is that of the female prior to flowering.

These observations show that we cannot necessarily expect plants to be exactly like their parents in appearance or THC content, even in the first generation. In subsequent generations the difference may be even greater and the plants may soon resemble those growing wild in our area, However, if we are very careful about our pollen source, we may succeed in growing a high THC strain for many generations since, as subsequent sections show, cannabinoid production is largely a matter of genetics.

Bonsai Marijuana

The common belief is that marijuana is an annual; it flowers and dies each year. In nature, this is probably always true, even in warm climates. (However, where it is warm year round, new plants may always be growing, There are reports that *C. sutivais* sometimes perennial in tropical and subtropical areas.) Nevertheless, appropriate manipulation may allow a plant to grow for years and possibly decades. Some people have kept females alive outdoors for several years by carefully trimming the flowering tops, but long-lived plants are more likely to be cultivated indoors where the environment can be carefully controlled. An individual in Los Angeles claims he has a bonsai marijuana plant in his house which has yielded an extremely potent product for more than three years. Just how much the traditional bonsai techniques, such as pruning and restricting water and nutrients, are applicable to marijuana is still unknown. This is an area where careful experimentation is necessary.

Grafting and Cloning

Most of the interest in grafting marijuana plants arose from the

mistaken belief that hops-marijuana grafts could produce an unrecognisable but potent plant. Even though this notion has been proven false, grafting various *Cannabis* stocks on one another is still of interest. For example, one plant niay root well and have a. strong stem, but produce little THC, while another may be the opposite. Or, a person might wish to have branches of Four or five different strains growing on a single plant. Each portion of the graft will retain the cannabinoid production it had before the graft because there is no transfer of cannabinoids. Sometimes the potency may increase somewhat after grafting because of the stress involved, although as discussed later, this will mean that the total yield of cannabinoids will also decrease.

Standard techniques, such as cotyledon wedge graft or growing point wedge graft, are used on marijuana plants. The object is to bring the vascular tissues of the scion (part grafted) and stock (part grafted onto) into contact. The graft can then be sealed with petroleum jelly or commercial sealing agents and held tight with adhesive tape or rubber bands. Grafts are most likely to be successful after the plant is well established (at least two weeks), but before it is mature, The more active the growth, the more likely the graft will take. One good technique is to grow the two plants to be grafted side by side or in adjacent containers. When they are between four and eight weeks old, make a single diagonal cut halfway through each stem at approximately the same level, one slanted upward and one downward. Slip the cut portions into each other and hold the joints together with adhesive tape. After one to two weeks, cut away the unwanted top portion and then, a few days later, cut away the unwanted bottom part.

A clone is all the descendants derived asexually (vegetatively) from a single plant. Since no sexual processes are involved, all members of a clone are genetically identical (except for somatic mutations). The most common way of making a clone is by rooting cuttings. Marijuana can be cloned by cutting off a lateral branch of a plant one to two month's old and immersing it in water or wet sand until rooting occurs. The plant growth hormone, indoleacetic acid (Rootone), can be used to stimulate rooting. The cutting is then put in soil and grown as usual. Lateral branching is encouraged by cutting off the growing tip

(apical meristem) at an early age, and this can be done repeatedly. Thus a single, highly potent plant can give rise to hundreds of plants. This is an obvious method for marijuana researchers who are studying the efleet of environment on cannabinoid production, but so far they have (with one exception) ignored it,[fi]

Pruning Branches and Manipulating Stems

Pruning the tops of marijuana plants is the custom in Brazil, But in the Bengal area of India, the lower branches are removed when the plant is about three months old. The Nepalese supposedly trim the tips, remove the larger leaves and shake the plant from time to time; the resulting mass of twisted leaves and Rowers is called *latta,* probably very similar to the *colas* of mature sinsemilla.

Splitting the base is another practice believed to increase potency. In India, farmers reportedly twist the base of the item or the flowering tops sometime before harvest. In Mysore, they twist the stem of the two-month-old plant, then bend it horizontally and sometimes tie it in that position to encourage side branches. Still another custom, reportedly practiced by the Burmese, is to split the stem about a month before maturity and insert a piece of wood, then gather together the flowering topi and push them into a basket. The basket is inverted over the tops and left there for the final month of growth.

In Mexico, farmers insert slivers of *acote* (a type of pineJ through the root of the plant below ground level when the plant is about four feet high. They claim that this prevents the formation of seeds and gives the marijuana a pine flavor, both highly unlikely.

In some parts of the Western Himalaya, plants arc stripped of all, or nearly all, of their leaves in order to stimulate the formation of numerous small, leafy shoots. These shoots are supposed to be stronger than the old foliage. While no experimental work has been reported on this point, it certainly seems worth investigating.

The Tepehua of Oaxaca, Mexico produce extremely potent marijuana by growing the plants in a hostile environment and by

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severe pruning. They pinch off the shoot tips from the young seedlings, thus removing the apical meristem with its high concentration of auxins (plant growth hormones]. This leads to the production of many lateral meristems (side shoots). The new lateral meristems are pruned once a week to produce a small, urn-shaped bush. Shoots that would ordinarily fill the interior of this "urn" are also removed. The exterior looks almost crystalline due to the heavy resin accumulation, and many plants develop a red pigmentation (cyanins). The leaves change from the ordinary palmate shape to vcrticillatc or whorled (like the spokes of a wheel) balls of entire (smooth-edged) leaves and abortive (incomplete or immature) flowers. When the Mood-like color begins to appear, two wooden splinters are inserted through the stem just above the ground at right angles to each other. At present there is no evidence that this latter practice has any effect on potency, but it is interesting that the stems are similarly bruised or impaled by various Asian farmers.

To sum up, though many peoples around the world prune marijuana plants, or split their stems, there is no scientific proof that these practices increase potency- However, as discussed later, any kind of stress tends to increase potency somewhat, though usually at the cost of decreasing the total yield.

Potency and Color

The extreme redness of the Tepchua's plants may merely indicate the soil's potassium deficiency or may be a genetic factor which has been observed in stems and leaves elsewhere (such as Zihuatenejo purple). Red and purple colors are produced by pigments called anthocyanins. Extreme nitrogen or phosphorous deficiencies can also produce red petioles (leaf stems) or leaves, Plants are green due to the presence of large amounts of chlorophyll; the other colored pigments only show up as the plant ages and the chlorophyll degrades. The nature of the pigments producing the gold color of some Central and South American marijuana is unknown, as is their relationship to the high THC content of these varieties. Both Acapulco Gold and Colombian (or Santa Marta) Gold tend to be very potent, especially Colom-

bian. *Punt a Raja* ("red point" in Spanish) is another potent plant which comes from the Llano area of Cali Hills near Santa Marta in Colombia, and derives its name from the *tad* color of the pistils. Marijuana can also be a blackish color, such as some grown in Africa and in Colombia ("Wacky Weed"). The dark green marijuana from the Choco area of Colombia near the Panamanian border is often nearly black.

Color is thought by some to be influenced by climate. Some persons have claimed char marijuana which matures late in cool weather tends to be a purplish color, but that the purple of the leaves, stems and/or flowers is not accompanied by increased potency.

In summary, there seems to be little relationship between potency and color, since each variety of marijuana contains plants with high, medium and low content of both THC and CBD.

Some Growing Techniques

Fifty **years ago a French pharmaceutical text described the growing of hemp for resin as follows:**

> **The choice of** ground is important: **hemp plants** strike out **many tap roots; the soil must therefore be light, loose** and at **the same time full of substance. The only preparation necessary is tilling and manuring. At** least **three** tillings **are necessary: the first takes place before** the winter, **the second** in **the** spring when **the weeds are beginning to grow, and the** third a **day** or **two before the sowing, about the** beginning of May **or June (in** North **Africa there are only** two tillings, **and sowing takes place at the end of MarchJ, The choice of fertilizers depends on the nature of the soil: horse** manure, **well-**mi ye d with **other** fertilizers, is suitable for heavy land; cow **or sheep manure is better** for light **soils, In** Tuniw a mixture of **farmyard** manure and superphosphates is used. The sowing is in **lines 20 cm** apart (in Norch Africa **60** cm). **The arrangements in**

> lines makes hoeing and thinning easier. The latter operation should be effected as soon as hemp has its first two leaves; care should be taken, when fcuperflous plants are being pulled up, not to lay bare the roots of those nearby. Once the hemp has reached a certain height, it grows rapidly. The male and female plants come up at the same time; but the former, though thinner, arc taller until they have almost reached maturity … In Europe, harvesting takes place at the end of September, and in North Africa in July.

A successful American marijuana farmer in the southwestern U.S. described his techniques as follows. Growing on a one-acre plot with a southern exposure, he seeds with red clover after each crop nf marijuana and plows the clover under before the first frost. He also plows in one ton of compost. He pulls up most of the males three different times, one week apart and hangs them upside down with a baggie over the end to collect the pollen. He pinches the tips off the female plants once at about six weeks. After about five months, some of the females start to develop male flowers. Watering is done about eight times a year, and this infrequent but deep watering results in deep roots and drought-resistant plants, The soil must be well drained and there must never be any standing water in the field. The females are harvested when they are 1/4 to 1/2 seeded, and about three dozen females are allowed to become fully seeded for next year's crop. They are then hung up for one day, the big stems temoved and hung up for another week. The large tops are sold separately from the small tops and leaves.

For quantity planting, one farmer recommends a hill-drop planter which scatters five to ten seeds in a group about every three feet. The crop is later thinned to the best two plants in each group; an ordinary soy bean or corn planter with a fine seed attachment for hill-drop planting will work. As soon as the plants begin to. crowd each other they should be thinned out, lea vine about four feet for each female to branch out, A large, fully-grown female may yield one-half to one pound of marijuana, depending on how many seeds are present. Austrian winter peas or vetch, planted in October and turned under in March

(southern U.S.), will be a good winter cover crop. Clover would ulso do, but it might not grow very much in winter. In the South, planting can start as early as the end of March, but at the latitude of Washington, D.C., April 15ih is about the earliest possible, *as* marijuana will usually survive a mild frost, but not severe or repeated frosts.[7]

Sin&emilla

Sinscmilla is *2.* running together of the two Spanish words, meaning "without seeds-" Since in nature virtually all the mature ova that the female develops will be fertilized and will set (seed), sinsemilla is necessarily produced artificially by separating the males. It is usually said that the practice of separating males was devised in ancient India to produce more potent marijuana. It may, however, have originally started in order to eliminate the troublesome seeds which are harder to separate from fresh, sticky tops, or to yield a. uniform crop for fiber, When it began is unknown, but "ganja doctors," who weed out the males, have probably done so for thousands of years. The males are not difficult to weed out, since they rend to mature earlier and shed their pollen before the females on the same site arc ready to be fertilized (an evolutionary advantage in that it Facilitates exogamvoutbn:eding). Usually, however, some male flowers will develop later, or if fertilization is delayed too long, some of the developing females will begin to produce male flowers. Consequently, one must be continually on the alert for not only male plants but also for male flowers on female plants. The tendency of females to produce male flowers varies enormously, depending on factors such as strain (seed origin), age, water, temperature and soil conditions. Remember also thac a plant's ovum can be fertilized by pollen From males a block away, or from the fingers oF your Friends who've been rolling joints.

What happens when you take away the males is that the unfertilized female proceeds as iF enraged by [he frustration of her mating instincts. Instead of diverting all her energies into producing seeds and then dying, she continues to grow, producing more flowers, more leaves and more resin. She will live for up to seven more months -a frustrated but very stony old maid.

Recently a superb photoessay on sinsemilla was published. *(Sinsemilla,* And/Or Press, 1976). The author, Jim Richardson, describes the odor of the ripe blossoms as having an "electric sweetness and ethereal penetrating quality," and makes several interesting claims about potency, Richardson says that increased resin production does not necessarily mean increased potency and that the high is less clear and sweet after blooming, whether or not seed is set (i.e. whether or not sinsemilla is produced). He also talks about the possible rediscovery of an ancient Indian method of determining the sex of the plants. On the main stall:, in the second or third node below the growing tip, are a pair of spear-like leaf spurs (stipules). There is one on each side of the stalk; their tips cross if the branches are opposite at this point. Behind these spurs the first flower buds appear several weeks before the first flower clusters appear on the branches. If the plant is a female, this bud continues to grow erect and eventually develops into a characteristic female flower with two pistils. If it is a male, it soon droops over and becomes the pod-like male flower. The structure, used by the *pvddor* (ganja doctor) to recognize males, turns out to be the often abortive, solitary female flowers that frequently take the place of what should be the lowest pair of male flowers. Undoubtedly the occurrence and appearance of these structures varies considerably with different strains and probably with growing conditions,

There are many methods of growing sinsemilla. One popular technique which works both indoors and outdoors in moderate climates, is to cut the plant back to one foot or so off the ground, leaving only a few leafy branches. Within a few weeks, it should begin sprouting new branches. When the new growth is securely started, remove the old branches and another crop of sinsemilla will be on its way. Hermaphrodism will be a continuing problem; watch carefully for the male flowers appearing on your female plants and pinch them off.

The time element involved in these operations will vary considerably, hut the following will serve as a rough guide:

Time after planting until weeding out first males: 8 weeks.

Subsequent interval for checking male flowers: 1/2 week.

Cutting back females to start another crop; 12-20 weeks.

The scientific literature does not yet contain any data on the THC or CBD content of sinscmilla. Consequently it is presently unknown, as with ordinary marijuana plants, which conditions during the later stages of growth are optimal for maximizing THC and minimizing CBD.

Polyploidy

Polyploidy is the occurrence of some multiple of the usual chromosome number in the cells. The diploid or normal number in *Cannabis* is 20, but plants having 30 (triploidj, 40 (tetraploid) or more arc occasionally observed. Some species or varieties of plants are naturally occurring polyploids; i.e. they evolved from the spontaneous or accidental appearance of a polyploid seed which had some selective advantage over its diploid progenitors. Polyploids, either naturally occurring or artifically induced, arc relatively common in flowering plants. Polyploids can be produced by specific chemicals which interfere with the separation of the chromosome pairs during mciosis, but this is a rather drastic treatment which often kills the seeds or plants. Seeds which do survive frequently produce stunted, aberrant plants, But this is not always true; large, healthy, beautiful plants, such as numerous popular flowers, may result. However, even when successful, polyploid plants frequently fail to breed true; their seeds tend to revert to diploid, *Catmabis* polyploids arc larger and have larger seeds (up to twice normal size) than the diploids and make take longer to mature.

This phenomenon would be of little interest here \vere it not for some experiments conducted by an American scientist named Warmkc during World War Tl. Treating marijuana plants with colchicine, he obtained a number of triploid and tctraploid and tetraploid plants had about the same average activity (though individual plants varied by a factor of eight) which was about twice that of the normal diploid strains. He used 26 different plants of each variety and his data were statistically significant. Unfortunately, he worked with an acetone extract of the plants and bis assay animals were small fish, making it doubtful whether hk data have any relation to cannabinoid content.

Nevertheless, further investigation is necessary, It has been established that tobacco tetraploids have more nicotine than diploids, and this may prove true for the cannabinoid content of marijuana polyploids versus diploids. Again, it is to be expected that the toral yield will decrease,

Warmkc was also the author of the famous hops-grafting experiments, in which marijuana and hops were grafted onto one another. His data showed transfer of cannabinoids into the hops plants, but he used water fleas as his test animals and the data never had any clear relationship ro cannabinoid content. Since then it's been shown that cannabinoids are produced locally i do not translocate. In any evenr, a recent repeat of this latter experiment using modern chemical techniques showed absolutely no transfer of cannabinoids into the hops portion of the grafts- either from the marijuana bottoms to the hops tops or from the marijuana tops to the hops bottoms. Hundreds, perhaps thousands of people, have attempted to produce more potent, or at least undetectable marijuana, on the basis of a few dead fish and water fleas. One is reminded of Mark Twain's comment: "1 like science because it gives one such a wholesale return of conjecture from such*a trifling investment of fact."*

Potency and Cannabinoid Content

Myths about which kind of marijuana is the most potent or provides the best high are legion. One of the most important factors is individual response, and that varies considerably. Factors such as nutritional state, exercise, time of day, other drug intake, and psychological state all influence the individual's response to any drug. For example, one experiment showed that the amount of morphine required for pain relief may vary by a factor of five, depending on trie time of day. Another demonstrated that an amount of amphetamine sufficient to kill most mice at one time of day will be harmless at another. Most people fail to take these factors into account and ascribe the character of the high to the contents of the marijuana. Although thousands of compounds occur in marijuana, the evidence seems to clearly indicate that virtually all of the significant physiological response is

due to THC and, to a lesser extent, to CBD. CBN may be of significance if, as is rarely true, it is present at three or four times the THC concentration. CBN seerns to be able to synergize with THC and increase its effect slightly, As stated before, it has also been shown that smoking CBD with THC blocks the THC high. But it is presently unclear just how much CBD is required to produce a given effect on the high, A reasonable guideline might be that CBD concentrations approaching that of THC are significant, The only other chemical variable in marijuana that seems relevant to the high is when the five carbon side chain in cannabinoids is replaced by a three carbon chain. This is the case in some marijuana from South Africa and Nepal and is true to a lesser extent in all marijuana. Three carbon THC (propyl cannabinoids) are discussed in more detail later in this book.

In examining the data in this chapter, it may prove interesting to keep in mind rhe following comments of a professional dope taster (The comments originally appeared in *High Times Magazine* Spring, 1975);

> ***Oaxacan*-has a minty taste and is also spicy, It tingles the taste buds. The minty taste allows the throat to stay open, which means you draw more smoke into your lungs without coughing it out. It's quite airy considering its power.**
>
> *Culidcan*—has that airiness but not the power.
>
> ***Santa Maria Go Id*- excellent intellectual high. Very creative. Very sophisticated high, but not particularly psychedelic like the best Mexican-this grass would be good for an intellectual fuck-like a mind-body communion.**
>
> *Lowland Colambian*—knocks you out but it does not get you high. In other words, the narcotising effect overwhelms the psychoactive effect.
>
> ***Jamaican*—is good for fucking-it's very simulating.**
>
> *Hawaiian*— hypnotic intensity-an extremely dramatic pot. Few people could finish a joint-people would sit transfixed by the sheer power of the stuff-a high grass, lots of top end-mental.

Wacky Weed—a, special kind of Colombian-has produced so much resin that it has stifled itself and died—that's why it's black sometimes. Wacky Weed is total. It makes you laugh, it makes everything absurd, it reduces your body to jelly—not anti-intellectual, but it's not exactly cerebral either. Sort of reminds me of quaaludes. Wacky Weed is physical stuff—I've seen people literally go into cardiac arrest.

Thai—to give me the momentum to get off the ground and climbing.

Top Mexican—astral.

Another marijuana sophisticate of my acquaintance has described the stronger types of marijuana as follows:

Punt a Roja—from the Cali Hills of Colombia—dark green with red streaks—little taste but 8% THC—truly hallucinogenic—psychedelic rather than wirey.

Santa Mart a Gold-6 to 8% THC—stimulating, gets you wired—not psychedelic like Punta Roja.

Lowland Colombian (Colombian or Panama Red)—red to red-brown—from the Llano$ area and else where-sleepy, narcotic.

Colombian Green—from the Choco area near the Panama border—very high rainfall. Nearly black—harsh on throat—about like good Mexican or Hawaiian.

Hawaiian—generally grown from Thai seed, so equal to the best Thai.

Thai—hallucinogenic at its best—definitely stronger than Colombian Gold.

se—harsh and not tasty, so make hash out of it.

Variations in THC and CBD Content

Introduction

The data summarized in this chapter have been painstakingly gathered from many scientific reports and have never before been collected together. They should provide a valuable basis for any future discussion of marijuana potency, However, certain limitations should be kept in mind, It has been established tliat marijuana should be air dried at least three days (or oven dried) in order to extract all the cannabinoids. But some studies have failed to do this or have not given a clear account of their procedure. Consequently, the values given are sometimes lower than they should be. Variation in sampling techniques is also a major problem. As the data show, there is dramatic variation in content of various plant parts and from plant to plant. Plants grown side by side from seeds from the same female can vary in can nab in old content by five times or more. Other variables are season, age of plant, and even time of day. There has seldom been careful attention to all these details, and thus the data are only roughly comparable. Most studies have been done in northern latitudes (the U.S., Canada and England) where the slow maturing but high THC content southern latitude strains of marijuana cither fail to mature, or, if they do mature, fail to develop the high potency and dramatic difference between males and females which they do in their native habitats. The keen-eyed will also notice that some of the marijuana widely agreed to be the world's strongest -Colombian and Hawaiian—are mostly absent from the tables, having been virtually ignored by researchers.

Much of the variation is due to fluctuation in the content of other constituents such as protein, fat and carbohydrate. Cannabinoids are secreted outside the membrane of the living cells

which produce them and cease to be a part of the plant's active metabolism. Nonenzymatic dehydrogenation of THC to CBN appears to be the main reaction which occurs after the oily cannabinoids are secreted. This reaction is relatively slow, so CBN is seldom present in substantial amounts in fresh marijuana> However, in countries with extremely hot climates, such as India and Southeast Asia, the marijuana often contains significant amounts of CBN. Since cannabinoids are relatively nonvolatile (they don't evaporate) and insoluble in water, it might be expected that the *total* cannabinoid content *per plant* (including polymers) would rise slowly but continually throughout growth and level off sometime around flowering and setting seed. Virtually no data are available on this point. Researchers have failed to measure the total weight of the plant and give only the percentage of cannabinoids by weight of the dried plant. If the plant photosynthesises rapidly and accumulates sugars, the percentage of THC will probably drop, since it synthesizes much more slowly. Therefore, drops in the concentration of THC and CBD usually mean that cannabinoids have decreased relative to the dry weight, but have not decreased in absolute amount in the plant. The one apparent exception to this is during senescence (aging and death) of the mature plant. Then, THC and CBD seem to decrease markedly without a corresponding increase in CBN. This appears to be one of the great unsolved mysteries of marijuana biology. Sometimes the explanation may be simple^such as the inclusion of the seeds in the dry weight. Another possibility is that the cannabinoids are formed into polymers which are not tested for. The formation of polymers may also account for much of the variation in CBD, THC and CBN content during growth, but there has been no research on this point.

Age Variations

Seeds possess extremely minute quantities of cannabinoids, if any. This is difficult to determine because the brae tie ts which surround the seeds contain the plant's highest concentration of cannabinoids. Even careful washing with an organic solvent may

leave traces on the seeds. After germination, the two seed leaves (cotyledons) appear. They also contain no cannabinoids or $uch small quantities that they arc difficult to measure. However, within a day after the sprouting of the cotyledons the first pair of true leaves appears. These have measurable quantities of cannabinoids. A study of seeds from Thailand grown in a greenhouse found that the true leaves contained about three times as much CBDas THC and that the concentration did not change during the first three weeks of growth. The cannabinoids were being synthesized as fast as the other constituents. Another study found that Turkish plants increased their CBD content from 0,07 to 0,34% in one week and that Mexican plants increased their CBD content from 0,03 to 0,2% in three weeks. Although there were only traces of THC in the Turkish seedlings (as in the adults), Mexican seedlings rose from a mere 0,04% of THC to a respectable 0.46% at three weeks. Furthermore, at two weeks the Mexican plants showed a variation of 0,2 to 1.1% THC, The average person will get quite stoned on marijuana containing 1.1% THC. These data, coupled with those in table 2 and a reading of the literature, show that not only is the cannabinoid pattern of the mature plant already well established in the seedling, but that a two-wcck-old seedling may sometimes be nearly as potent as a mature plant. Table 2 shows that Mexican seeds grown in Mississippi contained only 1.6% THC at 13 weeks, but later contained two or three times this percentage. However, Turkish plants have a lower percentage CBD content at 15 weeks than they have at seven days, though the adult plants have *a* vastly greater total amount.

There are several practical consequences of these data for the marijuana grower. First, very young plants can be harvested and smoked; and, provided that the seeds arc derived from a high THC content strain, they will be potent. Secondly, the potency of the plant does not necessarily increase continually as it gets older, but will often undergo constant variation. In one test, Mexican males went from a mediocre 1.6% THC content at 13 weeks to a whopping 5.6% at 15 weeks and then back down to a respectable 3% at 17 weeks. Bear in mind that these data are subject to sampling errors and should be taken with a grain *ofC&mobis!* Also, it is possible that the THC disappears into polymers which may be psychoactivc.[1]

TABLE 2

Variation of Cannabinoid Content with Agef

Ms/ues frt rt/s am* oriwr *tables are % dry weight, rounded off to one dfcif»3f place. Values #re for dried tops rounded off to one decimal place.*

M = Male F « Female V = Vegetative (before flowering) T = Trace {< 0.

SEED ORIGIN	GROWN IN	AGE IN WEEKS	THC			CfID		
			HI	*V*	F	M	*V*	*F*
Turkey	Mississippi	8	T		T	0,1		0.2
		11	T		T	0,2		0.2
		16	T		T	0.3		0.3
		IB	T		T	0.5		0.9
		19	—		0.1	—		1.0
Mexico	Mississippi	5		0.5			0.1	
		7		0.7			0.1	
		9		2.5			0.2	
		11		1.7			0,1	
		13	1,6		1.6	0,6		0.6
		15	5,6		3,3	0.6		0.2
		17	3.0		2.9	0.1		0.2
		19	3.0		4.0	0.2		0.4
Japan	Japan	2		0,1			0.1	
		4		0,2			0,3	
		8	0.4		0.3	0.1		0.2
		12	0.8		0,1	0.2		T
		16	0.4		0,9	0.1		T
		20	—		0.7	—		0.2
Japan	Japan	IB			2.7*			
		21			5.8			
		22			6.6			
		23			8.4			

SEED ORIGIN	GROWN IN	AGE IN WEEKS	THC M	THC V	THC F	CBD M	CBD V	CBD F
Japan	Japan	24			9,4			
		27			10.9			

'Value* for hrectfetE (ages approximate l
TSw **text for** discunmn of **sampling tsehniquaB**

SOURCE: P.S. F*Ititrman at at.. "Mississippi **Grown** *Cannabis iativa L.," **Journt! of** fnarmxputicai Science* SO f1971h 1246: **C-£,** TurrWF **•(•)., "Constituents of *Cannabistttiv* L. X.."Act* PftormaCtutic* Jafftrstaricn* 25 (19751: 7; H.** Kaneshirna et ?!.. "Studies **on *Cannabii* in Hokkaido, Pert 6," *HpkIftifforitSU Eisti Ktatfytithoko* 23** H973J: 1.

Cannabinoid Phenotypes

There are two basic types of marijuana plants: those cultivated for their fiber content and those cultivated for their drug content. The fiber type is generally grown in temperate climates and is useful for making cloth, rope and paper. It yields little or no drug. The drug type is generally grown in warmer, drier countries and is less useful for fiber. The fiber type has usually been called *Cannabis sativa,* and the drug type *Cannabis indict* Distinct groups within a species which differ in their form, chemical content and behavior are known, as phenotypes (literally, visible types). Genotype, on the other hand, refers to the genes or hereditary makeup of an organism. The phenotypic differ-ences which exist in various strains or stocks of marijuana with respect to their content are the result of different genes interacting with environmental variables. In order to enhance marijuana potency, we can manipulate growth conditions as well as exercise considerable care in the selection of seeds.

In the last century, breeding programs have led to the development of several hundred distinct varieties. Virtually all of these have been selected for the fiber content of their stems or the oil content of their seeds, wirh little emphasis on their drug content. However, recently there has been considerable research on determining the relative amounts of cannabinoids in various types of marijuana and delineating possible phenotypes with respect to their THC and CBD content. The results so far indicate that plants from temperate climates tend to have a high CBD

and low THC content, while those from warm southern tend to have low CBD and high THC content. Four phe no types have been described, and a fifth is proposed here:

Type I High THC and low CBD in both males and females; matures slowly; is usually native to areas below latitude 30* North (which runs through Morocco, Iran, N, India, S, China, N. Mexico and Florida),

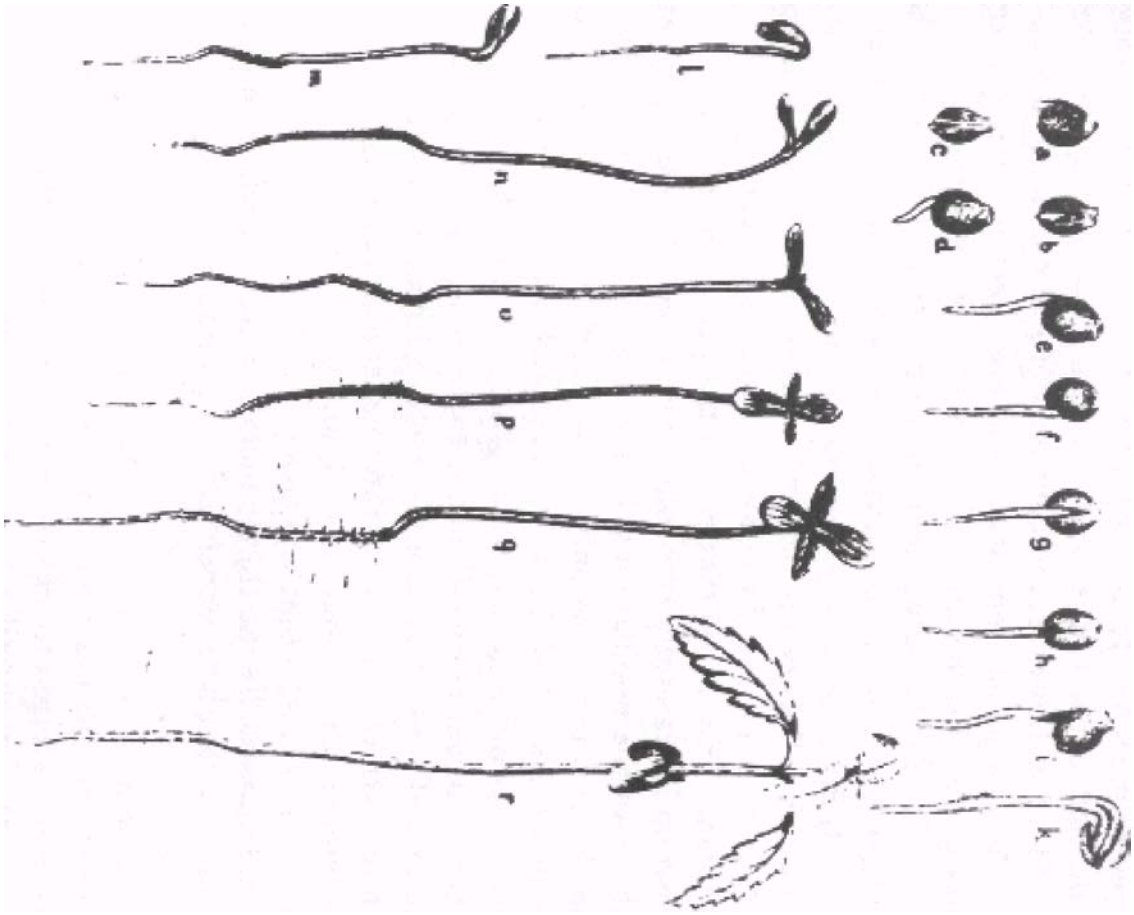
Type II Moderate levels of CBD and THC with higher CBD, and females having more of both; usually matures rapidly; native to regions north of latitude 30° North,

Type III Moderate to high levels of CBD with low levels of THC, and females having more of both; usually matures rapidly; native to regions north of latitude 30° North,

Type IV High THC and low CBD in both males and females; matures slowly; native to northeastern Asia (Japan, Korea, N, China). Has small quantities of cannabigerol monomethyl ether (an inactive cannabinoid). Plants of ten Very tall.

Type V High THC and very low CBD in both males and females; matures slowly; native to Indonesia, Southern Africa, and Nepal. Up to 80% of the THC is actually THCV (tetrahydrocannivarinj with a propyl side chain replacing the amyl side chain of THC.

These phenotypes appear co have a solid genetic basis since, as the data in the tables will show, seeds from these types produce essentially the same kind of marijuana no matter where they are grown. The slow maturing, high THC types are adapted for conditions near the equator where longer growing seasons allow thetn to develop fully. A great deal of variation exists and there is much overlap, particularly between types II and III, It is possible that the phenotypes were much more distinct in the past when transport of seeds from every area of the world was limited, Hybrids between the types seem to be completely fertile and to contain cannabinoids approximately intermediate between those of the parents, though the offspring may often deviate to either the high or low THC parent. It would be extreme-



ly interesting to follow the THC content of n high THC southern strain raised in the north through several inbred generations to determine whether, if it is protected against cross fertilization by the native low THC strains, it can maintain its high THC output. There is, however, the continual problem of natural selection. All marijuana seeds, including those of inbred strains, vary considerably, Furthermore, the slower developing plants will have little, if any, mature seeds when it is time to harvest in the northern climates. Consequently, they will be undci represented (if at all) in the second generation. Sensitivity to the other factors which influence the percentage of seeds that germinate and rate of development of the seeds also varies in each strain of marijuana. This means that even if die plants arc inbred and grown under carefully controlled conditions, the average genetic makeup of the population will probably change for each generation. There seems to be only one well-controlled experiment on this point. High THC South African seeds were grown in temperate areas by some half-dozen growers and produced so little CBD that it *was* virtually un detectable, as well as significant amounts of propyl cannabinoids. A careful study in a phyto-tron [growth chamber) over three generations at a high and a low temperature showed no CBD and little variation in canna-binoid content. Content was always higher at lower temperatures. However, by the third generation, natural selection had eliminated the plants which had large amounts of propyl cannabinoids.

Some data exist for second or third generations from other studies such as the one at the University of Mississippi previously referred to. However, in those studies there was little control over pollination, which means that the second generation Mexican seeds could be a cross between Mexican and Nepalese—or any other males that happened to mature at the right time, within a hundred yards or so.[2]

Relative Potency of Male and Female Plants

The First **observations about the differences in potency of the male** and female marijuana **plants** were **probably made thousands of years ago. The ancient Indian** practice **of separating** males

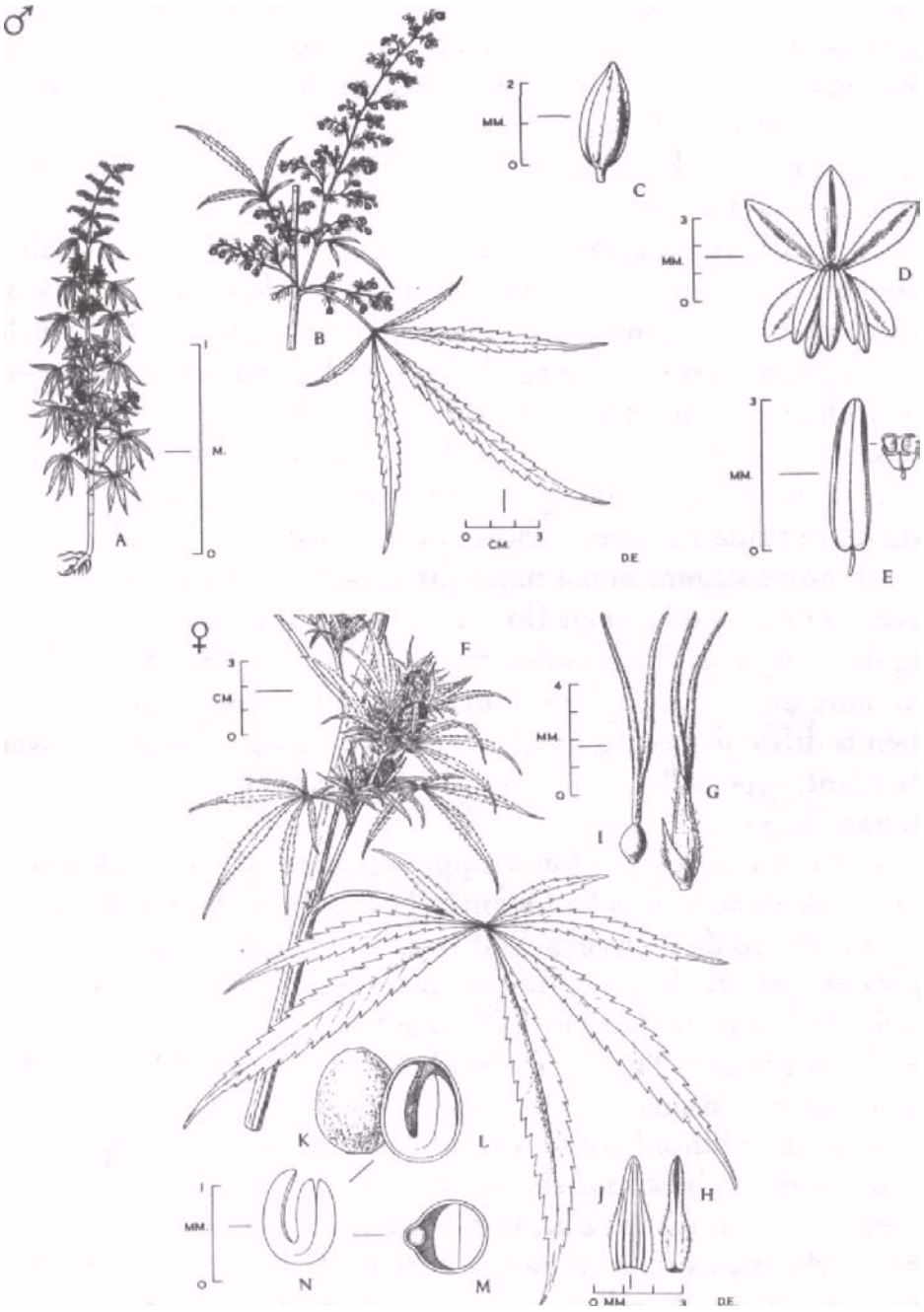


Fig. 13. Anatomy of male and female *Cannabis: A,* mature male plant; *B,* mature male flowering branch; *C,* immature closed male flower; *D,* mature open male flower with 5 sepals surrounding 5 anthers; *E,* single anther and cross section of anther containing pollen; *F,* female flowering branch containing many flowers and bracts; *G,* female flower with 2 projecting stigmas; *H,* bractlet removed from around female flower; /, female flower with bractlet removed showing ovary and 2 stigmas; *J,* inside of bracttet; *K,* outside of seed; *L,* seed in longitudinal section showing embryo; *M,* seed in cross section; *N,* embryo removed from seed showing root and cotyledon. (Reprinted, by permission, from Joyce and Curry, *The Botany and Chemistry of Cannabis,* 1970. Drawn by D. Erasmus.)

from females is often cite J as evidence of this, but in fact this is done in order to prevent or diminish fertilization of the females. The lesser potency of the males need not have anything to do with the practice. Males are sometimes culled out in fiber-producing countries because they mature earlier and die, and because they are a different height.

Actually, the male plants are the victim of bad press. Males often equal or exceed females in cannabinoid content, especially in the high THC strains (see table 3). In fact, usually the females are only more potent during the terminal stages of development when the males ate dying and the females are in full flower or are setting seed (see table 2). Ff the males could be prevented from flowering by pruning, flower removal or chemicals, they might continue to develop potency on a par with females. Males, however,-are much more difficult to manipulate than females. For example, their flowering is not triggered by decreasing day length as the females' generally is, but is relatively fixed and inherent in each strain. Pinching the flowers before they open is difficult because males tend to produce flowers all over the plant, especially when they arc frustrated by bothersome human fingers.

In the University of Mississippi experiments, the male and female Mexican plants hid identical cannabinoid contents when first measured at 13 weeks, and were still about equal even at 17 weeks (see table 2), Note that many of the males die by 17 weeks and that the later measurements refer to the more slowly-developing males. The table also shows that high CBD, low THC strains behave similarly to the high THC strains,

The cannabinoid content of males and females in high THC strains tends to be about the same, with the males sometimes exceeding the females. But, in the intermediate and low THC strains, the males tend to have a noticeably lower content. These data are not totally reliable, however, because the sampling techniques, growth conditions and degree of maturity varied drastically. Erratic sampling may also explain the aberrant data presented at the end of table 3. In a high THC strain from Afghanistan, the female has the expected small amount of CBD, but the male has a whopping 4,6%; whereas in another Afghani strain the males and females have about equal amounts of CBD, but the male has nearly five times as much THC. In one Turkish

strain the males have about four times as much of both CBD and THC. There are strains from India, Peru, Thailand and Czechoslovakia in which the male is high in CBD *and* the female high in THC. One strain from Jran has both sexes low in THC bur [he male high in CBD, while one Manchurian and one Thai strain have both sexes high in THC, but only the female high in CBD. Finally, in one Russian strain the male is high in THC and the female liigh in CBD, Some of the seeds may have been hybrids, or mixtures of different batches of seeds. Nevertheless, these data alert us to the possibility that there arc strains with dtastic differences between males and females-

TABLE 3

Comparison of Male and Female **Plants**

E3cb* w t *of values represert ts a (fjfferen* r *seed stock. Figures rounded off to one decimal place. THC and CBD are given in % dry weight of manicured mature flowering tops unless otherwise no&d.

M = Male F * Female T = Trace « 0.1%)

High THC Strains (Female > 0.5%)

SEED ORIGIN	GROWN IN	CONDITION	SEX	THC	CBD
Argentina	Argentina	Flowering	F	05	0.7
			M	05	0.5
Chile	Canada	Immature	F	0,8	0.1
			M	0.1	0.2
Gambia	Canada	1 mmature	F	1.0	0.1
			M	0.7	0.1
India	Mississippi	Flowering	F	1.3	0.9
			M	0.3	2.1
Japan	Canada	Immature	F	1.4	0.3
			M	0.5	0.1
		Immature	F	0.6	0.3
			M	0.5	0,3

THC AND CBD CONTENT

SEED ORIGIN	GROWN IN	CONDITION	SEX	THC	CBD
Japan	Japan	Flowering	*f*	4.8	—
		Bracts	*M*	2.6	-
		Flowering	F	1.9	—
		Leaves	M	0.6	-
		Flowering	F	1.2	0.2
			M	1.4	0.2
		Flowering	F	0.9	T
			M	0.4	T
		Flowering	F	2.1	—
			M	0.4	—
Korea	Mississippi	Flowering	F	0.9	0.1
			M	1.2	0.2
Mexico	Mississippi	Flowering	F	1.8	T
			M	1.7	0.1
		Flowering	F	4.0	0.4
			M	3.0	0.2
Mexico	Mississippi	Flowering	F	1.0	0.1
			M	1.2	0.3
		Flowering	F	3.7	0.4
			M	3.7	0.9
Netherlands	Canada	Flowering	F	1.4	0.2
			M	0,3	0.1
Poland	Canada	Flowering	F	1.1	0.7
			M	T	0,4
South Africa	Denmark	Immature	F	1.7	T
			M	0.3	T
South Africa	Mississippi	Flowering	F	2.0	0.6
			M	2.9	0.1
Sweden	Canada	Flowering	F	0.9	0.6
			M	0.1	0.6

SEED ORIGIN	GROWN IN	CONDITION	SEX	THC	CBD
Thailand -	Mississippi	Flowering	F M	2.5 2.4	0.4 0.2
Vietnam	Mississippi	Flowering	F M	— 3.2	- 0.5

Intermediate Strains (F>0.6% THC; F> 0.8% CBD)

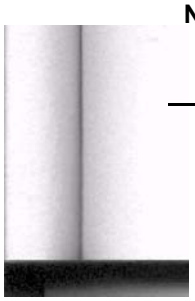
SEED ORIGIN	GROWN IN	CONDITION	SEX	THC	CBD
Czechoslovakia	Canada	Flowering	F M	0.7 0.1	0.8 0.3
England	Canada	Flowering	F M	0.6 0.1	1.5 0.4
Ethiopia	Mississippi	Flowering	F M	1.3	3.1
Germany	Canada	Flowering	F M	0.6 0.1	1.4 0.2
India	Canada	Flowering	F M	0.6 0.3	0.7 0.3
Morocco	Mississippi	Flowering	F M	0.7 0.2	0.7 0.4
Poland	Canada	Flowering	F M	1.1 T	0.7 0.4
Rumania	Canada	Flowering	F M	0.6 T	1.3 0.2
Sweden	Canada	Flowering	F M	0.g 0.1	0.6 0.6
Thailand	Mississippi	Flowering	F M	1.4 1.9	2.4 2.2
Turkey	Mississippi	Flowering	F M	2.8	1.9
Turkey	Canada	Flowering	F M	1.3 0.2	1.3 0.4

SEED ORIGIN	GROWN IN	CONDITION	SEX	THC	CBD
USSR	Canada	Flowering	F	0.7	1.3
			M	0.2	0.2
Yugoslavia	Canada	Flowering	F	0.6	1.0
			M	T	0.2

High CBD Low THC Strains (F<0.5% THC; F3»0.6% CBD)

SEED ORIGIN	GROWN IN	CONDITION	SEX	THC	CBD
Canada	Canada	Flowering	F	0.2	1.2
			M	0.4	0.2
		Flowering	F	0.1 T	1.7
			M		0.2
		Flowering	F	T T	2.0
			M		0.4
Czechoslovakia	Canada	Flowering	F VI	0.5	3.2
				0.1	0.5
		Flowering	F	0.2 T	1,5
			M		0.5
		Flowering	F	T	1.2
			M	T	0.2
England	Canada	Flowering	F	0.1 T	2.0 0.3
			M		
		Flowering	F	0.2 T	1.1 0.3
			M		
France	Canada	Flowering	F	0,1 T	2.8 0.3
			M		
		Flowering	F	T	1.9
			M	0.1	0.9
France	Canada	Flowering	F	0.4 T	1.8 0.4
			M		
Germany	Canada	Flowering	F	0.5	1.3
			M	0.1	0.2

SEED ORIGIN	GROWN IN	CONDITION	SEX	THC	C8D
Germany	Canada	Flowering	F	0.4	0.8
			M	T	0.5
		Flowering	F	0.1	2.7
			M	T	0.6
Hungary	Canada	Flowering	F	0.5	1.5
			M	T	0.1
		Flowering	F	T	1.6
			M	T	0.1
India	Canada	Flowering	F	0.3	1.2
			M	0.2	0.7
Ireland	Canada	Flowering	F	0.1	0.8
			M	T	0.2
Israel	Canada	Flowering	F	0.2	1.0
			M	0.2	0,2
		Flowering	F	0.5	0.7
			M	0.1	0.4
Italy	Canada	Flowering	F	0.1	1.9
			M	T	0.2
		Flowering	F	T	2.8
			M	T	0.3
		Flowering	F	0.5	0.6
			M	T	0.3
Lebanon	Lebanon	Flowering	F	T	2.8
			M	0,2	1.6
		Flowering	F	0.4	0.3
			M	0.6	0.7
Morocco	Mississippi	Flowering	F	0.1	1.6
			M	0.4	1.0
Netherlands	Canada	Flowering	F	0.1	1.3
			M	0.2	0.2



THC AND CBD CONTENT

SEED ORIGIN	GROWN IN	CONDITION	SEX	THC	CBD
Netherlands	Canada	Flowering	F	0.4	2.1
			M	T	0.2
Poland	Canada	Flowering	F	0.4	0.7
			M	T	0.3
		Flowering	F	0.2	1.7
			M	T	*0.3*
Portugal	Canada	Flowering	F	0.2	1.3
			M	T	0.4
Rumania	Canada	Flowering	F	0.1	1.9
			M	T	0.1
Spain	Canada	Flowering	F	0.4	2.7
			M	T	0.4
Sweden	Canada	Flowering	F	0.3	1,4
			M	T	0.4
		Flowering	F	0.4	2.2
			M	T	0.4
Turkey	Canada	Flowering	F	T	0.5
			M	T	0.4
		Flowering	F	0.1	0.8
			M	T	0.4
USA (Illinois)	Canada	Flowering	F	0.1	0.4
			M	0.1	0.3
USA (Kansas)	Kansas	Flowering	F	T	0.9
			M	T	0.3
USA (Iowa)	Canada	Flowering	F	0.1	1.0
			M	0.1	0.6
USA (Minnesota)	Canada	Flowering	F	0.1	1.6
			M	T	0,2
USSR	Canada	Flowering	F	T	0.6
			M	T	0.3

SEED ORIGIN	GROWN IN	CONDITION	SEX	THC	CBD
USSR	Canada	Flowering	F	0.1	3.4
			M	T	0.4
		Flowering	F	0.4	1.6
			M	0.1	0.2
Yugoslavia	Canada	Flowering	F	0.4	1.4
			M	0.1	0.1
		Flowering	F	0.2	0.2
			M	0.1	0.5

Aberrant Data

SEED ORIGIN	GROWN IN	CONDITION	SEX	THC	*CBD*
Afghanistan	**Mississippi**	**Flowering**	**F**	**2.1**	**0.2**
			M	**2.6**	**4.6**
		Flowering	**F**	**0.6**	**1.3**
			M	**2.7**	**1.9**
Czechoslovakia	**Mississippi**	**Flowering**	**F**	**1.0**	**0.3**
			M	**0.1**	**1.3**
India	**Mississippi**	**Flowering**	**F**	**2.7**	**T**
			M	**0.1**	**2.2**
Iran	**Mississippi**	**Flowering**	**F**	**0.3**	**0.1**
			M	**0.2**	**1.6**
Manchuria	**Mississippi**	**Flowering**	**F**	**2.0**	**1.9**
			M	**1.5**	**T**
Pakistan	**Mississippi**	**Flowering**	**F**	**0.7**	**1.3**
			M	**1.4**	**1.2**
Peru	**Mississippi**	**Flowering**	**F**	**2.1**	**T**
			M	**T**	**0.5**
Russia	**Mississippi**	**Flowering**	**F**	**0.1**	**1.8**
			M	**1.1**	**T**

SEED ORIGIN	GROWN IN	CONDITION	SEX	THC	CBD
Thailand	Mississippi	Flowering	F	2.9	T
			M	0.9	2.3
		Flowering	F	1.6	1.2
			M	1.7	T
Turkey	Mississippi	Flowering	F	0.4	0.8
			M	1.6	2.8

SOURCE: P.S. Fetterman el al., "Mississippi Grown *Cannabis sativa* L.." *Journal of Pharmaceutical Science* 60 (1971): 1246; J.H. Hollay at al,, "Constituents of *Cannabissativa L. XI," Journal of Pharmaceutical Scfance 64* (1975): 892; J,W. Fairbairn and J.A. Liebmann, "The Cannabinoid Content of *Cannabis sativa* L. Grown in England," *Journal of Pharmacy and Pharmacology* 26 (1974): 413; A. Ohlsson etal., "Constituents of Male and Female *Cannabis sativa," Bulletin on Narcotics* 23 (1971): 29; E. Small and H. Beckstead. "Common Cannabinoid Pheno types in 350 Stocks of *Cannabis,"Lioydia* 36 (1973): 144.

Monoecious Strains

Marijuana plants are often hermaphrodites. Male flowers will frequently sprout forth on female plants, particularly under adverse conditions, and strains are known in which nearly every plant contains both sexes. Such monoecious strains have been specially developed for fiber production because they yield a uniform crop which matures simultaneously {the males of dioe- - cious strains usually die about one month earlier than females). The monoecious strains contain little THC; even hermaphrodites from mostly dioecious strains are of the low THC, high CBD variety {see tables 4 and 5). It seems that it should be possible to develop high THC monoecious strains as well. One monoecious female Thai plant had 2.5% THC and 0.3% CBD, while a male of the same strain had 2.1 and 0.4%, respectively. It should also be kept in mind that the designation of a plant as monoecious is often rather arbitrary, since many individuals have few male flowers. Hemp breeders have also developed seeds which will yield nearly 100% females (produced by crossing two highly inbred strains).

Cannabinoid Content of Hashish

When we examine the cannabinoid content of hashish, we reach some very interesting conclusions. First, the actual content of

TABLE 4

Cannabinoid Content of Monoecious Strains

See table 2 for details

SEED ORIGIN	GROWN IN	CONDITION	THC	CBD
Bulgaria	Canada	Flowering	T	0.2
		Flowering	0.2	0.3
		Flowering	T	0.3
France	Canada	Flowering	T	1.0
		Flowering	T	0.5
		Flowering	T	0.2
Germany	Canada	Flowering	0.1	0.7
		Flowering	0.1	0.1
		Flowering	T	0.5
Poland	Canada	Flowering	T	0.1
		Flowering	T	0.3
		Flowering	T	0.6
USSR	Canada	Flowering	T	0.4
		Flowering	0.1	0.5
Yugoslavia	Canada	Flowering	T	0.5
		Flowering	0.1	0.4
USA*	Canada	Flowering	0.1	0.7
		Flowering	T	1.3
		Flowering	0.3	0.4
		Flowering	0.2	0.5

'Double backcross of Turkish **to German Monoecious**

SOURCE: E, Small and H. Beckstead, **"Common** Cannabinoid Pnanotypes in 350 Stocks of ***Cannebis."Uoydia* 36** (1973): 144,

THC is extremely low considering the price. The highest amount given in table 6 (11.5%) is not even twice the amount present in good quality marijuana from Africa, India, Mexico or Colombia, and it is accompanied by so much CBD that the high will be significantly diminished. In fact, there is almost always more CBD

than THC in hashish, sometimes as much as ten rimes more. This validates the frequent observation that hash promises much more than it delivers. An ounce of average quality hash from the Near East, costing $100, would provide about 1.4 g of THC along with a sizeable quantity of the inhibitory CBD, The same $100 would buy two ounces of marijuana which would contain an almost equal amount of THC with very little CBD. Remember, though, that the CBD may contribute to the pleasantness of the hash high,

TABLE 5 Comparison of Monoecious

Plants with Females of Same Strain

See *table 2 for details* F = Female B = Monoecious

SEED ORIGIN	**GROWN IN**	CONDITION	SEX	THC	CBD
France	Canada	Flowering	F	0.2	0.9
			B	0.1	0.3
		Flowering	F	T	o.g
			B	T	1.0
		Flowering	F	0.1	1.2
			B	0.1	0.2
		Flowering	F	0.1	0.3
			B	T	0.8
Germany	Canada	Flowering	F	0.1	1.2
			B	T	0.3
		Flowering	F	T	0.5
			B	0.1	0.1
Poland	Canada	Flowering	F	0.2	0.4
			B	T	0.1
		Flowering	F	T	0.9
			B	T	0.3

SOURCE: E. **Small** and H. Beckstead, **"Common** Can neb moid **Phanotypes in 3 GO Stocks of *Cannabfc," Lloydia* 36 (1973): 144.**

The extremely high CBD content of hashish is puzzling. It is be expected in hashish from areas which have high CBD marijuana, but it is at first quite surprising to find it in samples from Afghanistan, Nepal and Morocco, which typically produce high THC, low CBD type plants. Part of the answer probably can be found in the adulteration with material from young plants and poor quality plants. It is also probable that the origins of some of the samples are incorrectly identified. Furthermore, the published data on marijuana is biased toward high THC strains, since many of the seeds used were seized in illicit traffic.

However, when all the available data are examined (see tables), it is clear that plants with high CBD and low to moderate THC are common in the countries where hashish originates and which preponderate in its manufacture. It may be that low-quality marijuana is earmarked for hashish. The more knowledgeable farmers in Mexico, Colombia and Southeast Asia have already begun hashish manufacture, and their product should be very potent since it is being made from high THC, low CBD plants. The maximum content will not usually exceed that of the flowering tops, except when made from hand-rubbed resin, or the top quality made by the sifting method.

Some of the older accounts of hashish preparation refer to the inclusion of pollen. This is probably a mistake; they are undoubtedly referring to the powdery fragments of the. female tops. A mature crop of females will include few males, and microscopic analysis of hashish has rarely revealed more than traces of pollen. Pollen had been thought to be quite potent until recent data proved otherwise (see table 7),

TABLE 6 Cannabinoid **Content of Hashish**

SOURCE	COLOR	*%Of* TOTAL WEIGHT THC	CBD
Afghanistan	Dark Brown	1.7	_
Afghanistan	Dark Brown	6.5	-
Lebanon	—	1.4	1.4

THC AND CBD CONTENT

SOURCE	COLOR	% OF TOTAL WEIGHT THC	CBD
Greece	—	2.1	9.8
—	_	0.7	0.3
—	—	0.6	2.3
—	—	11.5	15.8
—	—	4.5	4.7
—	—	1.7	1.0
Pakistan	Dark Brown	2.3	—
Pakistan	Dark Brown	8.7	6.3
Pakistan	Dark Brown	6.6	—
Lebanon	Light Brown	1.9	—
Morocco	Light Brown	2.0	—
Nepal	Dark Brown	1.5	15.1
—	Dark Brown	1.4	—
_	Dark Brown	7.1	—
_	Dark Brown	2.4	_
_	Dark Brown	3.7	10.6
_	Dark Brown	10.9	—
_	Dark Brown	3.9	_
_	Light Brown	4.6	8.8
_	Light Brown	10.5	—
—	Light Brown	0.1	—

TABLE 6A

Cannabjnoid Content of Hashish

Individual cannabinoids as percent of* tote/ *cannabinoids in sample 9

CBDV = Cannabidivarin THCV = Tetrahydrocannabivarin

SOURCE	NO, OF SAMPLES	THC	CBD	THCV	CBDV
Lebanon	7	25-36	59-66	_	
Pakistan	19	15-53	39-57	-	—

Various Plant **Parts**

SOURCE	3				
	NO. OF SAMPLES	THC	CBD	THCV	CBDV
Afghanistan	5	42-61	35-45	-	-
Nepal	3	3-12	36-41	2-6	9-12
Morocco	5	49-60	31-40	-	-

SOURCE: K.H. Davis etal,. "The Preparation and Analysis of Enriched artd Pur» Cannabinoids from Marihuana and Hashish," *Uoydia* 33 (1970): 453; F. Merkus, "Cannabivarin and Tetrahydrocannabivarin, Two Constituents of Hashish," *Nature* 232 (1971): 579; P.S. Felterman etal., "Mississippi Grown *Can nab is sativa* L.," *Journal of Pharmaceutical Science SO* (1971): 1246; P. Chambon «t al., "Problames Poses Par la Culture Locale du Chanvre at Dosage des Chanvrs," *Bulletin des Travaaux de !e Societe de Pharmacit de Lyon* 16 (19721:46.

Cannabinoid Content of Various Plant Parts

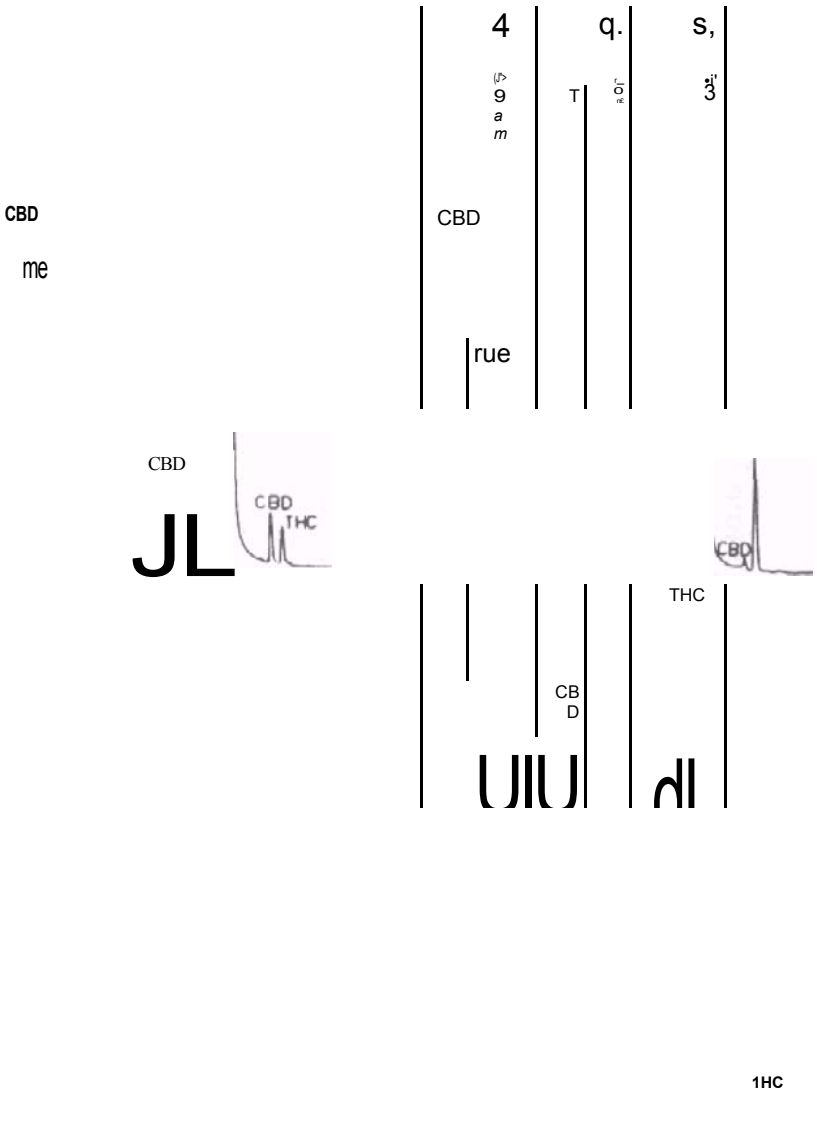
Anyone who has tried smoking the bottom leaves of even a mature plant knows that it can be a very unrewarding experience. However, if just the very tips of the flowering tops are harvested, even the most mediocre homegrown can yield potent marijuana. The bractlets (the tiny modified leaves surrounding the seeds) have the highest cannabinoid content, averaging about twice that of the bracts (see table 7). The bracts are the modified leaves which, with the flowers, form clumps at the ends of the flowering branches. Flowers tend to have more cannabinoids than bracts, though as the table shows, this may vary from nearly equal to three times as much for a particular strain. The cannabinoid content of the leaves decreases gradually from the top to the bottom of the plant. Smaller stems have even less, seldom exceeding 0.1% THC or CBD. Larger sterns have almost none, and seeds and roots have little, if any.

The data on South African marijuana grown in England show that while the top leaves always have a higher content than the bottom or middle ones, the ratios vary considerably-The top leaves can have between two to ten times more THC than the bottom leaves on the same plant. The ratios of top, middle and bottom for three plants were 8, 4, 1; 1.7, 1.4, l;and 3, 2, 1. A general principle that helps to make sense of all the data on cannabinoid content is that as the cannabinoid concentration increases, the differences become more pronounced. For

example, the differences between high and low content of THC in two plants may be very obvious in the flowering tops, but undetectable in the bottom stems. Also, when the contents are low enough, one may find a reversal of the usual pattern and observe middle leaves with higher content than top leaves (such as the female Turkish plants grown in Sweden), or bottom leaves and stem having equal amounts.

The ratio of the cannabinoid content of the various parts of the plant in males versus females or of one strain versus another also varies widely and often erratically. For example, in the flowering tops of one Lebanese strain, the females had five times more THC than the males, but in the top leaves the males had twice the THC of the females. While top leaves of the U.S.S.R. and Turkish females had equal amounts of CBD, the Turkish females had equal amounts of CBD, the Turkish middle leaves had seven times more than the Russian ones (see table 7). Similarly, the ratio of CBD to THC in the various parts may vary greatly. In accordance with the general principle stated above, this ratio tends to be higher in parts where the cannabin-oids are concentrated and in younger parts (since CBD is the probable precursor of THC). In one Lebanese strain, the CBD content in the female flowers was 70 times the THC, while in the top leaves it was 35 times, and in the bottom leaves and stems it was 20 times. In the males of this strain the figures were eight, nine, two, and three and a half times, respectively. In another Lebanese strain, the female had a nearly 1:1 ratio of CBD to THC in all parts, while the male had one and one tenth times more CBD in the flowers and six, four and 15 times more THC in the top and bottom leaves and stems.

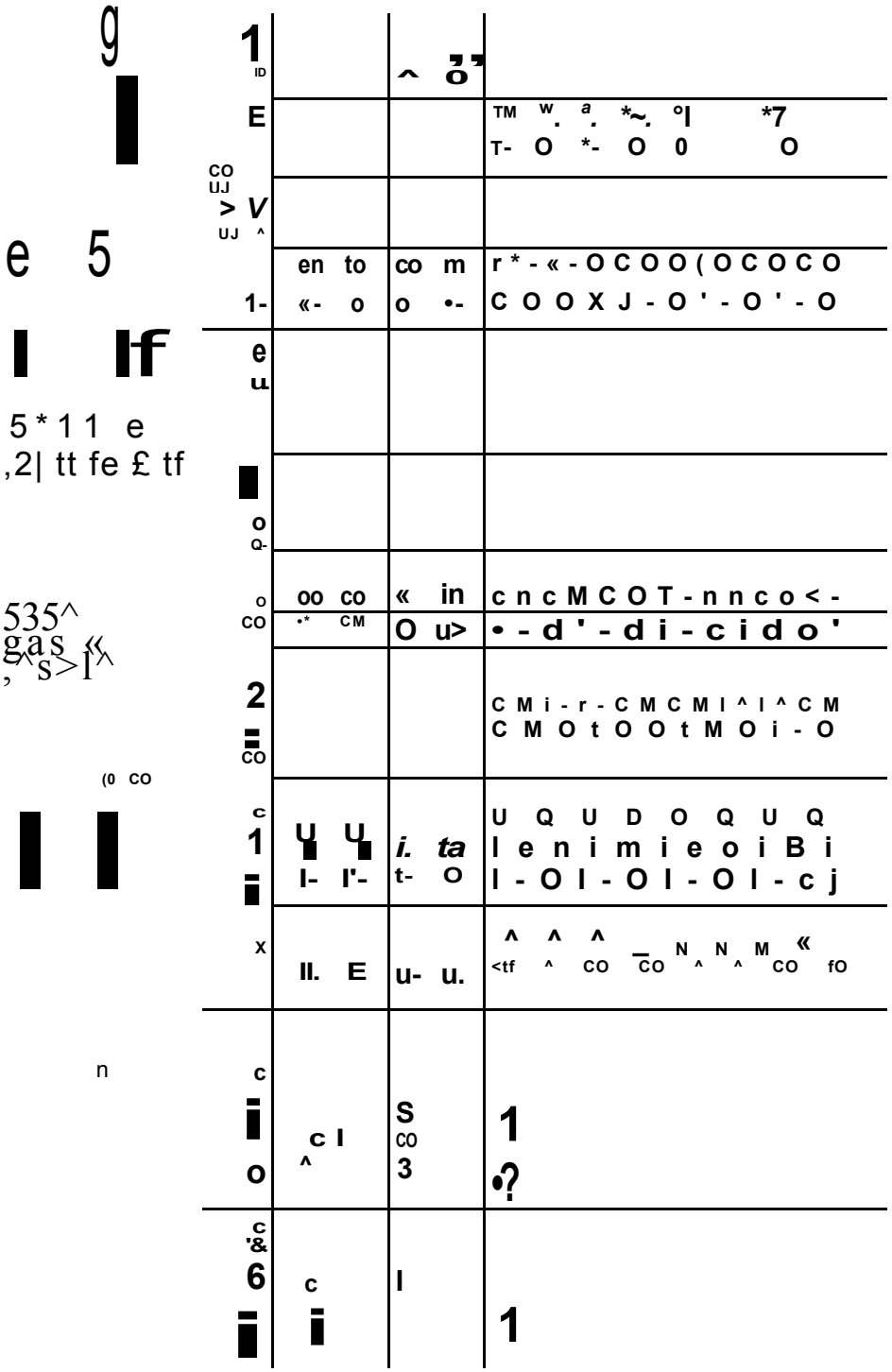
A recent study of marijuana grown in the Netherlands showed that the ratio of CBD to THC was almost constant at 1.3 for all leaves on the plant and for each part of each leaf, except that there was slightly more CBD in the leaf tips of large leaves (mean ratio 1.7). The wide variation discussed above may be partly due to sampling errors, but undoubtedly, as with virtually every other aspect of this extraordinary plant, there is great variation from one strain to another. A study of Turkish plants showed CBD content of 1.7% in the lower parts of single



Ftg, 14. Gas chromatograms showing cannabinoid content of various parts of male and female Lebanese marijuana. In this example the small (upper) leaves of the male have the highest THC content and most parts of the female have more CBD than THC-a common finding for Lebanese plants. For a more detailed explanation of chromatosraphy see the testing section of this book. (Reprinted from A. Ohlsson et a).. *Bulletin on Narcotics,* Vol. 23, 1971.)

small bracts, but only 0.5% in the upper parts of the same bracts. The higher concentration in the lower parts is probably due to the fact that they are older and have had more time to synthesize. Remember that Turkish plants are generally of the high CBD, low THC variety.

One practical consequence of these data is that particular care must be paid to the precise part of the plant being used. In sampling a kilo, for example, you may get a very incorrect impression if you happen to taste some bottom leaves or, conversely, some flowering tips. Another consequence is that the more potent



Seed Origin	Grown In	Sex	Compound	Bract lets	Bracts	Pollen	Flowers	LEAVES Top	Mid.	Bot.	S tarns
		3M-,	THC		1.1	0.3 T		1.4*		1.0	
		$3M_1$	CBD		0.1			0.4*		0.1	
		$3M_2$	THC		0.6	0.1		1.2*		0.8	
		$3M_2$	CBD		0.2	-		0.3*		0.2	
Lebanon	Lebanon	F	CBD				2.4	1.1	0.3		0.1
		M	CBD				1.3	0.6	0.4		T
USSR	Sweden	F	CBD				0.5	0.5	0.1		T
		M	CBD				0.6	0.3	0.4		0.1
Turkey	Sweden	F	CBD				0.8	0.5	0.7		T
		M	CBD				0.7	0.7	0.5		T
Czech.	Sweden	F	CBD				0.7	0.5	0.4		T
		M	CBD				0.7	0.2	0.2		T
So. Africa	England	F	THC				1.8-7.1	1.3-6.9	0.1-4.5		
		F,	THC					4.8	3.1	1.5	
		F_2	THC					6.1	3.0	0.8	
	.•.. ^.. .	F_3	THC					6.9	5.5	4.0	
		F_4	THC				3.7	3.0			
		F_5	THC				3.4	1.9			

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Propyl Cannabinoids

Before 1969 it was thought that all naturally occurring cannabinoids had the pentyl or five carbon side chain in the right hand (benzenoid) ring. Then some samples were discovered which contained small amounts of cannabinoids with a propyl or three carbon side chain instead of the pentyl. The three analogs of CBD, THC and CBN with the propyl side chain are termed cannabidivarol (CBDV), tetrahydrocannabivarol (THCV) and cannabivarol (CBV). Samples having significant amounts of these compounds generally come from India and adjacent areas (Nepal, Afghanistan, Pakistan), South Africa and Indonesia. However, it is assumed that further testing will reveal their presence in marijuana from other areas. Small quantities have been detected in marijuana from 29 countries; only seeds from Morocco, Poland and Turkey yielded plants without at least traces. As the table below shows, some samples may contain up to 50% of their cannabinoids as THCV or CBDV. Some South African pknts have as high as 80% of the total cannabinoids present as THCV. It is presently unknown whether the quantity of these compounds is affected by age, sex or plant part in any way significantly different from that of the pentyl cannabinoids. The only relevant data, from South African plants grown indoors, are presented below. It is apparent that higher temperatures favor the production of propyl compounds relative to pentyl and of cannabinoids in the males relative to the females.

		MALE	FEMALE
32°C	THC	0.19	0.16
	THCV	0.14	0.08
22* C	THC	0.07	0.14
	THCV	**0.02**	**0.06**

(Plants grown from South African seeds indoors at 32° Cor 22° C for 16-hour light period, then 12°C for eight-hour dark period.)

It is especially interesting that the duration of action of the propyl cannabinoids is significantly shorter than that of the pentyl compounds. Smoking marijuana with large amounts of THCV should produce a shorter high than usual, but human ex-

TABLE 8

Cannabinoids and Propyl Cannabinoids of High Potency Strains

All values are % of total Cannabinoids rounded off to nearest %

THCV - Tetrahydrocannabivarin CBDV = Cannabidivarin T * < 1%

Marijuana

SEED ORIGIN	GROWN IN	CONDITION	THC	THCV	CBD	CBDV
Afghanistan	USA (Mississippi)	Vegetative	—	48	—	T
		Flowering	67	4	4	10
South Africa	France	Immature	70	17	-	—
South Africa	Indoors	Immature	65	30	—	—
South Africa	USA (Mississippi)	Flowering	-	54	-	T
India	USA (Mississippi)	Flowering	—	11	—	2
Nigeria	USA {Mississippi)	Vegetative	—	9	—	T
Indonesia	Indonesia	Flowering	81	-	3	T
		Flowering	3	-	12	50
		Flowering	31	—	14	20
		Flowering	70	—	6	8

SEEP ORIGIN	GROWN IN	CONDITION	THC	THCV	CBD	CBDV
Thailand (1971)	Norway	Immature	80	...	9	-
Thailand (1972)	Norway	Immalure	89	-	8	_
Turkey (1971)	Norway	Flowering	3	-	96	-
Turkey (1972)	Norway	Flowering	13	-	85	-
South Africa	Norway	Immature	84	—	4	-
South Africa	South Africa	Flowering	56-92	-	3-12	-
Burma	Burma	Flowering	9-22	-	11-25	-
Nigeria	Nigeria	Flowering	26-78	—	4-13	-
Jamaica	Jamaica	Flowering	5E-98	—	2-17	-
Morocco	Morocco	Flowering	45-66	—	3(MO	-

Hashish

SEED ORIGIN	GROWN IN	CONDITION	THC	THCV	CBD	CBOV
Nepal	Nepal	Flowering	3-12	2-6	36-41	9-12
Pakistan	Pakistan	Flowering	15-53	-	39-57	-
Lebanon	Lebanon	Flowering	25-36	-	59-66	-
Afghanistan	Afghanistan	Flowering	42-61	-	35-45	-

SOURCE: ***ft.W.*** **Jenkins and D.A. Patterson, "The Relationship Between Chemical Composition and Geographical Origin of** ***Cannabls," Forensic Science*** **2 (1973): 59; C.E. Turner et at.. "Constituents of** ***Cannabls sativa*** **L. VI," *Journal of Pharmaceutical Science* 62 (1973): 1739; Mobarak et al,, "Studies on Non-Cannabinoids of Hashish. II,"C/w/i«wp/»*»3 (1974): 266; C.E. Turner and K.W, Hadley, "Chemical Analysis of *Cannabis sativa* of Distinct Origin," *Archives Investigation Medica* 6, supplement (1974}: 144; M. Paris et at., "Importance des Composes Propyliques dans le *Cannabis* Originate d'Afrique du Sud," *Plantas Medicittates Phytotherapie* 9 (1975): 136; K.H. Davis et al,, "The Preparation and Analysis of Enriched and Pure Canna-binordsfrom Marihuana and Hashish," *Lloydia* 33 (1970): 453; F. Merkus, "Canna-bivarin and Tetrahydrocannabivarin. Two Constituents of Hashish," *Nature* 232 (1972): 579; P.S. Fetterman etal., "Mississippi Grown *Cannabissativa* L.," *Journal of Pharmaceutical Science* 60 (19711: 1246; P. Chambon et al.. "Problemes Poses Par la Culture Locale du Chanvre et Dosage des Chanvre," *Bulletin ties Travsaux de la Societed»PharmaciadeLyon* 16 (1972): 46.**

periments have not yet been reported. For further discussion of chain length and chemical syntheses, sec the chemistry section of this book.

Cannabinoid Content of Female Flowering Tops

It is well known that marijuana from various areas of the world varies considerably in potency, but only very recently has any quantitative data become available. Table 8 gives figures in percent of dry weight for the CBD and THC contents of female flowering tops. The high THC strains are generally found south of latitude 30° North, although there are many exceptions to this. For example, one of the wild Illinois strains contained 2,3% THC, Most wild American hemp has derived from plants that were grown for fiber, and often originated from seeds imported from China in the nineteenth century. Though most Chinese strains are probably of the high THC type, natural selection eventually changed these into the high CBD, low THC type. It should be kept in mind that the figures presented are by no means exhaustive of the range of variation existing in each country, and that in many cases much higher contents would be found if more extensive studies on completely mature plants were done. Also, the recent development of an extensive underground traffic in marijuana has led to seeds of diverse origins being deliberately cultivated or scattered about in nearly every country, so we never know for certain (especially for wild stands) whether the particular plants studies derive from numerous inbred generations or if they are the result of a recent cross with seeds from the other side of the world. Nevertheless, Mississippi researchers found a five-fold variation in THC content of plants derived from seeds from a single plant and, undoubtedly,

such variation is neither uncommon nor the maximum. It is likewise reasonable to expect more variation in the offspring if the parents are of different strains.

In spite of these difficulties, the data are probably quite typical for plants from the areas indicated. It should be useful to refer to the section on cannabinoid phenotypes before studying table 8.

One point of immediate interest is the extreme variation in potency of samples from one country. The study on Argentinian plants showed a range of 0.5 to 8.3% THC; that is, from very weak to a quality comparable to the best Colombian or Thai marijuana. Mexican marijuana seized at the border was tested and found to be quite weak. Of 40 batches seized, only ten of them had greater than *1%* THC, and the range was 0.7 to 2.87%, Evidently there are still hundreds of tons of Mexican weed being imported which are quite incapable of getting anyone stoned. Presumably they are being bought by teenagers who can't tell the difference between grass and oregano. Even the best of the Mexican marijuana tested was still only half as potent as good Colombian, Jamaican or Thai and, furthermore, had the additional disadvantage of higher CBD content than the latter types. A series of samples analyzed in Jamaica averaged 2.96% THC with a range of 0,7 to 10,3%, the latter figure being the equal of the most potent marijuana grown anywhere. Ten Costa Rican samples varied from 1.0 to 3,7%. Similar variation is observed in the plants of the high CBD type, as in wild Illinois marijuana where the CBD ranges from traces to more than 7%.

There is much speculation as to the maximum potency obtainable from marijuana. THC contents over 8% are seldom found, except for a few unpublished studies which claim ranges up to 15%. Values over 10% must be regarded with suspicion, since there is the possibility that hash oil may have been added. This is especially true of hashish. Sampling error is another serious problem, if a small amount chosen for analysis contains mostly flowers or bractlets, very high values might be obtained, but these would not be truly representative of the whole flowering top. Likewise, samples may be biased toward lower values. To avoid this problem, a thoroughly mixed sample of some two to four grams of material should be extracted and analyzed. It is possible that breeding programs may be able to increase potency beyond that which occurs in nature.

Thai and Other Southeast Asian Delicacies

It is interesting to note that Thai seeds grown in both England and Mississippi produced marijuana of good but not remarkable potency (2.4 and 3.2% THC). Thai grass has sometimes sold for more.than $2000 a pound and up to $30 per stick (enough for about four joints), but, as with all marijuana, the quality varies greatly and there is also much bogus Thai around. I have smoked various batches of homegrown Thai from California and found it to be of only moderate quality. While it is true that these different environments and times of harvest have probably not allowed these seeds to express their full potential for THC production, it is relevant that some of the South African seeds grown in the same experiments in England and Mississippi produced plants with over *6%* THC. Three samples grown in Thailand had 4.8, 1,3 and 2.1% THC. The most potent Thai tops, which must have 8 to 10% THC in some cases, have not yet found their way into official analyses. It is also interesting that some Thai plants seem to be of the high CBD or at least of the intermediate type. In the Mississippi study, one plant had 2.4% CBD and 1.4% THC, but it is possible that if such plants matured fully, the CBD would mostly be converted into THC.

Comparing other Asian strains, two young, nonflowering Vietnamese plants grown in the same study contained 4.0 and 1.0% THC and only traces of CBD, while a Vietnamese male had 3.2% THC and 0.5% CBD. Four Korean stocks contained only traces of CBD (except one with 0.4%) and up to 3.8% THC in the only plants which matured (males). In one Chinese plant, the female had 2.0% THC and 1.9% CBD. Finally, Japanese plants are typically of the high THC type with up to 4%, and with a CBD content ranging from a quarter to nearly equal that of the THC. Summarizing, we can say that Southeast Asian marijuana is typically of the high THC type, but that it often contains sizeable quantities of CBD.

It is also to be kept in mind that Southeast Asian marijuana, at least when grown there, tends to convert much of the THC into CBN (this has been termed overripe marijuana). Although this is generally true of high THC plants even when grown in cool climates (South African plants grown in Norway had up to

0.8%CBN and 2%THC), the tendency seems to reach its extreme in Southeast Asia. Burmese samples sometimes have more than 60% of their total cannabinoids present as CBN. While these amounts of CBN will probably not be of much significance so far as modifying THC effects is concerned, it does represent a substantial loss of THC, Consequently, in hot, humid areas it is important not to let plants overripen and not to store marijuana for long periods. Finally, we may note that since the conversion of THC to CBN is nonenzymatic, it should depend mostly on the environment, not on the strain of marijuana,

TABLE 9

Cannabinoid **Content of Female Flowering Tops**

See *table 2 for details*

Immature plants are young females or, in a few cases, presumed females. Multiple values for a country represent different seed stocks

r SEED ORIGIN	ligh THC Strains (f GROWN IN	:emale>0.5%) CONDITION	THC	CBD
Afghanistan	Indoors	Immature	0.8	0.2
Afghanistan	Mississippi	Immature	2.1	0.2
Argentina	Argentina	Flowering	0.5	0.7
		Flowering	0.9	T T
		Flowering	3.3	0.2
		Flowering	8.3	
Chile	Canada	Immature	0.8	0.1
China	Mississippi	Immature	2.0	1.9
Colombia	Colombia	Flowering	5.5	-
Costa Rica	Costa Rica	Flowering	1.0	T
Czechoslovakia	Czechoslovakia	Flowering	0.5	1.3
Costa Rica	Costa Rica	Flowering	3.2	T
France	Mississippi	Flowering	3.2	0.1
Gambia	Canada	Immature	1.0	0.1

THC AND CBD CONTENT

SEED ORIGIN	GROWN IN	CONDITION	THC	CBD
Ghana	Mississippi	Immature	2.6	T
Hawaii	Hawaii	Flowering	6.9	-
India	India	Flowering	5.6	2.2
		Flowering	7.4	1.9
India	Mississippi	Flowering	1.3	0.9
Italy	Denmark	Immature	0.6	0.3
Jamaica	Indoors	Immature	1.3	0.1
Japan	Canada	Immature	1.4	0.3
		Immature	0.6	0.3
Japan	Japan	Flowering	1.2	0.2
		Flowering	0.9	T
		Flowering	2.1	
Korea	Mississippi	Flowering	1.0	0.1
Lebanon	Mississippi	Flowering	1.0	2.0
Mexico	Mississippi	Flowering	3.7	0.4
		Flowering	1.4	0.1 T
		Flowering	1.8	0.4
		Flowering	4.0	
Mexico	Acapulco	Flowering	4.2	—
Nepal	England	Flowering	2.7	—
		Flowering	4.4	
Nepal	Indoors	Immature	1.3	0.1
		Flowering	2.4	
Netherlands	Canada	Flowering	1.4	0.2
Panama	Panama	Flowering	3.2	0.3
Panama	New Hampshire	Flowering	4.0	0.4
Panama	Panama	Flowering	5.7	_
Panama	Indoors	Immature	0.6	0.1
Peru	Mississippi	Immature	2.1	T
Poland	Canada	Flowering	1.1	0.7
Rumania	Canada	Flowering	0.6	1.3

SEED ORIGIN	GROWN IN	CONDITION	THC	CBD
Senegal	Mississippi	Immature	3.6	0.1
Sierra Leone	Mississippi	Immature	1.2	T
South Africa	England	Flowering	7.1	-
		Flowering	2.1	-
South Africa	Mississippi	Immature	6.1	T
South Africa	Denmark	Immature	1.7	T
South Africa	Norway	Immature	2,0	0.1
South Africa	Czechoslovakia	Immature	1.3	-
Sweden	Canada	Flowering	0.9	0.6
Thailand	England	Flowering	2.4	—
Thailand	Thailand	Flowering	1.3	0.1
		Flowering	4.8	0.1
Thailand	Mississippi	Flowering	3.2	0.4
		Flowering	1.4	2.4
Thailand	Czechoslovakia	Immature	0.6	0.1
Turkey	Mississippi	Flowering	2.8	1.9
	Czechoslovakia	Flowering	0.1	1.1
USA (Iowa)	Mississippi	Flowering	0.7	2.7
USA (Illinois)	Illinois	Flowering	2.3	-
USA (New Jersey)	New Jersey	Flowering	0.7	0.4
USA (Iowa)	Iowa	Flowering	0.5	0.4
Vietnam	Mississippi	Immature	4.0	T

Intermediate Strain SEED ORIGIN	s (Female > 0.6% GROWN IN	THC; Female^ CONDITION	^ 0.8% C THC	:BD) CBD
Czechoslovakia	Canada	Flowering	0.7	0.8
England	Canada	Flowering	0,6	1.5
Germany	Canada	Flowering	0.6	1.4
Greece	Greece	Flowering	0.7	2.8
Hungary	Canada	Flowering	0.6	1.5
India	Canada	Flowering	0.6	0.7

SEED ORIGIN	GROWN IN	CONDITION	THC	CBD
Lebanon*	Norway	Immature	0.8	1.0
Lebanon	Mississippi	Flowering	1.0	2.0
Poland	Canada	Flowering	1.1	0.7
		Flowering	1.3	1.2
Rumania	Canada	Flowering	0.6	1.3
Sudan	Mississippi	Flowering	2.1	T
Sweden	Mississippi	Flowering	0.9	0.6
Thailand	Mississippi	Flowering	1.4	2.4
Turkey	Canada	Flowering	1.3	1.3
USA (Iowa)	Mississippi	Flowering	0.7	2.7
USSR	Canada	Flowering	0.7	1.3
Yugoslavia	Canada	Flowering	0.6	1.0

High CBD Low THC Strains (Female < 0.5% THC; Female > 0.6% CBD)

SEED ORIGIN	GROWN IN	CONDITION	THC	CBD
Argentina	Argentina	Flowering	0.5	0.7
Brazil	Brazil	Flowering	0.1	0.6
Canada	Canada	Flowering	T	2.0
		Flowering	T	1.0
Cyprus	Canada	Flowering	0.1	0.6
Czechoslovakia	Canada	Flowering	0.1	1.4
		Flowering	0.1	0.8
		Flowering	T	1.7
England	Canada	Flowering	0.1	2.0
		Flowering	0.2	1.1
France	Canada	Flowering	0.1	2.8
		Flowering	T	1.9
France	France	Flowering	T	0.6
Germany	Canada	Flowering	0.5	1.3
		Flowering	0.1	2.7

SEED ORIGIN	GROWN IN	CONDITION	THC	CBD
Greece	Greece	Flowering	0.7	2.8
Hungary	Canada	Flowering	0.5	1.5
		Flowering	T 0.1	1.6
		Flowering		2.5
India	Canada	Flowering	0.3	1.2
Ireland	Canada	Flowering	0.1	0.8
Israel	Canada	Flowering	0.2	1.0
		Flowering	0.5	0.7
Italy	Canada	Flowering	0.1 T	1.9
		Flowering	0.5	2.8
		Flowering	0.3	0,6
		Flowering		1.2
Lebanon	Mississippi	Flowering	1.0	2.0
Lebanon	Lebanon	Flowering	T	2.8
		Flowering	0,5	2.4
Mexico	Canada	Flowering	0.4	0.7
Netherlands	Canada	Flowering	0.1	1.3
		Flowering	0.4	2.1
Poland	Canada	Flowering	0.4	0.7
		Flowering	0.2	1.7
		Flowering	T	1.5
Portugal	Canada	Flowering	0.2	1.3
Rumania	Canada	Flowering	0.1 T	1.9
		Flowering		1.1
Spain	Canada	Flowering	0.4	2.7
Sweden	Canada	Flowering	0.3	1.4
		Flowering	0.4	2.2
Switzerland	Switzerland	Flowering	0.1	1.6
Syria	Canada	Flowering	0.1	0.8
Turkey	Canada	Flowering	0.1	0.8
		Flowering	0.1	1.2

THC AND CBD CONTENT

SEED ORIGIN	GROWN IN	CONDITION	THC	CBD
Turkey	Mississippi	Flowering	0.2	1.7
		Flowering	0.1	1.0
Turkey	Sweden	Flowering	T	0.8
USA (Kansas)	Kansas	Flowering	T	0.9
USA (Iowa)	Canada	Flowering	0.1	1.0
USA (Minnesota)	Canada	Flowering	0.1	1.6
USA (Iowa)	Iowa	Flowering	T	o.g
USA (Illinois)	Illinois	Flowering	-	7.1
USA (Iowa)	Mississippi	Flowering	0.1	1.2
USA (Minnesota)	Mississippi	Flowering	0.1	1.2
USA (New Jersey)	New Jersey	Flowering	0.3	1.0
USA (Minnesota)	Minnesota	Flowering	0.4	2.7
		Flowering	0.2	0.8
USA (Massachusetts)	Massachusetts	Flowering	0.3	1.1
USSR	Canada	Flowering	T	0.6
		Flowering	0.1	3.4
		Flowering	0.4	1.6
Yugoslavia	Canada	Flowering	0.4	7.4

SOURCE: R.W. Jenkins and D.A. Patterson, "The Relationship Between Chemical Composition and Geographical Origin of *Cannobis," Forensic Science 2* (1973): 59; C.E. Turnar etal,, "Constituent} of *Cannabis sativa* L. VI," *Journal of Pharmaceutical Science 82 (1973):* 1739; Mobarak etal., "Studies on Non-Cannabinoidsof Hash ish. *," Ch*mosf>hen>3* (1974): 266; C.E. Turner and K.W. Had ley, "Chemical Analysis of *Cannabis sativa* of Distinct Origin." *Archivos Investigation Media 5,* supplement (1974): 144; M. Paris etal., "Importance des Composes Propyliques dans le *Cannabis* Originate d'Afrique du Sud," *P/anres Medicinates Phytotherapie* 9 (1975}: 136; K.H. Davis et al., "The Preparation and Analysis of Enriched and Pure Canna-binoids from Marihuana and Hashish," *Lloydia* 33 {1970}: 453; F. Merkus, "Canna-bivarin and Tetrahydrocannabivarin, Two Constituents of Heshish," *Nature* 232 (1972): 579; P.S. Fetterman etal.,, "Mississippi Grown *Csnnabissativa L.," Journal of Pharmaceutical Science* 60 (1971): 1246; P. Chambon et al., "Problames Poses Par la Culture Locale du Chanvre et Dosage de» Chanvra," *Bulletin dot Traveaux de la So-cicte tie Priarmacie de Lyon* 16 (1972): 46.

Wild Weed in the USA

As mentioned elsewhere here, wild marijuana in the USA has generally escaped from fiber cultivation and is of the high CBD type. However, there is considerable variation with many intermediate and some high THC stands occurring (see tables). In the U.S., as elsewhere, insufficient study has been done to determine the frequency distribution of the various types within a given country, locality or even a single stand. Most studies have been, incomplete in their sampling and have presented the data in a careless and inadequate fashion. Three detailed reports on wild American hemp have been published. The Illinois study already mentioned found that 101 naturalized stands in that state ranged from 0.15 to 7.1% CBD and from 0.04 to 2.27% THC. Assuming a normal curve, 68% of the stands had between 0.25 1.79% CBD and between 0.03 and 0.65% THC. A Kansas study often locations found CBD ranging from 0.12% to 1.7% and THC from 0.01% to 0.49%. There was one and a half to 25 times more CBD than THC in the samples. The CBD content was highest in mid-June and the THC content in early July. The male flowers tended to have a slightly higher cannabinoid content than the female flowers. The plants were about seven feet tall before flowering and about eight and a half feet tall at maturity. The third study, conducted on three different stands'in Indiana, found that the CBD content varied over the season from traces to 6.8% and THC content varied from traces to

Recent Observations On Environmental Effects

Although there is a vast older literature on the effects of various environmental manipulations on marijuana, it is of no use for present purposes since the observations usually didn't pertain to cannabinoid content. Even when they did, there were no good tests for quantitative measurement of the active compounds.

The studies on wild hemp in Illinois and Indiana attempted to correlate many factors of soil content with cannabinoid production, but nothing conclusive emerged. Both studies agreed

that environmental variables which stressed the plants resulted in increased cannabinoid content. By far the most carefully controlled study was done in 1975 on Afghani plants grown in a greenhouse. All the variables were kept constant except the soil: 11 distinct types native to Maryland were used. At six weeks, before the plants flowered, they were harvested and their cannabinoids measured. THC exceeded CBD for all soils except one which was somewhat higher than average in potassium and lower in calcium. Since this one exception had a low total cannabinoid content, the conclusion was that deficient soil retarded development and conversion of CBD to THC. In the study, the CBD content did not vary significantly but THC varied by a factor of seven, exceeding CBD from slightly more than one to about six times. The two soils which produced plants with twice as much THC content as the other nine soils, had low magnesium, low iron and a lightly acid pH, and these plants tended to be short, have a low dry weight, a low number of nodes, a small number of leaflets per leaf at the top node, and a fairly high CBD content. Although the plants were immature and quite small when harvested, the data obtained are quite consistent with those of other experiments and there seems no reason to doubt them.

This study provides an excellent illustration of a fundamental point which has escaped its authors as well as everyone else in the field. If we calculate the *total* THC content per plant we find that the two soil conditions which yielded plants with two to three times more total THC than any of the other were actually not those giving the most potent plants. In fact, the plants with the greatest total yield had less than half the THC concentration of the most potent plants. This difference might have been even more striking if the plants had been allowed to mature. Though the *total* THC yield varied by a factor of nine, it might have varied more if mature flowering tops had been obtained. The soil conditions and plant characteristics for maximum *total* yield were strikingly different from those for greatest potency. The two soils had a slightly acid pH, and high phosphate, potassium and calcium, and the plants were the tallest, with the highest number of leaflets per leaf at the top node, the greatest number of nodes, the greatest dry weights and low to moderate CBD levels. The explanation for this may be that stress (in this case soil deficiencies) inhibits the synthesis of proteins, carbohy-

drates, etc. to a greater degree than it inhibits cannabinoid production and thus will give smaller, but more potent plants. If other kinds of stress, absent from this study but present in nature, were applied, the variation would doubtless be even more extreme. These would include drought, low light, competition from other plants, and damage by the elements, insects and fungi. Even so, the minimal soil stresses in this study led to the most potent plants being less than half as tall as the plants with greatest total yield.

The consequences of these observations for the marijuana farmer are clear. You have two basic chokes: high potency and low yield or lower potency and higher yield. These choices exist whether you are growing in a closet or in a field. Tf you have seeds of consistent quality, a few years' experience should enable you to manipulate the potency and yield of your product. You might, for example, try to grow 4 kg of 1% THC weed rather than 1 kg of *2%* THC weed, since you could extract the THC in the former and produce 1 kg of 4% weed. Finally, don't think that there is a single set of conditions which will give the greatest total yield or the highest potency, since there are doubtless many variations in light, soil, water and temperature which will affect the results. Furthermore, these conditions will vary considerably with the type of seed. These considerations also apply to high CBD type plants, in case you are contemplating isomerization of CBD to THC (see chapter on iso-merization).

A dramatic demonstration of the difference between potency and yield was made in a study done in' England. Plants were grown for about ten weeks and divided into two groups. One group continued to receive normal lighting, while the other was placed in the dark for the next three weeks. At the end of this period, both groups contained approximately the same percentage of cannabinoids, but the plants in the light had doubled in weight and in total content of cannabinoids. This study also demonstrated that supplementing the normal greenhouse daylight with either normal or ultraviolet light failed to increase THC content. The control plants grown outside had the most THC of all-50% more THC than the plants grown indoors. Nevertheless, it should be remembered that increasing the light probably increased total yield.

Several studies which used controlled growth chambers, where conditions can be regulated very precisely, have given interesting results. In one of these, South African seeds yielded more potent plants, particularly in males, when grown at 32° C than at 22° C; but humidity also varied. Another such study used four different types of seeds—two from temperate climates (Illinois and Nepal), and two from tropical climates (Panama and Jamaica), with the Illinois being of the high CBD type and the others of the high THC type. All four types were essentially identical in their ability to increase photosynthesis as the light increased and none saturated even at 1 20,000 lux (a measure of light intensity). This probably means that no matter what type of seeds you use, you can give the plants as much light as possible for best growth. Half the plants were grown under warm conditions (32° C day and 23° C night) and half under cool conditions (23° C day and 16°C night). When tested at various temperatures, such as might arise during the growing season, plants grown in warm temperatures had higher photosynthetic rates than plants from the cool temperatures. The Illinois plants had the highest photosynthetic rate, with the Nepal intermediate, and Jamaica and Panama being lowest, approximately constant and nearly equal to each other at each test temperature from 20° to 30° C. The chlorophyll contents of the Nepal and Illinois plants were.between four and seven times higher than those of the two tropical groups—a probable factor in the tendency of marijuana from southern areas to be less green when dried. What this data seems to mean is that marijuana from temperate climates, where light is less intense and fall days and growing season shorter, is genetically adapted to produce more rapid growth than that from tropical areas. A corollary to this is that there is probably no way to significantly speed up growth of seeds from tropical areas, though exposing females to a few short days (e.g. eight hours of light) will induce early flowering.

The cannabinoid concentrations were always greater for all four types under cool conditions of growth, but total yield of cannabinoids was probably greater in the warm conditions. Nepalese and Jamaican plants had three to four times greater THC concentrations in the cool temperatures, while Illinois plants had six times more and Panamanian plants were about equal. The first three populations doubled their CBD in the

cool temperatures, but the Panamanian plants were again about equal. Unfortunately, all these plants were immature, and the results may have been considerably different if they had been allowed to flower. In cool temperatures, the vegetative leaves had the following THC contents: Illinois, 0,3%; Nepal, 1.3%; Jamaica, 1,3%; and Panama, 0.6%. Thus, American marijuana growers might get much more potent plants from Jamaican seeds than from Panamanian or Colombian seeds, but again, the total yield from the less potent plants might well be significantly greater. These data show once again that there is no precise correlation between plant size or speed of growth and potency. Conditions which give the best growth and the greatest total yield of plant material, and hence of cannabinoids, will usually be different from those giving the most potent marijuana. Another growth chamber study of the pollen of South African plants found that THC content was maximal when the temperature was maintained at 24°C all the time. With 16 hours at 22° C and eight hours at 12" C (a common situation in temperate areas), the THC content was one-fifth; at 27° C for 24 hours, the yield was one-tenth; and at 32° C for 16 hours, then 12° C for eight hours (areas where it is very warm during the day but cool at night), the yield was l/20th of that of the 24° C/ 24-hour regimen, in practical terms, this seems to indicate that the strongest marijuana should result from growing at a constant but moderate temperature, and that indoor cultivation should be done in a thermostated room. This can be achieved by leaving the light on for 24 hours a day, which will also produce the maximum growth rate. Furthermore, since research indicates that low night temperatures tend to produce inter sexuality (male flowers on female plants), once flowering has been induced by a few short days (e.g., ten hours of light per day for five days), the plants can be returned to constant, 24-hours-a-day light in order to avoid production of male flowers on female plants with the resulting self-fertilization and ruining of sinsemilla. On the other hand, low night temperatures might be used to produce intersexuality and self-fertilization in those cases where it might be desirable to obtain mostly female seeds, To sum up, constant light can be used to maintain moderate to high temperatures, which may achieve maximum THC content, as well as maximum growth rate and avoidance of intersexuality.

Again, maximum total yield of THC will probably not be obtained under the conditions which give the strongest product.

The studies described here demonstrate that stress of almost any kind will tend to produce smaller but more potent plants. Some preliminary data show that plants grown in sand or in shady areas also have somewhat higher THC contents, so these evidently are stress conditions also. While slight nutrient de- - ficiencies may increase potency, recent data show that plants grown under extreme deficiency of nitrogen, potassium and phosphorus, though dwarfed, were comparable to controls in potency. This indicates that there is a point at which stress inhibits cannabinoid production as much as general plant growth, resulting in both low yield and no potency increase.[4]

Hybrids

Hemp breeders have long known that *Cannabis* strains can easily be crossed with each other. What they don't know is the relative fertility of the second generations. Researchers recently crossed 38 strains representing each of the five cannabinoid types and found that all of the hybrids had the normal diploid number of chromosomes (2n = 20), normal meiosis (division of the chromosomes during sexual reproduction), completely strainable pollen (a criterion for fertility), and no chromosomal aberrations. The hybrids were also exceptionally vigorous (a frequent observation when crossing strains of plants) and so there are apparently no breeding barriers between different populations. However, the definitive test of the fertility of the hybrids will be their ability to produce fertile seeds, and all populations have not been tested for interfertility.

The ratios of THC to CBD in the hybrids of the 38 strains were usually about intermediate between those of the parents, but occasionally one of the parents would dominate, with the domination being sometimes for high and sometimes for low THC levels. Three generations of Mexican marijuana grown in Mississippi remained high in THC and low in CBD, but probably most of the crossing was with other Mexican plants. In contrast, third generation Turkish plants had about four times as much THC and roughly half as much CBD as the first generation, in-

dicating that crossing with high THC strains was occurring. Clandestine growers in the midwestern U.S. have found that crossing the wild, low THC type marijuana native to the area with Mexican strains produces spindly, weak plants that seldom mature properly. However, crossing the native plants with red or gold Colombian produced marijuana with about one half the THC content of the Colombian, which matured and gave fertile seeds. I have not yet heard about the results of backcrosses of these hybrids with Colombian, They will probably give even higher THC content, though they will probably require a long growing season to mature and will have to be grown indoors if seeds are desired.

It is probable that whatever factors selected for high CBD, low THC type plants in northern latitudes will eventually defeat any attempt tu breed a high THC type that matures there, and high THC type seeds will have to continually be imported. Likewise, the attempt of certain governments to breed a variety free from cannabinoids is probably futile. Even if a cannabmoid-free variety should be developed, it would probably be at a severe disadvantage relative to the high cannabinoid types and could never replace them in the wild.

In general, the hybrids can be expected to show the phenomenon of hybrid vigor. This is a common occurrence in plants and merely refers to the fact that when two strains of a species are crossed, the offspring often arc more vigorous (i.e., they grow faster, are larger and healthier looking) than either parent. The implications of this for cannabinoid yield are presently unclear.[5]

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Variations in Content of Noncannabinoids

Essential Oils

Inevitably, all chemical constituents of marijuana will vary with such factors as genetics, age, sex, and growth conditions. But little research has been done on compounds other than the cannabinoids. The relatively volatile, low molecular weight substances which give plants their characteristic odors can be steam distilled to yield a generally fragrant, oily mixture termed an essential (from essence) oil. About 10% of the contents of the glandular hairs which produce most of the cannabinoids is comprised of the terpene hydrocarbons which make up most of the essential oil. The presence of a high concentration of these compounds in the hairs is yet another bit of evidence to support the notion that they are the biogenetic precursors of the cannabinoids. However, they are likely to be found in significant amounts throughout the cells of the leaves. It should be kept in mind that just as only very small amounts of cannabinoids appear in the essential oil, so will the terpenoids vary in their volatility; that is, the percent of a given compound in the essential oil is not necessarily a precise indicator of its percent of the terpenoids in the intact leaf.

The total yield of essential oil varies between 0.05 and 0.11%, with females and mature plants giving higher yields, at least in some strains. As they are the biogenetic precursors of cannabinoids, the terpenoid contents might be expected to parallel that of the cannabinoid*s. Males and females seem to have all the same terpenoids (a dozen or so can be easily detected), but the percentage of any given one relative to the others seems to vary at random, with males having more of some and females having more of others. Furthermore, the ratios of the different compounds vary in the different plant

parts, with myrcene (for example) being 3.2% of the oil from female flowers, but only 0.8% of that from female leaves, whereas the figures were 6.0 and 1.1% for males (in one study). Corresponding figures for another constituent were 0.6 and 1.6% for females and 1.3 and 0.5% for males. What all this boils down to is that there seems to be no precise correlation between any given terpenoid in the oil and the cannabinoids, and there is probably little hope for establishing any solid correlations of terpenoids with sex, age or seed strain. Nevertheless, we all know that even taking account of variations in curing, the aroma and taste of marijuana varies greatly. Furthermore, the very striking minty odor emitted by some varieties while growing has often been noted. The cannabinoids do not produce the characteristic smell of marijuana when burned, so the essential oils are probably responsible. Besides the caryophyllenes, beta-farnesene, alpha-selinene, beta-phellandrene, limonene and piper-idine contribute to the smell of fresh marijuana. Finally, we note once again that there is no evidence that terpenoids have any role in psychic effects of marijuana.[1]

Saturated Hydrocarbons

Short chain saturated hydrocarbons such as propane (three carbon atoms) and butane (four carbon atoms) are familiar to everyone, but every organism contains small amounts of hydrocarbons with longer chains (more carbon atoms). *Cannabis* is one of many plants with easily detectable amounts of saturated hydrocarbons which have between 25 and 30 carbon atoms per chain. Limited study of these compounds indicates that they show no consistent variation with growth conditions or cannabinoid content. For example, in comparing two high THC types (Thai and South African) with a high CBD type (Turkish), it was found that either or both of the high THC types could be higher, lower, or about equal to the Turkish strain with respect to any one often different hydrocarbons, in an apparently random fashion. Likewise, when Brazilian seeds were grown in both Germany and Brazil, it was found that some compounds increased and some decreased in Germany. A survey of a wide variety of samples from around the world showed that some

hydrocarbons varied greatly and others varied little. For example, normal pentacosane {25 carbons) ranged from traces in Brazilian samples to 4.3% of the total hydrocarbons in Greek marijuana, while normal nonacosane {29 carbons) varied by only about 30% between any two samples. Much further research will be required to determine whether there is any special significance to these variations.[2]

Alkaloids

Most of the plant chemicals found in nature which have any striking physiological effects at low dose levels are alkaloids; that is, they are nitrogen-containing compounds with basic {as opposed to acidic) properties. Consequently, it was surprising to find that the active constituent of marijuana was not an alkaloid. Nevertheless, all organisms contain numerous alkaloids in small quantities and a few of these have been isolated in marijuana. The relatively complex alkaloid, cannabisativine, constitutes about 0.001% of the leaves and 0.0005% of the roots of Thai plants, but seems to be absent or present only in traces in high CBD type plants; while the simple alkaloid, hordenine, seems to have an opposite pattern of distribution. Unlike the other constituents discussed here, the alkaloids seem to be correlated with the cannabinoids, at least in the high THC strains. For a high CBD strain, the conditions giving highest CBD concentrations were different from those giving highest alkaloids, but these data are very preliminary. It is extremely unlikely that alkaloids are of any significance as far as marijuana psychoactivi-ty is concerned.[3]

Variations in the Opiate Content of Poppies

In order to help place in proper perspective the mass of data on variations in chemical constituents of marijuana, it may be helpful to very briefly consider some data that have been obtained on opium poppies. There are many strains of poppies which vary greatly in their total yield of opium alkaloids, as well as in their content of any particular alkaloid. In one variety studied in the

92 U.S.S.R., the content of morphine and codeine each varied by *a.* factor of two, and growing conditions which increased morphine decreased codeine. Morphine content decreased as one moved from southern to northern latitudes, while codeine and percentage of total alkaloids increased, but total yield of alkaloids was greatest in the southern latitudes. Evidently, as with cannabin-oids, the opium alkaloids increase relatively (i.e., in percent by weight) in response to stress, but total yield is highest when stress is minimal. Likewise, it was discovered that whereas green capsules had the highest morphine concentration five to seven days after flowering, mature, dry capsules collected 33 to 35 days after flowering had the highest total morphine content. A crop yielded 25% more morphine if harvested when mature than at the earlier stage. It was also found that there was 20% greater total yield if the plants were spaced 6 cm apart rather than 12 or 18 cm. Finally, as with *Connabis,* it has been found that the seeds do not contain the active constituents.[4]

Harvesting and Preparing Marijuana and Hashish

Scientific Foundations

To obtain maximum potency, the timing of the harvest is critical. Sometime after the seed has become fully mature, the plant will begin to senesce and die. THC production begins to decrease and THC begins to degrade into CBN (this happens in the living plant as well as after harvest). Unfortunately, a reliable, scientifically-proven method of determining exactly when to harvest in order to maximize THC and minimize CBD has yet to be developed.

One approach is to harvest the plants continually by pinching off or pruning the flowering tops. Another is to cut them back severely to within a foot or so of the ground, leaving some leafy branches, which are removed several weeks later when the new branches have sprouted. Outdoor growers who have to deal with climatic fluctuations tend to harvest their whole crop as soon as it's mature, but in areas where the climate remains mild, large outdoor crops can also be harvested continually for as long as six months.

Farmers m Asia sometimes bend the stem of the plant near the base or cut it and insert a small stone or a piece of opium a few days before harvest. They believe that this will increase its potency, but there are no reliable data on this point, and there is no apparent mechanism by which potency increase could occur. After harvesting, it is common practice to hang the cut plants upside down for curing. These and other methods may rest on the mistaken belief that cannabinoids are synthesized in the roots and translocated to the top of the plant. This is not true. Actually, the specialized cells which synthesize cannabinoids happen to be more numerous and perhaps more active in the flowering tops than elsewhere.

Most descriptions of the preparation of *Cannabis* products are second-hand repeats of nineteenth century accounts—none too accurate to begin with. The accounts generally derive from India and adjacent areas and use the native terms for the products. Since the procedures they describe are the world's oldest for the preparation of *Cannabis* products, it is appropriate to recount a few of them here. Most are from the *Indian Hemp Drugs Commission Report* (1893-1894).

Harvesting **and Hashmaking in** India

The terms *charas, ganja* and *bhang* are roughly equivalent to hashish, flowering tops and leaves, respectively. As will be seen, the preparation methods vary considerably.

> The manufacture of round ganja is not completed till the fourth day after the plants are cut. The plants are gathered somewhat later in the day and laid out under the open sky for the night. The sorting is done the next morning, a great deal more of the woody portion being rejected than in the case of flat ganja. The twigs are laid out in the sun till noon, when the men return to the "chator" and rolling is begun. A horizontal bar is lashed on to uprights about four feet from the ground, and mats are placed on the ground on each side of it. Bundles of twigs, either tied together by the stem ends or not, according to the skill of the treader, are set out on the mats. The men range themselves on each side of the bar, and, holding on to it for support, proceed to roll the bundles with their feet. One foot is used to hold the bundle and the other to roll it, working down from the stems to the flower heads. This process goes on for about ten minutes, and during it the bundles are taken up and shaken from time to time to get rid of leaf. The bundles are then broken up and the twigs exposed to the sun. A second but shorter course of rolling by foot follows, and then the twigs are hand pressed, four

or five together. After this the twigs are opened up and exposed to the sun again. Towards evening the twigs are made into bundles of about one hundred, and placed on mats and covered up for the night.

The next morning the bundles are untied and the twigs again exposed to the sun. if they are sufficiently dry by midday, they only require a little handling and rolling to complete the manufacture. If they are not dry enough, the first course of rolling has to be repeated, after which the useless leaves fall off with a very little manipulation. The twigs are next sorted according to length and tied into bundles of three descriptions—short, medium and long. In this process all useless twigs and sticks are eliminated. The bundles are placed in rows under a mat which is kept down by a bamboo, and left for the night. The manufacture *is* completed the next day by exposing the bundles to the sun, heads upwards till the afternoon, and then searching them with hands and bits of stick for any leaves that may have remained in them. These are shaken out, and with them pieces of the compressed flower heads, which have been accidentally broken off, fall on to the mats.

It has been seen that a great quantity of stick, leaf and seed, and not a little flower head, have been separated from the bundles of prepared ganja. The stick may be used as fuel. The leaf is winnowed from the seed and thrown away, though it has been proved by analysis to contain the narcotic principle in larger quantity than ordinary bhang. The seeds are kept for the next year's culture, and the superfluity may find its way into the market. The seeds are not narcotic and they are sometimes eaten, besides being used for the expression of oil and other purposes. The bits of flower head are, in the case of flat ganja, picked up and pressed into the mass of the flower heads again or burnt . . . In the case of round ganja, they form the "chur" or "frag-

merits" on which the excise tariff imposes the highest duty, because in that state the drug is absolutely free of leaf and stick.

Bhang as recognized by the excise department is the dried leaf" of the wild plant. . . The preparation consists simply in drying the leaves. The plants are cut in April . . . but goes on up to June and July. They are laid out in the sun and one day may be sufficient to dry them so as to allow the leaves to be shaken off or beaten off. . . The early flowering stage would seem to be that in which the plant yields the best bhang.

The method of preparing Khandwa ganja . . . The harvest begins in the first or second week of November. The flower heads, which the cultivators call *mat,* or produce, are broken off with about twelve inches of twig, carried in baskets to the threshing floor, and spread out on it in a layer nine to twelve inches thick . . . The crop is exposed to the dew for the night. The next day the twigs are formed into heaps, and each heap is trodden in turn and when not being trodden is turned over and exposed to the sun to dry. This goes on for four or five days and results in the twigs being pressed flat and deprived of a great portion of their leaves and thoroughly dried. The produce is then removed to the cultivator's house, where it is built into a stack five or six feet high, and has heavy weights placed upon it,

In the Javadi hills, the plants are cut and carried bodily to the village threshing floor. There they are sorted, the flower spikes and upper leaves being retained and the sticks thrown away. The selected heads arc spread out for three to five hours in the heat of the day to dry and are then loosely rolled in the hand to work out such seed as may have been formed and to break up the leaf that remains. This working also causes the spikes to stick

to one another to some extent. The broken leaf is then winnowed out, collected and powdered. The flower heads are then placed in a thin layer in a basket which has been dusted within with leaf powder and are trodden by one or two men according to the size of the basket. After the operator has passed over the layer four or five times, it is dusted with leaf powder, and a fresh layer of spikes is put into the basket on top of the other, and the treading is repeated. This process goes on till the basket is full. The contents are then turned out onto flat hard ground and a stone is placed on the pile with other stones to add to the weight. The material is left thus for the night. Next morning, each layer is taken off separately, broken up and spread in the sun. Each piece is trodden and turned over from time to time. In the evening the pieces are again repiled and weighted for the night, and the next day the process of exposure is repeated until the material is thoroughly dry. Great importance is attached to the thoroughness of the treading, the sufficiency of the pressing, and the completeness of the drying; the quality of the drug being said to depend on the manner in which those processes are carried out. if the latter are not dried sufficiently, they appear green and are of inferior quality, good ganja being brown.

. . , the dried leaves which have fallen out in the process are used as bhang or patti. After carefully removing the stalks, the dried leaves are boiled in water for some time; and the boiled leaves are carefully squeezed with the hands to purge them of all filth and dirt and then dried in the sun. The dried leaves are next boiled either in milk or cocoanut water. The quantity of milk or cocoanut water must be proportionate to the quantity of leaves boiled, so that the milk or cocoanut water might be entirely absorbed by the leaves. They are again

kept in the hot sun for about three or four days. After they are well dried, they are preserved in earthen vessels for use.

Charas—This is locally a by-product which is not brought into account, but appears to be the harvester's perquisite, who probably part with it to friends who smoke, if they don't want it themselves. It is the resinous substance that sticks to the hands or collects on the sickle when cutting or plucking the tops. The hands are now and then rubbed t6-gether and the charas is collected in the shape of a pill, which is naturally half dirt and sweat and half charas. A piece about the size of a marble may per-haps be the reward of a day's work,

... from the Upper Sind Frontier ,.. charas is collected by people walking to and fro through the bhang plants with greased leather coats on and also by going clothed only in a loincloth with their bodies smeared with oil. The latter process is fol-lowed ... in the Native States of India. One of the witnesses also mentions a process resembling that noticed in the Punjab, by which the dust made by beating the plant is collected on cloth. He states that this process is peculiar to Afghanistan: and the charas from there is well known for its pale green colour, and is highly appreciated.

It will be seen from the above detailed descrip-tion that bhang, whether produced by the cultivated or wild plant, is prepared by simple drying. The processes by which ganja is prepared consist of pressing, drying, and removal of the leaf. The manu-facture is most perfect in Bengal. In other provinces it is not characterized by the same degree of care and one or another of the three essential features of the manufacture is more or less neglected, Ganja collected from the wild plant and from the bhang crops of Sind, and probably also that yielded by stray cultivation, is simply dried. There are only

two methods of preparing charas which appear to be used when the drug is produced on any considerable scale, *viz.* that by rubbing the flower heads with the hands as in Kumaon and Nepal, and that described as being practiced in Yark and, which may be called the *garda* method, and consists of heating the plant over cloth, and manipulating the dust that is thus deposited. The collection of the resin adhering to hands and implements in the course of harvesting ganja is worth remembering, for it is proved in Gwalior and Bombay. The practice of the Malwa Bhilsis perhaps established. Other methods are unimportant, and the common report that charas is collected by men dressed in leather moving about in the hemp crops has not been definitely located. It is doubtful if this device is employed anywhere in India.

In the "Punjab Products" the manufacture of this sort of charas called *garda* is described. The finest quality is when the dust is of a reddish colour, This is called *surkha.* When it is green it Js called *bhangra.* The most inferior is that which adheres to the cloth after shaking, and has to be scraped off or shaken off with more violence. This is called *khaki.* In each case the dust has to be kneaded with a small quantity of water into a cake, and then forms charas. It is stated that this drug is much in use. The specimens which formed the basis of the article were none of them from the plain districts of the Punjab, except possibly one from Dera Ghazi Khan. They came from Lahoul, Spiti, Bokhara, Yarkand, Dera Ghazi Khan, and Kashmir.

Samples of Baluchistan charas made in the Sarawan division of the Kalat State have been sent to the Indian museum by Mr. Hughes-Bullcr. The following is the mode of preparation. The female "bhang" plants are reaped when they are waist high and charged with seed. The leaves and seeds are

> separated and half dried. They are then spread on a carpet made of goat's hair, another carpet is spread over them and slightly rubbed. The dust containing the narcotic principle falls off, and the leaves, etc. are removed to another carpet and again rubbed. The first dust is the best quality, and is known as *nup;* the dust from the second shaking is called *tahgalim,* and is of inferior quality. A third shaking gives *gania* of still lower quality. Each kind of dust is made into'small balls called *gabza* and kept in cloth bags. The first quality is recognized by the ease with which it melts. *Nup* is sometimes spelled *rup And gania* often given *a.sgauja.*

A modern visitor to Kashmir noticed two kinds of hashish currently being made: the relatively *weakgurda* made from flowering tops, and*uter* made from the resin and commonly adulterated with clarified butter *(ghee).* Farmers may allow you to rub resin from their plants for 25 cents an ounce. Some persons believe that the sun brings out the resin, but it is more likely that it merely makes it sticky and easier to collect. Place both hands together flat and rub up the top of the plant gently so as not to kill it, spending a few minutes on each plant. After a while, rubbing the hands together will rub off small pieces of hashish. These will be difficult to smoke at first but will become harder as they dry. Modern *gurda* preparation involves shaking, crushing or beating the dried tops over a fine cloth through which the hairs pass. The collected resin is placed in a corn husk, put in the fire for a few seconds and then twisted into a sticky bar about eight inches long and one inch wide.[1]

Still another description of hashish in India is given by Bouquet. He maintains that *bhang* can be made of any combination of leaves and male and/or female flowers, often ground to a coarse powder, which may keep three to four years if protected from sun and moisture. The mixture is incorporated in many preparations such as *buengh* or *poust* (with water) and *lutki* (with alcohol). *Lutki* with opium or *Datura* added is called *mudra.* Bouquet describes three kinds of ganja preparation.

Flat Ganja—the cut stalks are tied together in bundles, the large leaves are eliminated, and only the inflorescences, which are stuck together by the exuded resin, are kept. The bundles of inflorescences are placed on the ground and tramped underfoot to flatten them. The bundles are then untied, and the product sorted and packed under the name of large flat or ewig-flat, according to the length and breadth of the stems.

Round Ganja—instead of being trampled underfoot, the tops are rolled in the hands until they have become rounded and tapered in shape. This kind of ganja is always packed in bundles (generally of twenty-four pieces),

Chur-ganja or Rora—the tops, detached intentionally from the plants, or accidentally from the flat or round ganja, constitute what is known as rora. This is generally delivered to the consumer in the form of a coarse powder.[1]

Hashmaking in Lebanon

In 1932, Lys described the preparation of hashish in Lebanon, specifically in the areas of Zahle, Ras-Balbeck and Horns. Sometime between August and November, depending mainly on when the seeds were originally sown, the females are harvested and left for a week in the open air. The plants are then placed in the shade for further drying. When dry, the tops are shaken and gently beaten over a cloth. The resultant powder is sieved to eliminate the larger pieces of stem and the seeds. The highest quality is that obtained from the first shaking (hashish zahra or *zahretel kolch),* which is brown. The remaining powder is placed in small cloth bags and steamed. The resin melts partially and is pressed into the desired shape, usually foot-shaped pieces called soles or *turbahs.* Second quality *(zahret el assa)* is light brown, and the more crumbly third and fourth qualities are greenish yellow or green.[3]

Hashmaking in China

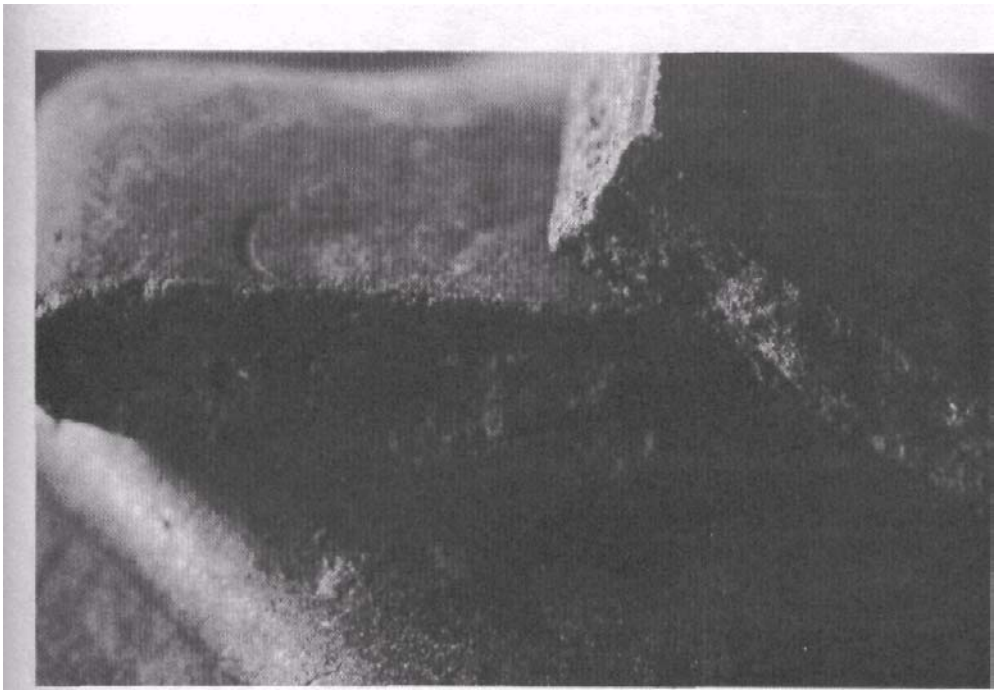
I.C. Chopra and R.N. Chopra, the Indian marijuana experts, have said that the highest yield and best quality charas (hashish) comes from the western area of Sinkiang province near the town of Yarkand. It may still be produced there, since a recent visitor to China reported legally purchasing hash and hashpipes and seeing old people getting stoned in the parks.

There, the plant grows at altitudes up to 5000 feet and reaches ten feet in height. At maturation {September and October), the female flower tops are collected and dried, then crushed between the hands into a powder which is passed through seives until it has the consistency of fine sawdust. This greenish powder is stored in rawhide bags during the four or five months of the winter. At the onset of hot weather, the powder is exposed to the sun long enough for the resin to melt. The resin is stored for a few days in 10- to 14-pound leather bags and then kneaded with wooden rods until each bag yields one to two pounds of the oil, which appears on the surface of the kneaded resinous mass. The charas is then transferred to hide bags for sale. As in other areas, cloth bags may be substituted for rawhide ones and steam may be used to melt the resin,[4]

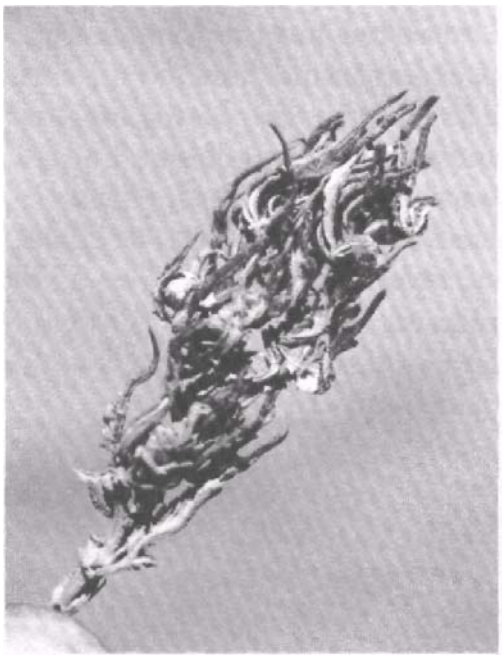
Hashmaking in **Greece**

A report by Bratteaux in 1934 describes a different process used by the Greeks. According to him the males were weeded out as soon as they were recognizable. When the females were fully mature and the basal leaves began to yellow, they were harvested and dried. The flowering tops were crushed between two pieces of linen which yielded a resinous powder, then placed in white linen bags and squeezed in a press. The press produced flattened cakes with the mark of the fabric on them. The preparation of hashish in Greece was described by Rosenthaler in 1911. At that time plants were grown only in the Tripolis area, since neighboring areas had failed to yield potent material. About three to four million kgs were obtained each year. Rosenthaler says nothing about separating males and that the product, in contrast to that from

India, was full of seeds. Seeds were sown in February and March and harvested at the end of August. The plants were cut, bundled and placed in the open to dry for two to three months. Then the seeds and stems were separated and the stems were burnt and used as fertilizer. In December and January the entire harvest was turned into hashish in factories employing 80 to 100 workers each. They collected the dried bundles and beat them with sticks to yield a powder, then sifted through a series of sieves in a tiresome and expensive process. Only 10% of the original material became hashish. Most of that was exported by devious routes to Egypt,[5]



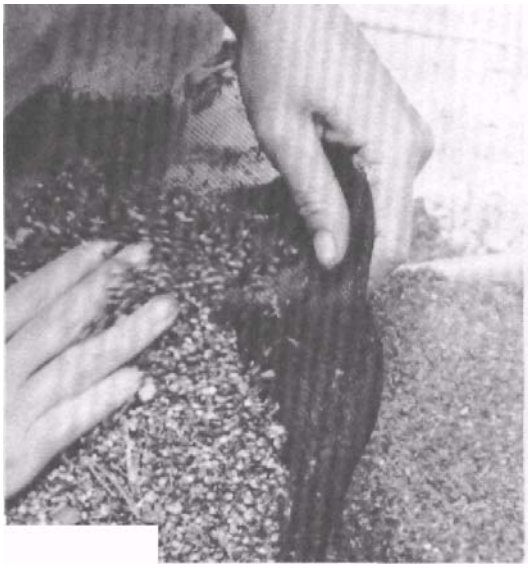
Hashmaking in Mexico



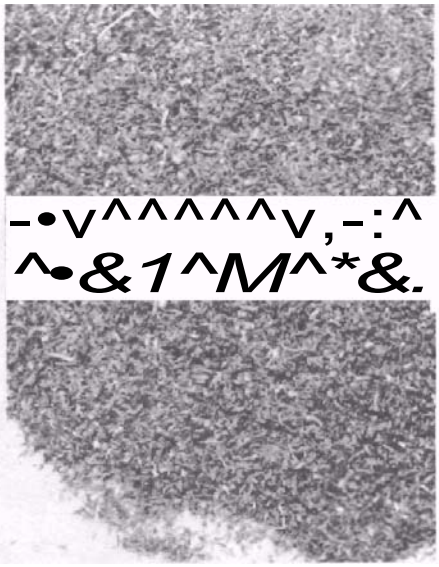
Oaxacan *peto rojo*

Young plant

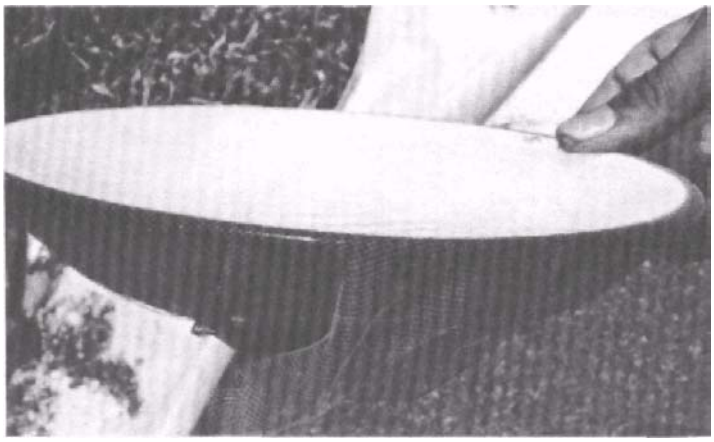
Sticks removed by hand



Screening seeds

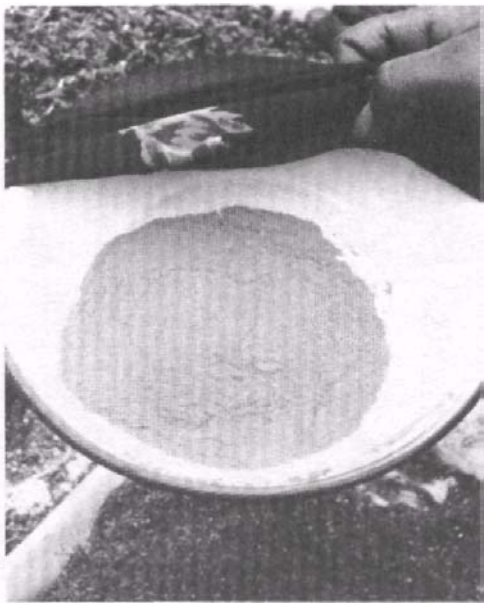


Cleaned weed



Silk-covered bowl

Silk-screening



The results of silk-screening

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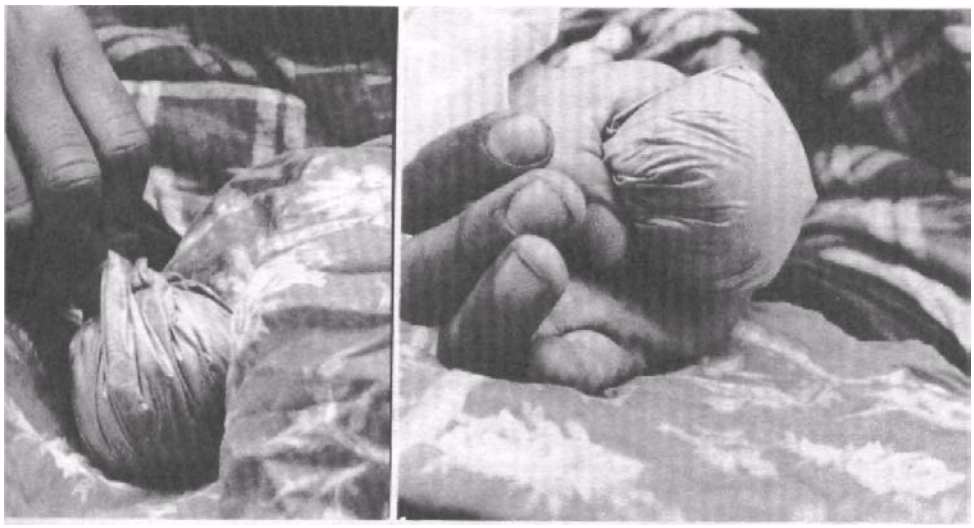
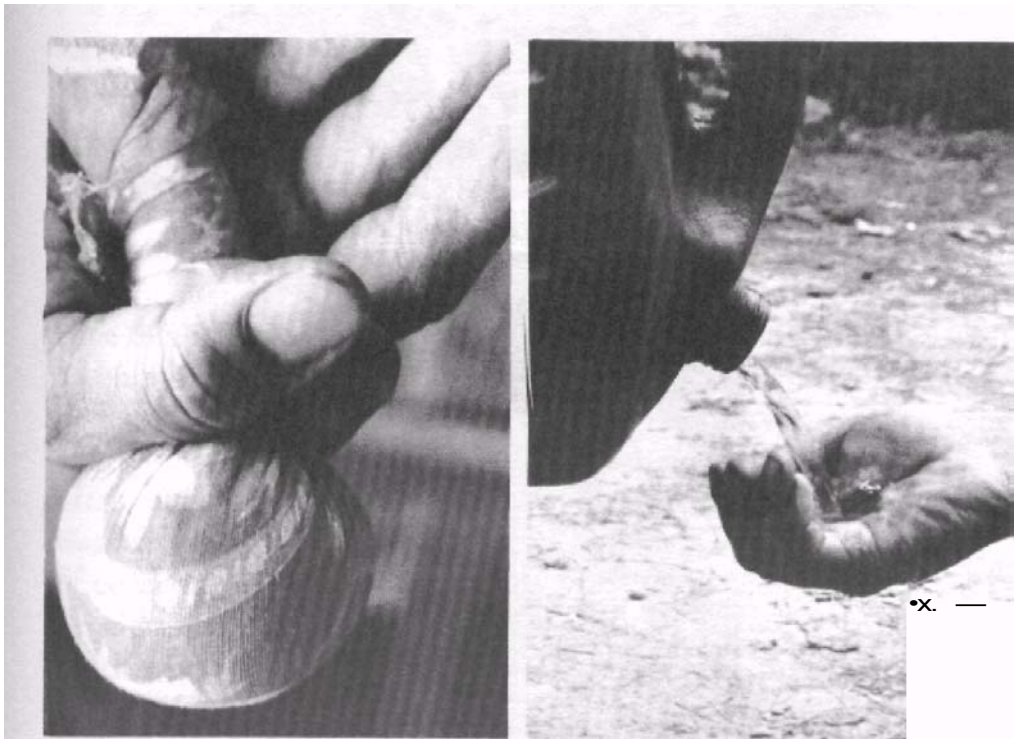
The powder is poured into a plastic bag for sun drying.

Hashmaking in Mexico



A few grams of the powder are poured into another bag. This is then rolled into a tight ball.

A cloth handkerchief is tightly wrapped around the plastic ball.



The ball is hand twisted and then compressed. The

mariguano's hands are moistened with water.

The water is squeezed into the handkerchief-covered ball.

The hash ball is heated over hot coals, slowly.

The final product

Potent Preparations for Smoking, Drinking and Eating

For thousands of years *Cannabis* has been made into a variety of beverages, foodstuffs and, since the sixteenth century, smoking preparations. It has been commonplace, especially in smoking mixtures, to add other potent psychoactive drugs. The possible additive or synergistic (producing a different or greater effect together than alone) effects of these combinations have not been studied. Opium and the leaves of various Solanaceae (tobacco, henbane, Datura), the latter containing scopolamine type compounds (jimsonwecd), have been frequent additives. The *anassa* or *nassa* formerly used in Russia was probably of this type. The *hashish kafur* used in the East contained opium and a sweet-smelling substance mixed with powdered hashish and rolled into thin sticks five to ten cm long for smoking.

The drinking preparations are of two main types. For *assis,* one grinds the leaves or tops in a mortar with water and consumes the whole thing. For the *esrar* type, one macerates the leaves with alcohol mixed with syrups or jams diluted with water of roses, jasmine or orange blossom. *Bers* (or *berch), chastig* and *cbats-raki* (anise scented) are of the *esrar* type. A preparation of this sort was very popular among underworld people in the Krasnodar area of Russia in the 1930's.

Not surprisingly, most of the eating preparations contained large quantities of honey or sugar. *Manzul* contains about 10% hashish mixed with sesame oil (and often cocoa butter), powdered chocolate, spices and seasonings. A wide variety of crushed or chopped nuts or seeds may be added, and the thick paste is often cut up into flat discs one cm thick and three cm across. Hashish is sometimes added to the *helwa (haloua, heloua)* type of confection so popular in the Middle East. These sweets are characterized as aphrodisiacs in Arab medicine—with opium, cantharides (Spanish fly) and seeds of *Strychnos nux-vomica* containing strychnine frequently added. *Mc^'agun* is very similar except that honey and then gum arabic powder are added to form a paste which is made into pellets for swallowing. Synonyms are *magoon* (India), *majun* (Turkey), and *madjun* (North Africa).

For *dawamesk* (or *dawamesc)* the hashish powder or flowering tops are simmered in butter or oil of almonds or sesame and strained. The oily extract containing most of the cannabinoids is flavored with cinnamon and cloves, musk, etc., and aphrodisiacs are often added. *Mapushari is* the term used if rose extract and powder are added. *Mosmok, mosjuk, teriyaki, banghia, malak, assyuni,* and *teridka* are names for related preparations. The following is the recipe for a confection of this type from Morocco.

Almonds and walnuts	1 kg
Cubeb, Nutmegs, Malaguetta pepper	250 g
Datura seeds, Belladonna Berries	50 g
Cannabis Tips, Honey	1 kg
Butter	500 g

Garawish varies in that the ingredients are added to a well-cooked syrup, thickened with further heating and poured on an oiled surface to cool. In Algeria, barley sugar was used in its preparation.

Powdered hashish or flowering tops are sometimes added to *rahat lokum* (Turkish Delight) along with starch, sugar, water, nuts and essences of rose and orange. The hard, rectangular pieces are rolled in starch and sugar in the East, but the familiar candy of this name is sold in the West without the coating.

The stuffing in dates sometimes contains hashish, *Kiste,, kibarfi, mtsari,* and *kulfl* are prepared in India and occasionally elsewhere; and *briji, capsh, ikinji* and *zahra* are found in Syria and Palestine.

6

Extraction of THC and Preparation of Hash Oil

Sample Preparation

The extraction of the cannabinoids can be performed by itself, or combined in a single operation with isomerization and preparation of hash oil. It is best to remove seeds and give them to a friendly farmer; large stems should also be taken out, but neither of these is really necessary. The material can be powdered in a blender for somewhat faster extraction. Hashish should be heated and crumbled up first. Marijuana should first be dried, especially if you are ^working with fresh-picked plants. THC and CBD will commonly be present in their acid form, which may not be highly soluble in some solvents. For best results, convert them to their nonacid forms by heating the marijuana or hashish for ten minutes at 120° F or five minutes at 200° F in an oven. Research has shown that it is not passible to extract more than 50% of the cannabinoids from fresh, undried material. Three days at room temperature (circa 25" C) causes about a 70% weight loss (about 8% of the remaining weight is water), and no further loss occurs unless the marijuana is heated.

Solvents

A wide variety of organic solvents will work, but availability, cost, toxicity and flammability will limit the choices. Research has shown that chloroform is the best solvent; it extracts about 98% of the cannabinoids with one half hour of shaking. Light petroleum ether extracts about 90%. But ethanol (grain alcohol) is most often used. It is easier to obtain and extracts a high percentage as well. Ninety-five percent ethanol is hard to obtain,

but denatured 95% ethanol works just fine. Isopropyl alcohol {rubbing alcohol is 70% isopropanol) and methanol work, but the latter, especially industrial methanol, has rather toxic and explosive fumes. The alcohols extract undesirable water soluble substances such as chlorophylls and sugars, which you may wish to remove later by washing with water if you are making hash oil. (You can also do a water extraction prior to solvent extraction—David Hoye's "Double Wash Oil.") Common organic solvents such as benzene, chloroform and petroleum et icr will not extract the water soluble constituents of marijuana or hashish, and will yield a somewhat more potent oil as a result. However, their vapors are more flammable and they are harder to obtain. Methylene chloride (dichloromethane) works well. Unleaded gas, preferably without additives {white gas), paint thinner, or turpentine may work also, but undesirable odors or residues might remain. IT CANNOT BE TOO STRONGLY EMPHASIZED THAT ALL THESE SOLVENTS ARE FLAMMABLE AND DEVICES WHICH EMIT SPARKS OR FLAMES SUCH AS MOTORS OR PILOT LIGHTS ON APPLIANCES SHOULD NOT BE PRESENT. SMOKING IS HAZARDOUS. NONSPARKING MOTORS CAN BE OBTAINED. GOOD VENTILATION IS MANDATORY.

TABLE 10

Common Cannabinoid Solvents

Name	Solvent Quality	Flammablllty	Toxicity	Availability
Chloroform	**High**	**High**	**High**	**Low**
Petroleum Ether	**High**	**High**	**High**	**Medium**
Benzene	**High**	**High**	**High**	**Low**
Ethanol	**Medium**	**Medium**	High	High
Methanol	**Medium**	**Medium**	**High**	High
Isopropanol	**Medium**	Medium	High	High
Methylene Chloride {Dichloromethane)	**High**	**None**	**Medium**	**Medium**

Apparatus and Procedure

Those with lab apparatus can do the extraction and concentration in a standard reftuxing setup (e.g., heating mantle for five liter flask with water cooled reflux head). The rest of us can manage with homemade devices such as those pictured. The water in the tub or bottom half of the double boiler heats up the solvent containing the marijuana. The warm solvent gradually extracts the cannabinoids, and some of it evaporates in the process. The solvent vapors condense on the ice-cooled lid and drop back down into the solvent containing the marijuana. This process of evaporating and recondensing solvent is called refluxing. Vapors do not escape into the air because of the seal formed by the plastic and rubber bands. If the ice melts (or in the one variety pictured, the cold water is not running fast enough), the pressure builds up and fumes escape around the edges of the plastic seal. The time of refluxing varies with the efficiency of the solvent. Chloroform or dichloromethane will probably not require more than ten minutes, while ethanol or isopropanol may need several hours for complete extraction. This may be tested roughly by removing, *carefully* drying, and smoking some of the grass. When extraction is complete, the device is cooled, the marijuana removed from the solvent and placed in the strainer, and the resealed apparatus again turned on. A few minutes of refluxing should suffice to wash most of the remaining cannabinoids from the marijuana. This second step will frequently be unnecessary since only a small amount of cannabinoids will be saved this way—though more will be saved if fresh solvent is used for this step.

After discarding the marijuana from the strainer or filtering it out of the solvent, the next step is to concentrate the solvent containing the cannabinoids. This is achieved by placing a pan or beaker above the strainer, resealing the apparatus and refluxing. The solvent now collects in the pan or beaker, resulting in the concentration of the cannabinoids in the inner pail or the top of the double boiler. When most of the solvent has collected in the pan or beaker, the apparatus can be cooled, opened and the pan or beaker removed, saving the essentially pure solvent for reuse. A portion of marijuana may be placed in the remain-

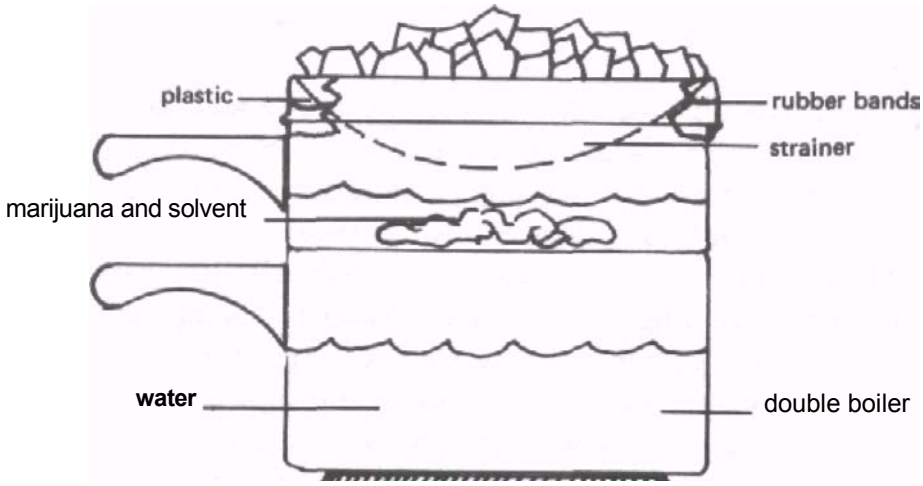


Fig. 15. Design **for extraction and** isomerizaiion **apparatus**

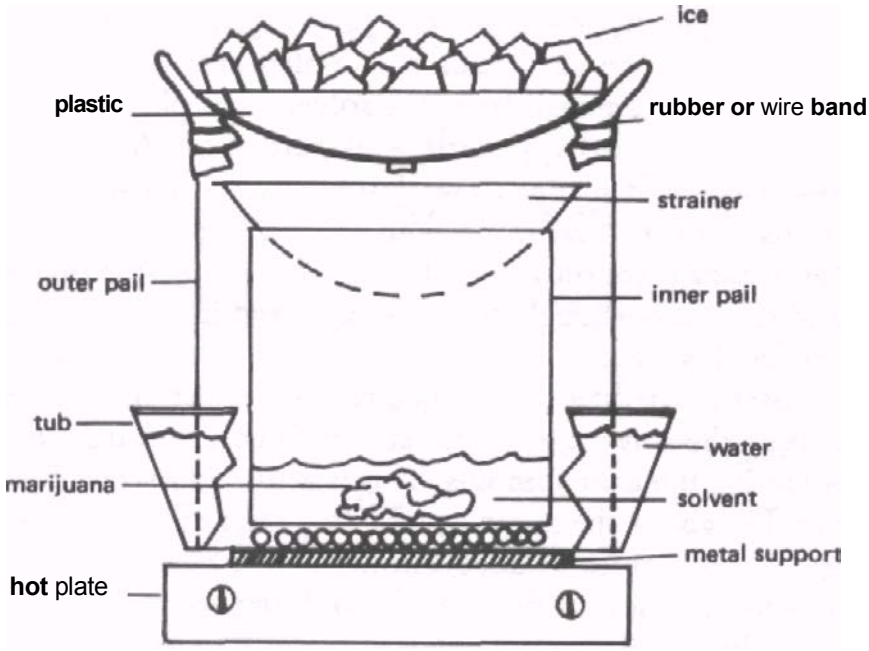


Fig. **16.** Design for axtraction and isomerization **apparatus**

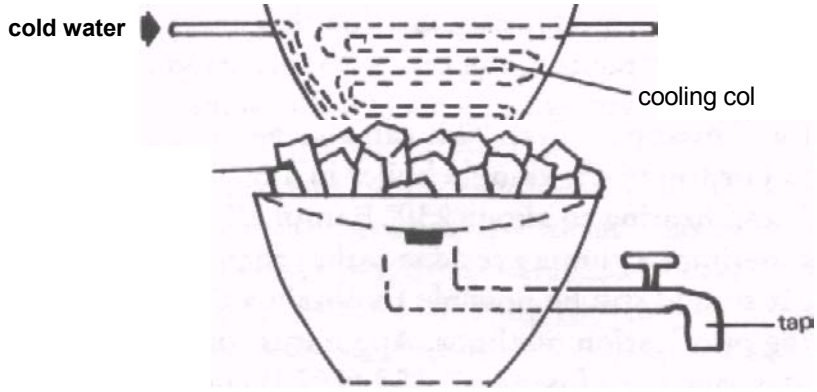


Fig. 17. Alternative designs for the top portion of Figures 1E and 16

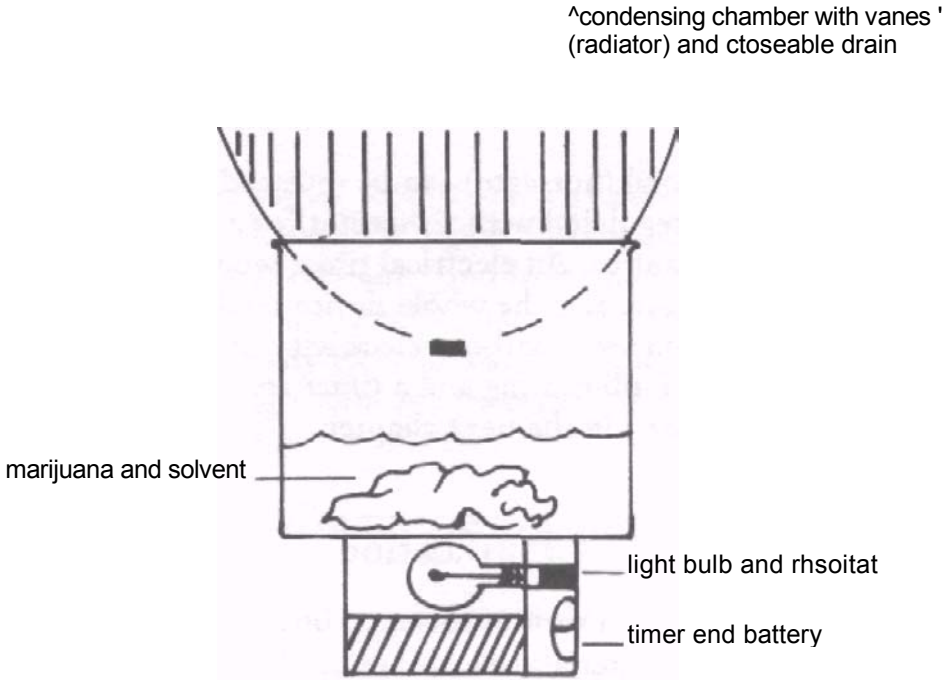


Fig. 18. Air-cooled automatic battery-operated extractor-isomerizer

ing solvent, mixed thoroughly, and evaporation of the *small* amount of remaining solvent completed (good ventilation), if you use an ounce of marijuana for this and you used a pound for the extraction, the ounre should wind up roughly 16 times stronger, if you wish to make hash oil instead, add a small amount of water to the remaining solvent and continue evaporation until all the water has disappeared, since all the remaining solvent will disappear first. This can also be done by placing the inner pail or top of the double boiler in a cooking oil or mineral oil bath and heating to about 230" F until all the water evaporates. Sometimes a gummy residue rather than an oil may be obtained. It should still be possible to obtain an oil by using the following purification methods. Apparatus for large scale extraction is described in *Lloydia 33:453* (1970) and *Cannabis Alchemy* (Level Press, 1973).

If heating is gentle, and the surface area in contact with the vapors is large, neither ice nor running cold water will be necessary for condensation. The principle involved is the same as that of the air-cooled radiator in cars. Air cooling is more likely to succeed in a cool room, out of doors, or with a fan creating an air flow over the top of the apparatus. With air cooling, it is necessary to be extra careful that no vapors are escaping into the room.

The heating coil (hotplate) can be replaced by a lightbulb and the current regulated with a rheostat for a gentle, easily controlled heat source. An electrical timer would make the operation automatic and the whole device could be battery powered for use in areas without electricity or running water. Air cooling, h'ghtbulb heating and a timer are employed in the isomerizer discussed in the next chapter.

Purification

This can be done with various solvents, but alcohols should not be used since the materials one wishes to eliminate from the oil are also soluble in the alcohol. Dissolve the oily residue from the extraction in three to six times its volume of benzene, gasoline, petroleum, or ether, and add an equal volume of water. Shake in a large bottle or separatory funnel and carefully release the

pressure every few shakes. Let stand for a few minutes to half an hour and separate the top solvent layer containing the cannabinoids from the lower water layer and the middle emulsion layer. The water plus emulsion layers can be shaken with further fresh solvent to remove the last traces of cannabinoids. Extraction is complete when tKe solvent is clear. Place the combined solvent extracts in the inner pail or top of the double boiler, place a pan or beaker above the strainer as before, seal the apparatus with the plastic and rubber bands and place ice in the lid as before. Reflux until almost all the solvent has been collected in the beaker, then open the apparatus and evaporate the remaining solvent as before. If you desire to remove the colored impurities from the oil, add activated charcoal equal to about one third to one half the weight or volume of the solvent containing the dissolved oil, mix well and filter. Evaporate the solvent as usual. This oil should contain roughly ten times the concentration of cannabinoids present in the original marijuana. Artificial hashish can be made by adding oil to blenderized marijuana in a ratio of from 10 to 50% oil, kneading and drying.

Special Extraction Apparatus

An apparatus which allows for continuous extraction and removal of hash oil is depicted in figure 18. The oil is occasionally tapped from the lower container and from time to time the device must be cooled and the marijuana or hashish in the upper container changed. Many variations are possible; several are noted in the following comments from the DEA.

The DEA Comments on Hash Oil

The following comments were made by the DEA (Drug Enforcement Administration) in 1973:

> There are many ways to produce hashish oil, but the basic principle used by most clandestine operators is similar to that of percolating coffee. A basket filled with ground or chopped up marijuana

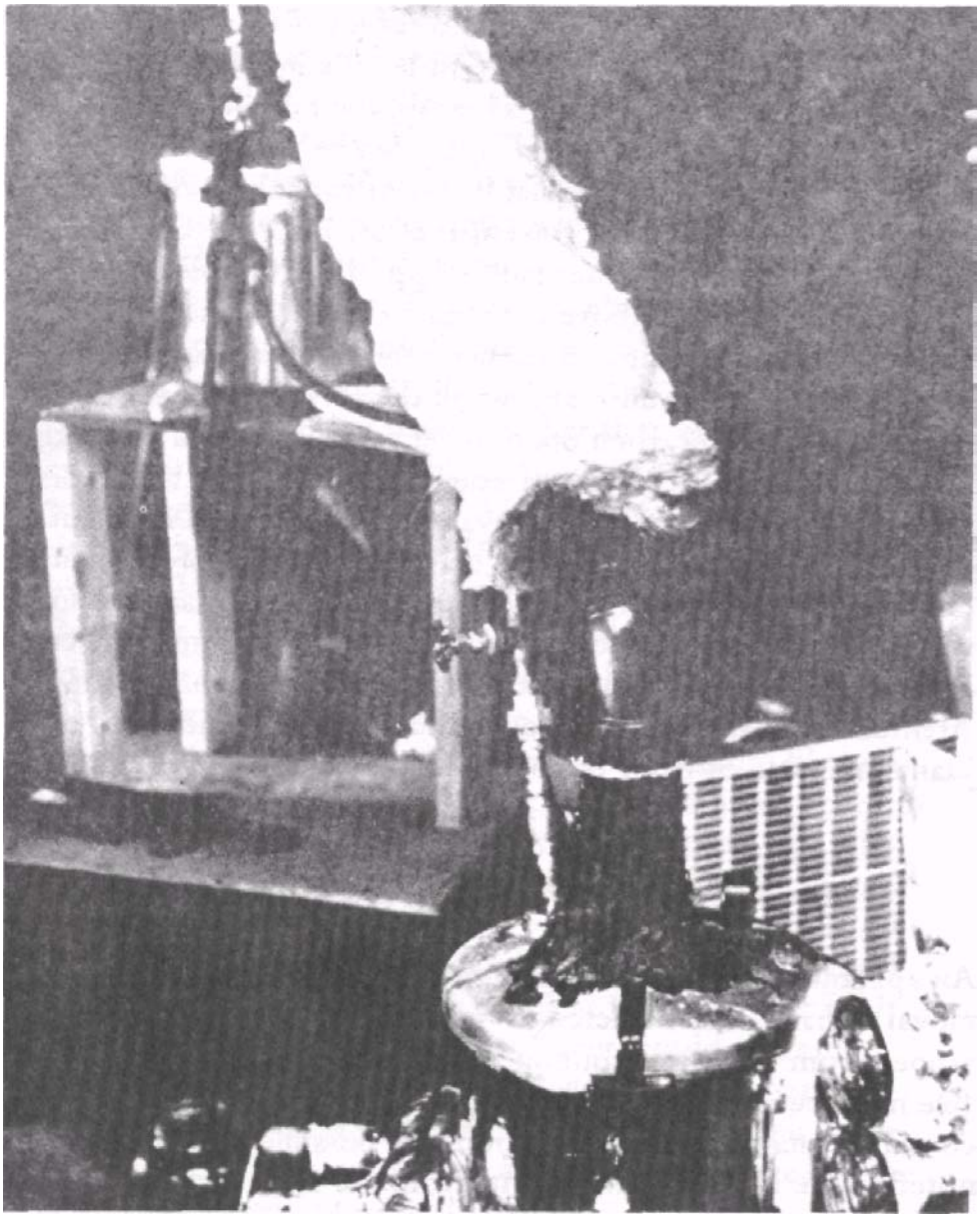


Fig. 19. Apparatus for continuous extraction of hash oil. Thin tubing brings the mixture of cannabinoids in solvent from the first pressure cooker in the background through the top of the second cooker which is painted black to absorb heat. Heat lamps are used to evaporate the solvent which rises through the insulated plastic pipe. The DEA stated that this apparatus produced 2.5 quarts of oil from about 82 pounds of marijuana in one hour. The time is unquestionably too short, but if the other figures are correct and grass with 1% THC content was used, the oil would contain about 20% THC. (Reprinted from *Drug Enforcement,* 1973.)

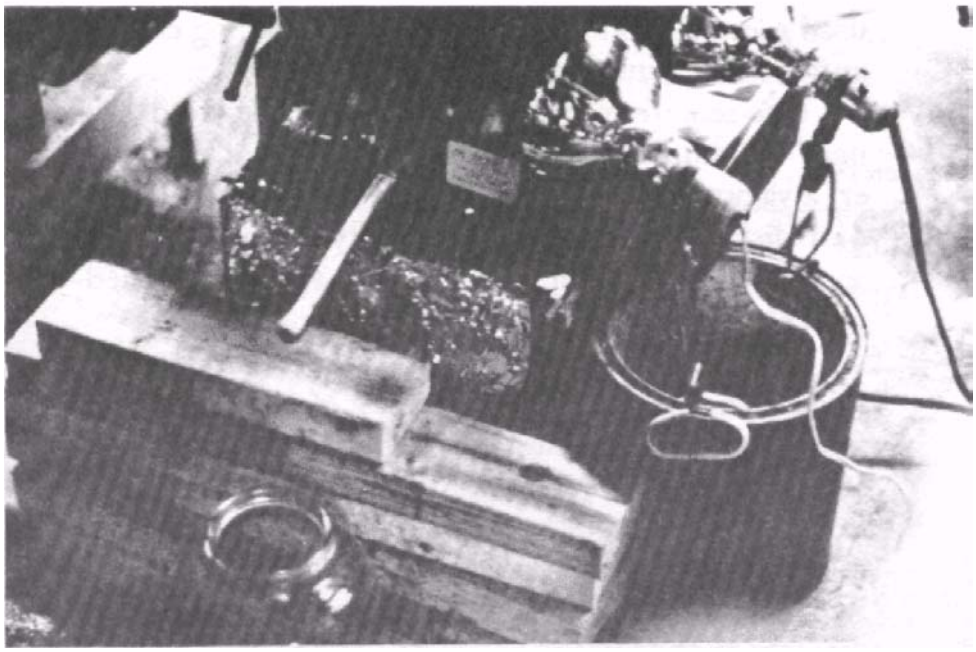


Fig. 20. Another view of the second cooker shows the tube through which the final product is drained into jars. (Reprinted from *Drug Enforcement,* 1973.)

plant is suspended inside a larger container, at the bottom of which is contained a solvent, such as alcohol, hexane, chloroform or petroleum ether. Copper tubing or similar material is arranged at the top through which cold water circulates. The solvent is heated and the vapors rise to the top where they condense, then fall into the basket of marijuana. As the solvent seeps through the plant material, the THC and other soluble chemicals are dissolved, and the solution drops back to the bottom of the container. Continued heating causes the process to occur over and over again. The solution becomes increasingly stronger until the plant material is exhausted of its THC. Sometimes new material is added and the same solvent reheated, yielding an even more potent solution. Only simple equipment is required. One laboratory used a 55-gallon drum in which was supported a smaller, perforated drum. Copper tubing, attached to a wooden lid, was connected to a cold water supply. Another laboratory^

used more elaborate equipment with cooling coils and reflux column 'potted* in plastic.

One seizure revealed a veritable 'Rube Goldberg' machine consisting of a boiler, a heat exchanger, a vacuum assembly and other components {with parts list, instructions and assembly methods) for a sophisticated hashish oil apparatus which was scheduled to be shipped to the Middle East.

Hashish laboratories have been seized in the middle and western United States, Mexico, and South America, Hashish oil itself has been found in several parts of the United States, in Central and South America, and in Europe. Most of the hashish oil that has been confiscated originated in India or Afghanistan and was shipped via commercial freight directly to the United States or Canada for forwarding. Thus far the senders and laboratory operators have usually been U.S. citizens.

The high THC content of hashish oil presents serious problems to all concerned—the law enforcement officer, the scientist, and the user. For the . law enforcement officer, the shipment of hashish oil complicates further an already complex problem. Instead of searching for large, fairly bulky packages of hashish or marijuana, the officer must search for smaller, more easily hidden liquid containers. The material can be dissolved in liquor, aftershave lotion, perfume, or commercial solvents. It may be packaged in heat sealed plastic bags and placed on the bottoms of pickle barrels, fuel tanks of planes, boats or cars. Small vials of the oil can be concealed in fountain pens or jewelry.

Meanwhile, the scientist faces the urgent task of evaluating the effects of hashish oil with a THC potency that may be as high as 90 percent.

The DBA also thinks that users face health hazards from hash oil, and, while this is unquestionably true for persons who use large amounts, the only hazard for most users will be the law enforcement officers.

TABLE 11

THC Content of Hash Oil

YEAR	SUPPOSED OHIGIN	%TMC
Early 1973	Afghanistan	11.0
	Afghanistan	29.0
	Afghanistan	17.0
	Colombia	0.3
	Colombia	12.0
	Colombia	17.0
	Morocco	12.0
	Nepal	10.0
	USA	6.0
	USA	8.0
	USA	20.0
	USA	21.0
	USA	34.0
Late 1973	Afghanistan	13.0
	Afghanistan	20.0
	Morocco	20.0
	Nepal	3.0
	Nepal	9.0
	USA	7.0
	USA	8.0
	USA	12.0
	USA	16.0
	USA	17.0
	USA	18.0
	USA (Iowa)	0.6
1974	Afghanistan	0.6
	Afghanistan	8.0
	Afghanistan	13.0

YEAR		KTHC
1974	Lebanon	5.0
	Netherlands	11.0
	USA	11.0
	USA	12.0
	USA	16.0
	USA	16.0
	USA (California)	19.0
	USA (California)	20.0
	USA (California	31.0
	USA (Iowa)	1.3
	USA (Kentucky)	18.0

SOURCE: "Pharmchem **Reports 1973-1974,"** Pharmcham Research **Foundation, Palo Alto. California**

THC Content of **Hash Oil**

As can be seen from table 11, the THC content of hash oil varies tremendously. This is only to be expected, since the manufacturers use a random assortment of marijuana and preparation techniques. Although CBD contents of hash oil have seldom been reported, they may tend to be somewhat higher in marijuana, since poorer quality marijuana may be used for oil preparation. On the other hand, since isomerization is s^ simple, as time passes, one may expect to find more and more oil that has been isomerized and which contains almost entirely THC. Much of the oil is being produced abroad; the Afghani govern--ment seized some 76 kg of oil in the period from July, 1973 through November, 1974. The oil available on the U.S. West Coast in 1974 averaged about 15% THC. Dealers sometimes cut hash oil with other oils, which means that the original hash oil may have averaged much higher. The ratio of THC to CBD should be identical to that of the marijuana used in preparing the oil unless the isomerization of CBD to THC, described in the next section, has been carried out. Thus, one oil prepared from Iowa grass had 1,3% THC and 31% CBD, and would be useless for anything except isomerization.

7
Isomerization

Principles

The final step in tetrahydrocannabinol biosynthesis in the living plant is the dehydration of CBD to THC. This is catalyzed by a specific enzyme coded for by a single gene. In principle, it should be a simple matter to extract the cannabinoids using *A* wide variety or organic solvents and to perform dehydration on the mixture, converting any CBD present into THC, In practice, this is, in fact, extremely easy to do since merely refluxing (heating with an apparatus for returning the cooled vapor to the reaction mixture) the organic extract with a small amount of an acid such as HCl or sulfuric acid is sufficient to isomerize the CBD to THC in a few minutes. The acid provides hydrogen ions (protons) which catalyze (speed up) the dehydration of CBD to THC. Look at figure 1 where it is clear that a hydrogen atom has been transferred from an oxygen atom (CBD) to a carbon atom (THC).

Procedure

The general procedure and apparatus are identical to those already described for the extraction. The isomerization of CBD to THC is accomplished by refluxing with a small quantity of organic or inorganic acid. If alcohol is being used, add about 2 ml of 1 normal HCl (prepared by adding 120 g concentrated HCl slowly to 900 ml water) or 2 ml of 1 normal sulfuric acid (prepared by adding 30 ml concentrated sulfuric acid slowly to 1 liter of water) for each 200 ml solvent (roughly the amount needed for 100 g of marijuana). If benzene or petroleum ether

or other relatively non polar solvent (most common ones other than alcohols) are being used, 100 mg paratoluenesulfonic acid or 684 mg {0.006 moles) trifluoroacetic acid are used instead of the HCl or sulfuric acid. Roughly four times as much acid can be used if hashish is being isomerized. The object is to have about 1 g of CBD in 100 ml solvent that is 0.005 molar (about 0.05%) in acid content.

Assemble the apparatus described; add the marijuana, hashish or hash oil; the solvent and the acid; seal and reflux (i.e., heat gently) for about one hour. You can expect about 90% of the CBD to isomerize to A^1 THC if an organic solvent such as benzene or petroleum ether is used, but only about 60% yield of A^1 and A* THC's with other products (e.g., ethoxyhexahydrocannibinols) if ethanol or another alcohol is used. If the cannabinoids have already been extracted; i.e., if you have hash oil, you may simply dissolve the oil in solvent and heat with acid to gqt isomerization. For example, a saturated solution of paratoluenesulfonic acid in methylene chloride heated at 80" F for 45 minutes gives about 90% yield of THC. As the reaction times are increased, more A^1 THC will isomerize to A^6 THC, but since the two have nearly the same activity, this does not matter. For oil, use about 5 ml oil per 100 ml solvent.

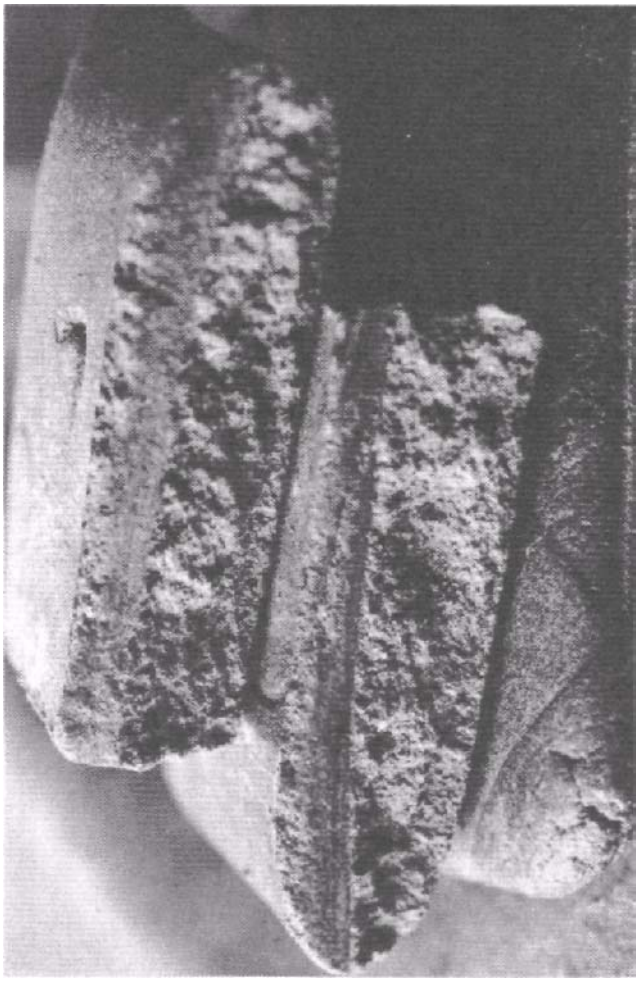
The solvent may now be removed, leaving the isomerized cannabinoids behind as an oily residue (deposited on the marijuana if this is left in). Solvent removal is accomplished exactly as described in the extraction section. Although the amount of acid used is small, you may wish to neutralize it with a small quantity of base, such as baking soda, prior to evaporation of solvent. Also, if you have used alcohol for isomerization (or extraction), you may shake the large volumes of alcohol containing the cannabinoids with benzene, petroleum ether, or other nonpolar solvents. The cannabinoids are much more soluble in the latter, and the smaller volume is easier to evaporate. Again, if the latter solvents are used, it is good to wash them with water several times (i.e., shake with an equal volume of water and discard the water) before evaporation to rid them of the undesirable water soluble substances, even if the marijuana has been water-extracted prior to isomerization (David Hoye's "Double Wash" technique).

Automation

The area of extraction and isomerization has been pioneered by David Hoye, inventor of the world's first automated isomerizer. At $179 this machine may seem over-priced, but it has the advantage of being significantly safer than home-built apparati. One can easily imagine this machine becoming a common item in the American kitchen along with the toaster and electric blender. However, claims that it will double the potency of any marijuana without weight loss are obviously untrue. This would require about twice as much CBD as THC being present, a very rare situation with commercial marijuana.

Deciding When to Isomerize

Isomerization is desirable only when the marijuana has signify cant quantities of CUD. Thus, good-quality marijuana such as that from Mexico, Colombia, or Southeast Asia, will usually not be suitable for isomerization, though it can be extracted and concentrated. However, some strains from these areas contain considerable CBD even when their THC content is high. Wild marijuana from northern latitudes, or that cultivated fur fiber in such areas as the U.S., Europe, or Turkey, will usually have considerable CBD. It should be kept in mind that low THC does not necessarily mean high CBD. Some strains are extremely low in all types of cannabinoids. A study of wild stands in Illinois showed THC varying from almost none to 2.3% and CBD from almost none to 7.1%. The only sensible thing to do is to first analyze for CUD content. Various labs will do this, though if you desire a quantitative analysis, you must first obtain from them a controlled drugs transfer form (this idiocy has been forced on them by the DBA). You can also assay for CBD yourself by performing the extremely simple Beam test for CBD discussed in the testing section. The only problem lies in the need for a standard with a known CBD content, though this need may be circumvented if someone markets a well standardized test with a color chart (the Beam test gives a purple culor with CBD).



8 Testing for THC and CBD Content

Colorimetry

There are color tests which are relatively specific for marijuana, but for present purposes we want a rapid, simple, roughly quantitative test which differentiates between CBD and THC. Ammoniacal silver nitrate gives a green color with CBD and no color with THC or CBN, but the Beam test likewise reacts only with CBD and is simpler. It is desirable to first dry the marijuana in an oven at ^00° F for five minutes. Add 1 g of dry marijuana, preferably finely powdered, to 10 ml petroleum ether or other organic solvent, shake and let stand ten minutes. Evaporate 0.2 ml of the filtered extract in a white porcelain dish, spot plate, or test tube. (Use gentle heat from hotplate or water bath.) Add four drops 5% potassium hydroxide in ethanol (5 g solid KOH in 95 ml of 95% ethanol) to the residue and wait five minutes for the violet color to appear. Samples with known CBD content can be tested simultaneously to give a standard curve, if a colorimeter is available; if not, rough quantitation can be done by comparing the colors by eye. Colored papers or pencils can be used to match the color of known CBD contents, and these colors can subsequently be used to roughly quantitate unknown samples. Extracting the marijuana with water prior to performing the Beam test may help to quantitate it.

At the present time there seems to be no good color test which reacts only with THC, However, if the Beam test is first run and shows the presence of relatively little CBD, many different tests can then be applied to the marijuana to roughly quantitate the THC content by first subtracting the value of the

Beam test. One of the easiest *of* these is the Duquenois test. Prepare an extract as above and evaporate it to dryness. Add four drops Duquenois reagent (0,4 g vanillin, five drops acetaldehyde in 20 ml 95% ethanol), then eight drops concentrated HCl, mix and let stand ten minutes. The violet color can be compared against standards of known THC content as above. If the color is too intense, use less sample or less extract and vice versa.

Samples can be sent to labs for quantitative analyses, but you will have to go through some paperwork and hassles; so you may prefer to roughly quantitate the test by analyzing marijuana you have already smoked.

Many tests give different colors with CBD, CBN and THC, and these might be used to measure CBD and THC simultaneously, especially if a colorimeter is available.[1]

Fluorimetry

Some recent experiments hold out hope for measuring THC by flourescence techniques. THC gives an intense greenish-yellow color under a black light with the following reaction, while CBN gives a weak reaction and CBD does not react. Extract 1 g of dry (preferably heated for 5 minutes at 200° *F)* marijuana for two minutes with 5 ml petroleum ether, benzene, chloroform, or similar solvent. Filter, evaporate the solvent on a boiling water bath to dryness and add 0.5 ml concentrated sulfuric acid. Cover tube and mix the acid with the residue, then heat carefully for ten seconds on a boiling water bath and cool. Carefully add 10 ml 20% ammonium hydroxide, mix and examine under black light. It may be possible to do the reaction directly on the marijuana without first extracting with a solvent, but it may need to be filtered before examining in black light. Again, standard marijuana with known THC concentrations will be needed, but a series of fluorescent standards can be prepared. Those with a fluorimeter available can probably dispense with standards once they standardize the test on their machine. Those with a machine available may also make use of the fact that heating the residue of the marijuana extract for 15 minutes at 230" F and redissolving in solvent gives fluorescence emission peaks at

420 nm for THC and 440 nm for CBD and CBN. If fluorescence is too intense in any test, use less marijuana for extraction or dilute solvent.[1] This test is very experimental and will probably be hard to adapt to home use. It is given here only to stimulate research.

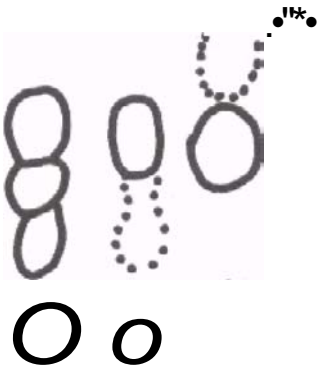


Fig. 21. Thin layer chromatogram of marijuana extract. *A is* from marijuana; *8* is from hashish; and *C* is from the hand of a marijuana smoker. Small spots of the extracts are placed on the base line, the solvent rises by capillary action from the bottom to the top carrying the compounds with it at varying rates. After drying, the plate is sprayed with a color-developing reagent and the spots identified by comparing with standards.

Chromatography

Chromatography on thin layers of silica gel or alumina is a standard technique for identifying and separating marijuana constituents. Marijuana is extracted with solvent as described above, and a small amount is spotted with a capillary tube or micropi-pette on one end of the plate. The plate is then placed vertically in a small amount of solvent. The solvent is drawn to the other end by capillary action, which carries the cannabinoids present in the

extract varying distances up the plate. The plate is then dried and sprayed with a dye which develops different colors with the various cannabinoids. The procedure is easier than it sounds, and with a little practice could be done at home; it will still require known standards to give very roughly quantitative results. Some of the dyes originally used as spray reagents are now being used in field tests for marijuana. They could easily be used to give at least rough quantitative results.^

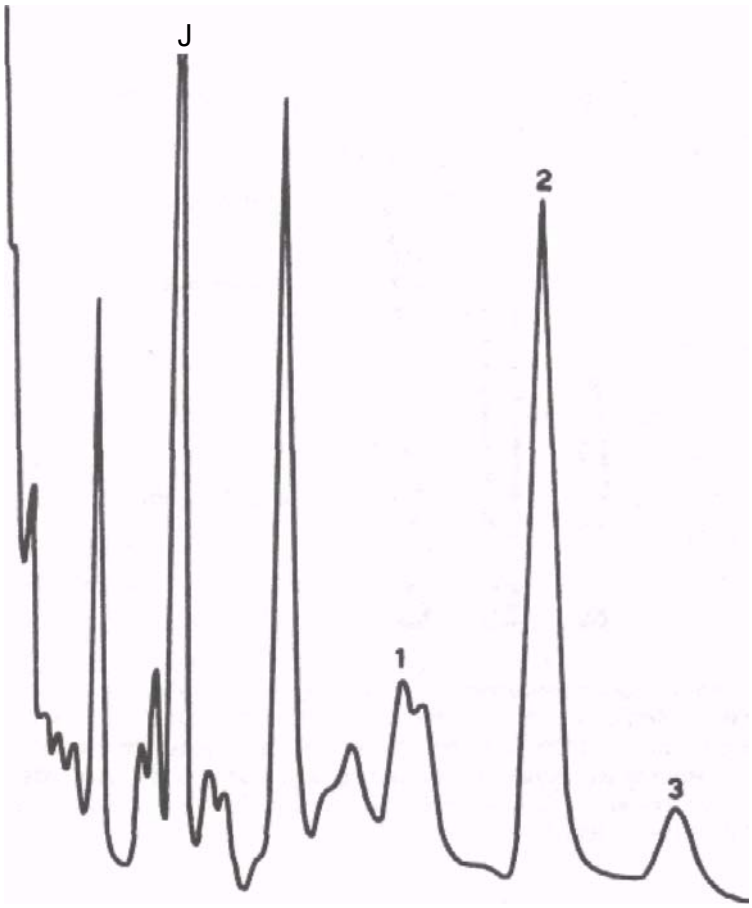


Fig. 22. G*t chromatoflram of en extract of marijuana. 1 is CBD; 2 ii A'-THC; **3 it CBN. In this** procedure **a** small **amount of the** liquid **extract it injected into** a long **heated coil through which gat Dattet. The thousands of** compounds **leave the column at different time* and are detected and displayed at a** series **of irregular** peaks **tean above. Injection of known** standards allows identification **of the peak*.**

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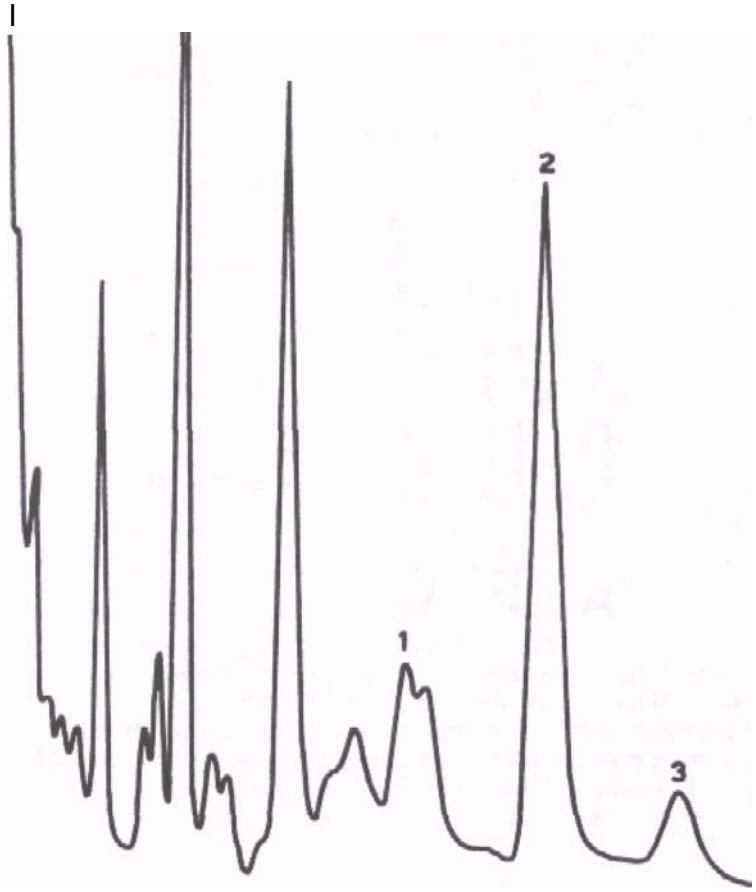

Fig. 22. Gas chrocnatogram of an extract of marijuana. 1 isC8D; 2 is A'-THC;3 is **CBN. In thii procedure a** small **amount of the** liquid **extract it injected into a long heated coil** through **which gat passes. The thousands of** comoundj **leave the column at different time* and** are detected and displayed **at a terie* of irregular** peaks **wan** above. **Injection of known** standards allows **identification of the peaks.**

Appendix

Chemical Syntheses

JOURNAL **ABBREVIATIONS**

ACS	Acta Chemica Scandinavica
AP	Archiv der Pharmazie
BCSJ	Bulletin of the Chemical Society of Japan
BER	Berichte der Deutsche Chemische Gesellschaft
BSC	Bulletin de la Societe Chimique de France
CA	Chemical Abstracts
CCCC	Collection of Czechoslovakian Chemical Communications
CJC	Canadian Journal of Chemistry
CPB	Chemical and Pharmaceutical Bulletin
CT	Chimie Therapeutique (Chimica Therapeutica)
GCI	Gazzetta Chimica Italiana
HCA	Helvetica Chimica Acta
JACS	Journal of the American Chemical Society
JBC	Journal of Biological Chemistry
JCS	Journal of the Chemical Society
JGC	Journal of General Chemistry (English translation of Zhurnal Obschei Kimii)
JHC	Journal of Heterocyclic Chemistry
JMC	Journal of Medicinal Chemistry
JOC	Journal of Organic Chemistry
JPS	Journal of Pharmaceutical Science
LAC	Leibigs Annalen der Chemie
MON	Monatshefte fur Chemie
REC	Recueil Travaux Chemiques
TET	Tetrahedron
TL	Tetrahedron Letters

CHEMICAL HINTS

Much useful information can be found in any lab text in organic chemistry such as that of Wiberg.

Drying

Shake the solution with an anhydrous salt such as $MgSO_4$, Na_2SO_4, etc. and filter out the salt. Solids can be dried by spreading on a filter paper at room temperature or drying in an oven at low heat.

Solvents

All solvents should be anhydrous unless otherwise specified. This can sometimes be done by drying as above and is to be attended to especially in the case of ethanol which is available in 95% or 100% (100% takes up water from the air very rapidly).

Joints

Whenever apparatus with ground glass joints is used, Dow silicone grease provides excellent lubrication and airtight seal.

Petroleum Ether

This usually refers to the light boiling fraction (60°-80° C) of petroleum ether which must not be confused with "ether," which refers to diethyl ether.

Vacuum Evaporation

This requires a heavy-walled flask. Ordinary lab vacuums are about 15mm Hg. A simple water-forced suction vacuum requires only a water source to produce a vacuum of about 25mm Hg, which is satisfactory for most purposes. Evaporation causes the temperature to drop which slows evaporation. Running a stream of warm water over the flask or putting it in a warm water bath avoids this. To avoid difficulties in getting residues out of the

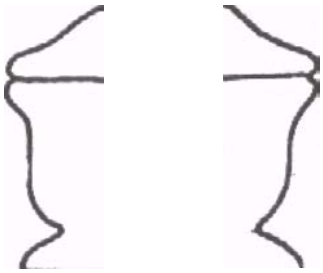

Fig. 23. Vacuum exsiccator

bottom of the flask, it is useful to do the evaporation in a vacuum exsiccator shaped as shown or in a flat dish in the exsiccator. Whenever a forced water vacuum is used, it is wise to place a water trap between the vacuum and the solvent being evaporated to prevent water from entering when the pressure fluctuates.

Stirring
This can be done in the old way with a stirring propeller entering through one of the necks of the flask, attached to a non-sparking motor. It is easier to sit the flask on a magnetic stirrer, and drop a magnetic stirring bar (preferably Teflon coated and egg shaped for round-bottom flask) in the solution.

Heating and Refluxing
Do not smoke or have any flames (such as a pilot light on gas appliances) around when using organic solvents, especially ether. Bunsen or other types of gas burners are generally outmoded. Much better are electric heating mantles available for each size of round-bottom flask. Put a rheostat in the circuit to regulate the temperature of the mantle. For refluxing, adjust the rheostat so that the vapor level in the water-cooled condenser is about a quarter of the way up the condenser. Heating plates or combination heating plate-magnetic stirrer is also useful.

Ventilation
If a lab hood is not available, some forced air ventilation such as a large fan near a window is advisable, especially if ether is **used.**

Lithium Aluminum ***Hydride***
Lithium aluminum hydride is expensive and often difficult to obtain. It can be synthesized [JACS 69,1197(1947)], but this is rather tricky. Its use can usually be circumvented by using a different reducing method or a different synthetic route.

Safety
An explosion shield, asbestos gloves, face mask and tongs are desirable.

A Substitute for Raney-Nickel, JACS 55,1004(1963)
5 mMoles Ni acetate in 50 ml water in 125 ml erlenmeyer flask;

connect as below to Hg pressure outlet. Flush with N_2, stir and add over 30 seconds with the syringe, 10 ml IM $NaBH_4$in water. After hydrogen evolution ceases, add 5 ml more of NaBH4. Decant the aqueous phase, wash solid with 2X50 ml ethanol to get the Ni-boride catalyst as a black, granular solid. Hydrogenation can then be done as described below at room temperature and atmospheric pressure.

A Highly Active Raney-Nickel Catalyst, JOC 26,1625(1961)
Add with stirring, in small portions over one-half hour, 40g 50% Raney-Ni to 600 ml 10% NaOH in a IL three-neck flask and continue stirring one hour. Let the Ni settle and decant the solution. Wash residue with 5X200 m] water, 5X50 ml ethanol, always keeping the Ni covered with liquid. Store under ethanol in refrigerator. Hydrogenation with this catalyst can be carried out in a low pressure Parr bottle (e.g., 30-80 ml ethanol, 5-1 Og Ni suspension, 1-2 ml 20% NaOH, 40°-50^D and 40-60 PSI H_2).

A New Method for Hydrogenating at **Room** Temperature and Atmospheric Pressure

Method /: External Generation of Hydrogen
JACS 75,215(1953)
This method reduces the solvent volume in the reducing flask for large-scale work. Add IM $NaBH_4$ in water to an aqueous HCl or acetic acid solution containing a little $CoCl_2$, if necessary for a rapid rate.

Method 2: Internal Generation of Hydrogen
JACS 54,1494-5,2827-30(1962)
Three-necked flask fitted with a graduated dropping funnel or a 50 ml burette, an inlet port fitted with a rubber serum cap, and an Hg manometer which allows gas to escape when the pressure exceeds about 25 mm above atmospheric pressure. At room temperature (25° C water bath) with stirring, add 1 ml 0.2M chloroplatinic acid (commercial 10% is about 0.2M) to 40 ml ethanol and Ig decolorizing carbon (e.g., Darco KB—may omit this but the reaction is slower). Flush with N_2 if possible and add 5 ml IM $NaBH_4$ (prepared from 3.8g $NaBH_4$, 95 ml ethanol, 5 ml 2N NaOH) rapidly to a vigorously stirred solution (black precipitate forms). After about one minute inject about 4 ml

concentrated HCl or glacial acetic acid to initiate hydrogen generation. Then inject about 0.02M of the unsaturated compound. Add $NaBH_4$ dropwise so that flask pressure remains about atmospheric pressure. Reaction is over when uptake ceases. $NaBH_4$ addition can be made automatic by putting a syringe full of it in an Hg-filled tube (about 15mm Hg, with holes so that as the pressure drops, more solution enters). This apparatus is available from Delmar Scientific Labs. Can also use $PdCl_2$, $PtCl_4$, Ni, Rhodium, PtO_2, platinum-carbon catalyst, palladium-carbon catalyst in place of chloroplatinic acid, but the last three are poor. Other salts can be used in place of the chlorides.

Note that the above procedures permit hydrogenation without the use of hydrogen tanks or special hydrogenation apparatus (Parr bottles, etc.).

Other references on the use of boron compounds for reduction: Org. Rxns. *13,28(1963);* JACS 56,3566(1964); JOG *28,* 3261(1963); JCS 371(1962).

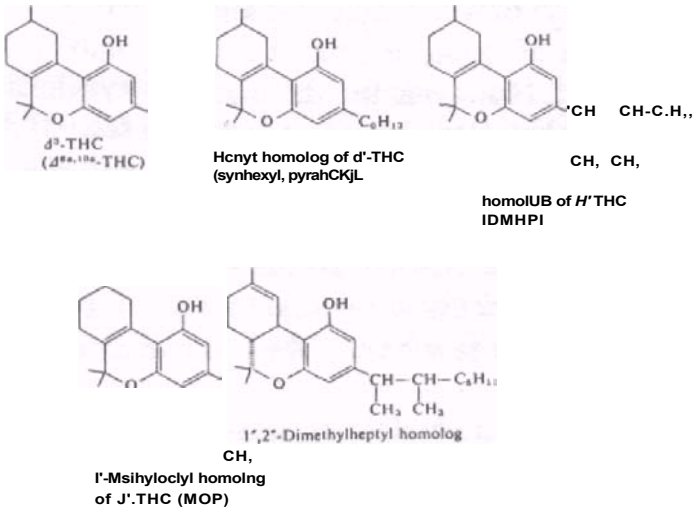

Fig. 24. Some widely tested synthetic cartnabinoids

IS IT LEGAL?

The A^1 and $A^{1(6)}$ THC's with the n-pentyl in the 5' position (obtained by using olivetol in the syntheses) are naturally occurring and hence illegal, but the A^3 THC's and the numerous isomers, homologs and analogs of the A^1 and $A^{1(6)}$ compounds are probably legal.

Apparently, recent federal legislation outlaws delta-1, delta-1(6), delta-3,4-THC's, both cis and trans and D and L and compounds. This still leaves hundreds of legal cannabinoids.

STRUCTURE-ACTIVITY RELATIONSHIPS

THC refers to tetrahydrocannabinol, and A refers to the position of the double bond. Various numbering systems are used, so the following equivalences should be noted: A^1 THC = A^1 3,4-trans-THC = A^9THC and A^6THC = $A^{1\ (6)}$THC = A^8THC = A^6-3, 4-trans-THC.

Little careful human testing has been done, so data given here and elsewhere on the relative psychedelic activity of various cannabinoids is often only a rough guess. A^1 THC and A^6THC have about the same activity which is about five times that of A^3 THC. Cannabidiol, cannabidiolic acid, cannabinol, cannabigerol and cannabichromene all have very little or no activity. Only the *S.* (-} isomer of THC seems to be active. When the n-pentyl at the 5' position is replaced by 1,2-dimethylhep-tyl, potency and duration of action increases about five times, giving the most active THC analog yet tested.

It should be noted that recent testing has indicated that a 1,1-dimethylheptyl or 1-methyloctyl and probably similar side chains give THC's of equal or greater activity than the 1,2-di-methylheptyl cpd. However, the difficulty of synthesizing these compounds plus their very long action (up to several days or more) makes it doubtful whether they deserve all the interest they have generated among psychedelic enthusiasts. More con-cern should be devoted to the shorter side chains, since they would presumably allow one to get very stoned but to be straight again within a few hours, thus allowing the drug to be more easily manipulated.

Substituting N, O, or S atoms at various places or saturating the double bond to produce hexahydrocannabinol probably re-tains activity. [SeeO4 74,125667(1971) for S analogs.] Alkoxy side chains at 5' retain activity. Unsaturated side chains are as active as saturated ones. Ether moieties at the 5' position, but not as the 3', retain activity. Activity is retained if an additional alkyl is placed at 4' but lost if placed at 6'. Activity is greatly decreased or lost if the H at the 4' or 6' positions is replaced by carboxyl, carbomethoxyl, acetyl or acetoxyl; if the hydroxyl is replaced by H; if the OH is at 5' and the side chain at 4'. Methyl and/or ethyl at 1 and 5 retains activity, as does removal of the methyl at 1. An hydroxyl in the side chain is active, but not on

the first carbon of the side chain. Esterifying the OH retains activity, but etherifying eliminates activity.

THC can be synthesized via cannabigerol and cannabichromene in low yield [TET 24,4830(1968), TL 5349,5353(1969), Proc. Chem. Soc. 82,(1964)]. For several moderately difficult routes leading to A^{1} *6' THC via cannabinol in about 10% yield, see LAC *685,126(1965).* For a synthesis of $A^{1\ (6\}}$ THC from cinnamyl derivatives and isoprene see JACS 59,4551(1967}. A rather difficult synthesis of A^{1} and A^{116J} THC is given in JACS 59,5934(1967). For a variety of THC analogs of unknown activity see BSC 1374, 1384(1968); JCS 952(1949); JACS *63,* 1971,1977,2766(1941), 64,694,2031,2653(1942), 67,1534 (1945), 70,662(1948), 7i,1624(1949)$_{f}$ 52,5198(1960); CA 75,48910(1971); TL 3405(1967); JMC 11,377(1968); CT 2, 167(1967); CA 76,126783(1972).

Since 0 or 1 and perhaps 2 double bonds anywhere in the lefthand ring above, as welt as changes in the size and position of the alkyl groups will probably all produce compounds with THC activity, many compounds similar to menthadieneol, menthatriene, verbenol, epoxycarene, pulegone and 4-carbethoxy-l-Me-3-cyclohexanone can be used in the methods below to get active THC analogs (e.g., isopiperitinol will work [TL 945 (1972)]). Also, 5-chlororesorcinol and 5-methylresorcinol (orcinol) have been shown to give weakly active THC's [see CA 76,33946(1972), US Patent 3,028,410(1962), and TET *23,* 3435(1967) for syntheses of orcinol and related compounds], Unfortunately, recent data indicate that orcinol gives a THC with very low activity. It appears that delta-5 and delta-7 THC have very little activity. If the methyl groups at carbon 8 in THC are changed to longer alkyl groups, the activity decreases, but the replacement of the alkyl groups by hydrogen or other groups has not been carried out. Open chain analogs also have activity [see CT 2,167(1967)].

For new information on the structure-activity relationships of cannabinoids see JMC *16,*1200(1973), Arzneim, Forsch *22,* 1995(1972), and Chem. Revs. 76,75(1976).

For THC analogs see JMC 19,445-71,549-53(1976); Eur. JMC 10,79(1975); Phytochem. 14,213(1975); CA 52,57564, 170672-3(1975); Diss. Abst. *34B,* 1442(1973); J. Labelled Cpds.

11,551(1975); Compt. Rend. Acad. Sci. 2S1C,197(1975).

For THC in one step from chrysanthenol see Experientia ^1,16(1975).

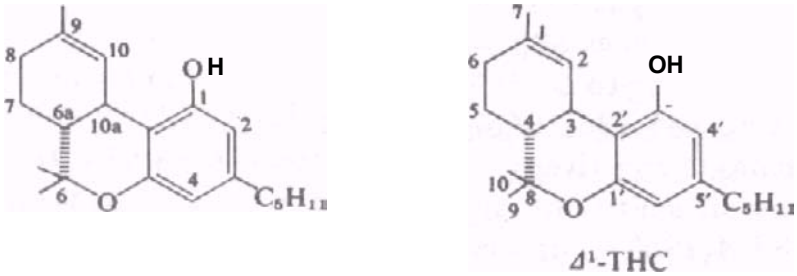

fig. **25. Two commonly** used numbering systems for the same molecule

The following gives the synthesis of a water soluble THC derivative which is equipotent with THC and perhaps more rapidly acting (see Science 177,442(1972)). Stir equimolar amounts of THC, dicyclohexylcarbodiimide and gamma-morpholinobutyric acid hydrochloride (or gamma-piperidinobutyric acid hydrochloride) fJACS *83,2891(1961)}* in methylene chloride at room temperature for 16 hours and filter, evaporate in vacuum (can triturate with ether and filter). The cost of synthetic THC will vary greatly depending on many factors, but high quality grass can probably be produced for under S20 a kilo.

For good reviews of marijuana chemistry see Prog. Chem. Natural Prod. 25,175(1967), Science 165,1159(1970), C. Joyce and J. Curry (Eds.), *Botany and Chemistry ofCannabis* (1970), JACS 95,217(1971), JPS 60,1433(1971), Ann. N.Y. Acad. Sci. 191(1971), Prog. Org. Chem. 5,78(1973), Marijuana-R. Mechoulam (Ed.) (1973), and Chemical Reviews 76,75(1976).

Only the first three methods below give the natural C (-) isomer of THC. The other methods give the racemic product and consequently their yields of active THC are actually one-half that indicated.

SYNTHESES OF THC AND ANALOGS

K(-)-A$^{I(6)}$ THC HCA 52,1123(1969), cf. JACS 96,5860(1974).

Method 1

This method gives about 50% yield for THC and about 90% for the l',l'-dimethylpentyl analog.

Olivetol 4.74 g (or equimolar amount of analog), 4.03 g (+) cis or trans p-methadien (2,8)-ol-l (the racemic compound can be used but yield will be one-half), 0.8 g p-toluenesulfonic acid in 250 ml benzene; reflux two hours (or use 0.004 Moles trifluoroacetic acid and reflux five hours). Cool, add ether, wash with $NaHCO_3$ and dry, evaporate in vacuum to get about 9 g of mixture (can chromatograph on 350 g silica gel- benzene elutes the THC; benzene: ether 98:2 elutes an inactive product; then benzene: ether 1:1 elutes unreacted olivetol; evaporate in vacuum to recover olivetol},

Method 2
Dissolve the olivetol or analog and p-menthadienol or p-methatriene (1,5,8) in 8 ml liquid SO_3 in a bomb and fuse 70 hours at room temperature. Proceed as above to get about 20% yield.

«(-)-$A^{1(6)}$ *THC* JACS 55,4552(1967), JCS (C) 579(1971), cf. Diss. Abst. J5J3,3843(1974),and?hytochemistry 14,213(1975). Convert (-) alpha-pinene to (-) verbenol (sec precursors section). Add 1M (-) verbenol (racemic verbenol will give one-half yield), 1M olivetol or analog with methylene chloride as solvent. Add BF_3 etherate and let stand at room temperature one-half hour to get approximately 35% yield after evaporating in vacuum or purifying as above to recover unreacted olivetol. Solvent and catalyst used in method 1 above will probably also work. Either cis or trans verbenol can be used. The JCS paper adds Ig BF_3-etherate to a solution of Ig olivetol and l.lg verbenol in 200 ml methylene chloride and let stand two hours at room temperature. JACS 94,6164(1972) recommends two hours at -10° C, the~n one-half hour at room temperature and the use of cis rather than trans verbenol (the latter gradually decomposes at room temperature). The reaction is also carried out under nitrogen, using twice as much verbenol as olivetol, 0,85ml BF_3 etherate and 85 ml methylene chloride/g verbenol (both freshly distilled over calcium hydride) to give ca. 50% yield. See also JACS 94,6159(1972) for the use of citral and Arzneim. Forsch. 22,1995(1972) for use of p-TSA.

In the synthesis of THC with verbenol, the cis isomer is preferable to the trans since the latter decomposes at room temperature. Pinene or carvone give active THC's [JMC*17*,287(74)].

owJA[1(6)] THC JACS 92,6061(1970), U.S. Patent 3,734,930

1M (+)-trans-2-carene oxide (2-epoxycarene), 1M olivctol or analog, 0.05 M p-toluenesulfonic acid, in 10L benzene; reflux two hours and evaporate in vacuum (or can separate the unreacted olivetol as above) to get about 30% yield THC. Olivetol can also be separated as described below. For synthesis of 2-epoxycarene (A^4 carene oxide) from A^4 carene (preparation given later) see p-methadieneol preparation (method 2). 3-careue oxide gives 20% yield of $A^{1,61}$ THC.

A^3 THC JAGS £3,2211(1941}

1M pulegone, 1M olivetol or analog, 0.3 M $POC1_3$; reflux four hours in 1 L benzene and evaporate in vacuum or pour into excess saturated $NaHCO_a$ and extract with dilute NaOH to recover unreacted olivetol. Dry, and evaporate in vacuum the benzene layer to get the THC.

$_A$i (6) *THC from Cannabidiol* HCA 52,1123(1969) Reflux Ig cannabidiol, 60 mg p-toluenesulfonic acid (or 0.003 M trifluoroacetic acid) in 50 ml benzene for 1V4 hours. Evaporate in vacuum to get about 0.7 g THC. Alternatively, add 1.8 g cannabidiol to 100 ml 0.005N HCl and reflux four hours. Proceed as above to get about 0.5 g THC [cf. JACS 94,6159(1972)],

Nitrogen Analogs o/A^3 THC CA 72,66922(1970); JACS *88,* 3664(1966), TL 545(1972}

5.4 g olivetol or 0.03 M analog, 5.8 g 4-carbethoxy-N-benzyL3-piperidone hydrochloride or 0.03 M analog [JACS 71,896 (1949) and 55,1239(1933} give an old and clumsy synthesis, and Heterocyclic Compounds, Klingenberg (Ed.}, part 3, chaps. IX-X1I (1962) gives information on related compounds] in 10 ml concentrated sulfuric acid. The concentrated sulfuric acid should be added dropwise, with cooling (cf. U.S. Patent 3,429, 889). Add 3 ml $POC1_3$ and stir at room temperature for 24 hours. Neutralize with $NaHCO_3$ to precipitate 2.3 g (I). Filter; wash precipitate with $NaHCO_3$ and recrystallize from acetoni-trile. Dissolve 4.3 g (I) in 30 ml anisole and add 0.1 M methyl Mgl in 50 ml anisole. Stir 12 hours and evaporate in vacuum or acidify with sulfuric acid, neutralize with $NaHCO_3$ and filter;

wash to get 2.4 g N-benzyl analog of THC. For other N-analogs of unknown activity see JOG 5.3,2995(1968). Recover unreacted olivetol as usual.

The 5-aza analogs given in the JOG rcf. seem to be active but they use the pyrone intermediate from certain routes of THC synthesis for a precursor. See U.S. Patent 3,493,579(03 Feb. 1970) for quinuclidine analogs and JOC 35,440(1973) for a different approach to N-analogs. See JOC J9,1546(1974) and HCA 56,519(1973) for other N-analogs.

A[1,61] THC U.S. Patent 3,576,887

This synthetic route allows one to proceed from the alkylresorcuiol dimethyl ether without using a compound of the verbenol or cyclohexanone type.

Synthesis of olivetol aldehyde [Aust. J. Chem, 2^2979 (1968)].To a stirred solution of phenyllithium (1.6g bromobenzene and 0.16g Li) in 50 ml ether, add 0.01M olivetol dimethyl ether (or analog-see elsewhere here for preparation) in 5 ml ether and reflux 4 hours. Add 5 ml N-methylformanilide, reflux 1 hour and wash with 2X50 ml dilute sulfuric acid, 50 ml water, 25 ml saturated NaCl and dry, evaporate in vacuum the ether (can dissolve in benzene and filter through lOOg of alumina) to get 60% yield of the dimethylolivetol aldehyde (1) (recrystallize from ether-pentane). Can recover unreacted starting material by refluxing the vacuum distillate 3 hours with excess 10% HCl, removing the organic layer and extracting the aqueous layer with ether: wash and dry, evaporate in vacuum the combined ether layers.

An alternative method for (I) JACS 65,361(1943}] In a 200 ml 3 neck round bottom flask with *a* stirrer, a reflux condenser, a dropping funnel and a nitrogen inlet tube, introduce a rapid stream of nitrogen and in the stream issuing from the central neck, cut 1.5g of lithium into ca. 70 pieces and drop into the flask containing about 25 nil dry ether. Place the fittings in position, slow the nitrogen stream and add *[1]A* of the solution of 9.2g n-butyl-chloride in 25 ml dry ether. Start the stirring and add the rest of the n-butyl-chloride at a rate giving a gentle reflux. Continue stirring and reflux 2 hours and add 15 ml olivetol dimethyl ether in 25 ml dry ether. Reflux 2 hours and add dropwise a solution of 15 ml N-methylformanilide in 25 ml dry

ether with stirring at a rate sufficient to produce refluxing. Continue stirring 1 hour, treat with 3% sulfuric acid and then pour into excess of this acid. Remove upper layer and extract aqueous layer twice with ether. Wash combined ether layers with dilute aqueous $NaHCO_3$ and water and dry, evaporate in vacuum the ether (can distil! 148-52/0.3) to get 78% (I).

JACS 65,361(1943). A mixture of 6.5g (I) (or analog), 20 ml pyridine, 1 ml piperidine and 9g malonic acid is warmed on a steam bath 1 hour. Add another Ig malonic acid and heat another '/2 hour. Reflux % hour and pour into excess iced 10% HCl, stirring occasionally over 2 hours. Filter and dry to get 6g 2,6-dimethoxy-4-n-amylcinnamic acid (II) (recrystallize from ethanol).

lOg (II), 40 ml 80% isoprene and 40 ml dry xylene or toluene is heated in an autoclave at 185° C for 15 hours. Cool, dilute with 160 ml petroleum ether and shake with 100 ml saturated aq. Na_aCO_3. Let stand and separate the middle layer. Wash the middle layer with a mixture of petroleum ether and dilute aq. Na_2CO_3 and again separate the middle layer and treat with 75 ml tO%HCl and 75 ml ether. Shake, separate the aqueous layer and wash the ether 3 times with water. Dry and evaporate in vacuum the ether and dissolve the residue in petroleum ether. The solid which ppts. after about 10 minutes is unchanged (II). Filter and let stand in refrigerator overnight and dry and evaporate in vacuum to ppt. about 7g of the l-methyl-5(2,6-dimethoxy-4-n-amylphenyl)-l-cyclohexene-4-COOH (III) (recrystallize from petroleum ether),

Ig (III) in 5 ml dry ether is added to 10 ml 3M MeMgl (from 0.21g Mg and 1.2g methyl iodide) in ether, heated to 130° C to evaporate the solvent and the oil kept at a bath temperature of 165° C for % hour. Cool in dry ice-acetone bath and cautiously add ammonium chloride-ice water mix to decompose the excess Grignard reagent. Acidify with dilute HCl and extract with ether. Wash with NaCl, dilute K_2CO_3, NaCl and dry, evaporate in vacuum to get the dimethyl derivative (IV). Reflux (IV) in 25 ml benzene with 100 mg p-toluenesulfonic acid for 1 hour with a Dean-Stark trap and dry, evaporate in vacuum (or wash with $NaHCO_3$, NaCl first) to get the THC or analog.

Hydrolysis of benzopyrones (for synthesis see elsewhere

here) will produce compounds of type (III) which will work in this synthesis. The hydrolysis proceeds as follows fJCS 926 (1927)]: Add lOg of the benzopyrone to 20g 30% NaOH, cool and shake 1 hour with 19 ml methylsulfate. Extract the oil with ether and dry, evaporate in vacuum to get the ester. Acidify the aqueous solution and filter, wash, dissolve ppt. in sodium carbonate and acidify, filter to get the free acid. Both the acid and the ester will work in this synthesis.

For a possible route to benzopyrones via condensation of isoprene and 3-CN-5-OH-7-alkyl-coumarin see JACS *82,5196* (1960). See JMC 16,1200(1973) &r another ref. on the pyrone route to THC.

A[3] *THC Analogs TET 23,77(1967)*

11.6 g 5-(l,2-dimethyl)-heptyl resorcinol or equimolar amount of olivetol or other analog, 9.2 g 2-carbethoxy-5-methyl cyclo-hexanone(4-carbethoxy-l-methyl-3-cyclohexanone), 5 g $POC1_3$, 70 ml dry benzene (protect from moisture with $CaCl_2$ tube). Boil 5 minutes (HCl evolution) and let stand at room temperature 20 hours. Pour into 10% $NaHCO_3$, separate the benzene layer and wash with 3X50 ml 10% $NaHCO_3$. Dry and evaporate in vacuum the benzene and recrystallize from 50 ml ethyl acetate to get 6.6 g of the pyrone (I). 4,5g(I}, 150 ml benzene; ajdd dropwise to a solution prepared from 7,8 gMg, 18 ml methyl iodide, and 90 ml ether. Reflux 20 hours and add 45 ml saturated NH,4,Cl. Separate the organic layer and extract the aqueous phase with benzene. Combine the organic layer and benzene and dry, evaporate in vacuum to get the THC analog.

A[3] THC *Analogs from Resorcinol* TET 2^,83(1967)

22g resorcinol, 36 g 4-carbethoxy-l-methyl-3-cyclohexanone, 20 g poly phosphoric acid; heat to 105° C and when the exothermic reaction which occurs subsides, heat at 140° C for one-half hour. Pour onto ice-water; filter; wash with water and recrystallize-e than ol to get 34 g of the pyrone (I). 6.4 g (I), 8 ml cap-royl-Cl or analog (for preparation see above reference, page 84); heat on oil bath (can use mineral oil) at 120° C until the exothermic reaction subsides (HCl evolution). Cool and pour into ethanol. Filter to get 8 g precipitate (II). 3.2 g (II), 4.4 g dry $AlCl_3$; heat on oil bath at 170° C for one hour. Cool and add

HCl; filter and dissolve precipitate in 7 ml 2N NaOH, Filter and acidify with HCl to precipitate 1.4 g (III) (recrystallize-ethanol). Test this for activity. Use benzoyl-Cl or benzok anhydride to esterify the OH group (this may not be necessary), methyl MgBr or methyl Mgl to methylate the keto group, and sulfuric acid to dehydrate and hydrogenate as described elsewhere here to get the THC analog. Since the resulting THC analog has the side chain at the 6' position, it may not be active. This paper also gives a synthesis for THC analogs with the side chain in the 4' position, but again their activity in man is unknown. Verbenol, etc., should work in this synthesis, thus obviating the need for the methylation step.

$_{A}$K6) *THC)ACS 88,367(1966)*

1M olivetol or analog, 1M citral in 10% BF_3 etherate in benzene about eight hours at 5-10° C. Extract unreacted olivetol with dilute NaOH and evaporate in vacuum the ether to get about 20% yield of the trans THC, and 20% of the cis THC which can be converted to the active trans isomer by reacting with $5Br_3$ in methylene chloride at -20° C for IVi hours. [TL 4947(1969)]. Alternatively, the reaction can be carried out in 1% BF_3 etherate in methylene chloride to get 20% A^1 THC.

A^3 *THC Analogs* JACS ^,1971(1941) cf. CA 52,170672-3 (1975)

7.6 g 5-n-heptyl resorcinol or equimolar amount analog, 6.6 g (0.037M) 4-carbethoxy-l-methyl-3-cyclohexanone or analog, 5.8 g $POC1_3$ in 60 ml benzene, Reflux 5 hours, cool and pour into $NaHCO_3$ to get about 6 g THC analog and 1 g more by concentrating the mother liquor, or proceed as described elsewhere here to recover unreacted resorcinol. 3-carbethoxy-l-methyl-2 or 4-cyclohexanone, 2-carbethoxy-cyclohexanone, etc. will probably also give active THC analogs.

A^3 THC *Analogs* JCS 952(1949)

1.75 g 2-Br-4-methyl-benzoic acid, 1.5 g olivetol or analog, 10 ml IN Na OH and heat to boiling; add 0.5ml $CuSO_4$. Filter; wash with ethanol and recrystallize from ethanol to get (1). 10 g (I) in 150 ml benzene; add to methyl-Mgl prepared from 47.5 g methyl iodide, 8 g Mg, 1 20 ml ether. Reflux fifteen hours, conl and pour on ice. Add saturated N^Cl and separate the ether.

Wash two times with water and dry and evaporate in vacuum the ether to get the THC.

PRECURSORS FOR **THC** SYNTHESIS

pMenthatriene (1,5,8) BER 59,2493(1956)

90 g d(+) carvone [fi {-} carvone or racemic carvone probably will work also] in 150 ml ether; add dropwise with stirring to 7.5 g lithium aluminum hydride in ether. Heat one hour on water bath; cool and carefully add water and then ice cold dilute sulfuric acid. Separate the ether and extract the aqueous layer with ether; dry and evaporate in vacuum the combined ether to get about 60 g product (can distill 65/14).

(+) Cis and Trans f)-Menthadien-(2,8)-oi-i

Method 1: LAC 674,93(1964) cf. BSC 3961(1971), JOC *38,* 1684(1973)

136 g (+) limonene in 2 liters methanol; 2g bengal rose dye. Illuminate with a high voltage Hg lamp (e.g., HgH 5000) for fourteen hours or until about 1M of O_2 is taken up. Evaporate the methanol at 0-10° C to about 500 ml and then stir with ice cooling and add this solution dropwise to solution of 250 g Na_2SO_3 in 1,5 liters water and continue stirring for twelve hours. Heat two hours at 70° C and extract with ether and dry, evaporate in vacuum (can distill with addition of Na_2 CO_3 at 40-70/0,2) to get about 100 g mixture containing about 40% product which can be purified by fractional distillation.

Method 2: HCA 45,1665(1965)

Convert (+} A^3 carene to (+) trans-4-acetoxycarane (I) via (+) rrans-4-OH-carane. Reflux 50 g (I) for 45 minutes (180° C oil bath under N_2 or Argon). Cool and can distill (57/10) to get about 25 g mixture of A^3 and A^4 carene (residue is unchanged starting material) containing about 60% A^4 isomer.

Alternatively, to 150 ml ethylene diamine add portionwise with stirring at 110° C under Argon or N_2, 5.3 g Li metal; after one hour add dropwise 11.0 g (+) A^3 carene. After one hour cool to 4° C and add water. Extract with ether, wash the ether five times with water and dry, evaporate in vacuum to get 100 g of a mix containing about 40% (+) A^4 carene (can separate by fractional distillation).

A^4 carene can also be obtained from A^3 carene as follows: [JCS (C) 46(1966)]: Dissolve 1 g A^3 carene in 50 ml propionic acid and heat at a suitable temperature (e.g., one-half hour at room temperature may do) in presence of ^ g Palladium-Carbon catalyst (5%) in ethanol and filter, evaporate in vacuum (can distill 63.5/19.5). See J. Soc. Cosmet. Chem. 22,249(1971) for a review of {+) A^3 carene chemistry.

A^2 *Carene oxide (2-epoxycarene)* LAC 657,22(1965), [cf. TL 2335(1966), and CA 68:22063(1968)]

To 136 g A^4 carene in 330 ml methylene chloride and 120 g anhydrous sodium acetate, add dropwise with vigorous stirring in an ice bath, 167 g of 50% peracetic acid and continue stirring for ten hours. Heat to boiling for two hours, cool, wash with water, sodium carbonate, water, and dry, evaporate in vacuum the methylene chloride to get about 100 g p-menthadieneol. Apparently [CA 65,22063(1968}] substituting sodium carbonate for sodium acetate results in the production of A^2 carene oxide (2-epoxycarene) in about 50% yield (can distill 63/7).

4-Carbethoxy-1-methyl-cyelohexanone LAC 630,78(1960) Cool 20 g of sodium metal in 325 ml ethanol to -15° C in an ice-salt bath and add in small amounts over one hour a solution of 100 g 3-methyl-cyclohexanone and 150 g diethyloxalate (keep temperature below -10° C). Keep three hours in cold and then twelve hours at room temperature. Add solution of 1.3 L of water, 60 ml 2N sulfuric acid. Separate the yellow-brown oil and extract the water with ether or $CHCl_3$ until the yellow is removed. Combine the oil and the extract and distill the solvent and the unchanged starting material (100° C bath, 13 mm). Slowly heat the residue in a one-half liter flask with air cooling. CO_2 evolution starts at 160° C. Continue heating to 220° C and keep at this temperature for 1H hours or until a test with 1% ethanol-$FeCl_3$ solution shows the end of the reaction by a violet color (unconverted material gives a brown color). Can distill two times on Vigreux column to give about 83 g of oily colorless product.

(-) Verbenol JCS 2232(1961)

Racemic alpha-pinene will yield racemic verbenol which will give one-half the yield of (-) verbenol.

27 g (-) alpha-pinene in 500 ml dry benzene; heat and keep temperature at 60-65° C throughout. Add with stirring over 20 minutes 84 g dry (dry over $P_2 O_s$) lead tetra-acetate. Stir one-half hour; cool and filter and add filtrate to water. Filter and evaporate in vacuum the benzene layer (can distill 96-7/9) to get 21.2 g cis-2-acetoxy-pin-3-cnc(I)). 5 g (I) in 25 ml glacial acetic acid; keep at 20° C for one-half hour and add water and extract with ether. Wash the extract with aqueous $Na2CO_3$ and evaporate in vacuum the ether (can distill 97-8/9) to get 4.3 g trans verbcnyl acetate (II). Hydrolyze (II) with NaOH to give the (-) cis and trans verbcnol. For other methods of producing verbcnol see CA 57,361(1943), CA 57,16772(1962) and BSC 2184(1964), JCS (B) 1259(1967). The last paper also gives a method for converting (-) beta-pinene to (-) alpha-pinene. See also CA 65,2312(66),

5-Alkyl ***Resorcinols*** *from Acyl* ***Resorcinols*** **CA** 72,66922(1970)

Compounds I-III may be able to give **active THC** analogs **if used** in place of **olivetol** for synthesis,

45 g l-{3,5-dimethoxyphenyl)-1 -hexanone(I) or analog (for preparation see the following methods) in 400 ml ether and 0.3 M methyl-Mgl in 150 ml ether react to give 49 g 2-(3,5-di-methoxyphenyl)-2-heptanol(II). Heat 49g (II) with 1 ml 20% sulfuric acid to 105-125° C/30 mm for 1^ hours to get 34 g of the 2-heptene compound (III). 33g (III) in 100 ml ethanol, 6g Raney-Ni, 1500 PSI hydrogen, 150° C to get 26 g of the 2-hcp-tane (IV). 26 g (IV), 118 ml 57% hydrogen iodide; add 156 ml acetic anhydride and heat at 155° C for two hours to get 22 g of the resorcinol. *5-Alkyl Resorcinols* BER 69,1644(1936)

25 g ethyl-3,4,5-trimethoxybenzoyl acetate and 2.1 g Na in 100 ml ethanol; warm to react. Add 2 g n-propyl iodide (or n-amyl iodide, etc.) and heat twelve hours on steam bath; neutralize and distill off the ethanol. Extract with ether and dry, evaporate in vacuum to get about 32 g of the alkyl acetate (I). Heat 22 g (I) in 5% KOH in ethanol for one hour at 50° C to get 14 g 3,4,5-trimethoxyvalerophenone (II), which crystallizes on standing. 11 g (II), 600 ml ethanol, 60 g Na; warm and after Na is dissolved, add 2 L water. Acidify with HCl, distill off the ethanol and extract with ether. Dry, evaporate in vacuum the ether to

get 7.8 g olivetol dimethyl ether (or analog) (III). 7.2 g (III), 70 ml hydrogen iodide; boil two hours and distill (164/760) to get olivetol.

OtivetolHCA. 52,1132(1969)

Reduce 3,5-dimethoxybenzoic acid with lithium aluminum hydride to 3,5-dimethoxybenzyl alcohol (I), To 10.5 g(I) in 100 ml methylene chloride at 0° C add 15 g PBr_3; warm to room temperature and stir for one hour. Add a little ice water and then more methylene chloride. Separate and then dry, evaporate in vacuum the methylene chloride. Add petroleum ether to precipitate about 11.5 g of the benzyl bromide (II). To 9.25 g (II), 15 g Cul, 800 ml ether at 0° C, add butyl (or other alkyl)-Li (16% in hexane), and stir for four hours at 0° C. Add saturated NH_4Cl and extract with ether. Dry and evaporate in vacuum the ether (can distill 100/0,001) to get about 4.5 g olivetol dimethyl ether (III) or analog. Distill water from a mixture of 90 ml pyridine, 100 ml concentrated HCl until temperature is 210° C. Cool to 140° C and add 4.4 g (III); reflux two hours under N_2. Cool and pour into water. Extract with ether and wash with $NaHCO_3$. Make pH 7 and dry, evaporate in vacuum to gee 3.8 g olivetol which can be chromatographed on 200 g silica gel (elute with $CHC1_3$) or distill (130/0.001) to purify.

5-Alkyl Resorcinols TET *23,77(1967)*

Since the method as given originally leads to 4-alkyl resorcinols which do not produce an active THC, it is here modified to give the 5-alkyl isomers. The method is illustrated for 1.2-dimethyl-heptyl resorcinol which gives a much more active THC than olivetol.

Convert 3,5-dihydroxyacetophenone (5-acetyl resorcinol) to 3,5-dimethoxyacetophenone(I) in the usual way with di-methylsulfate.

To 24 g Mg, 1 crystal I_3, 100 ml ether, add dropwise under N_2, 180 g 2-Br-heptane in 100 ml ether over one hour and then reflux two hours. Add over IVi hours a solution of 90g (I) in 200 ml tetrahydrofuran and reflux 10 hours. Cool and add 180 ml saturated NH_4Cl; decant the solvents and extract the residue with tetrahydrofuran. Combine the solvents and the tetrahydrofuran and dry, evaporate in vacuum. Add a few drops 20% sul-

furic acid to the residual oil and evaporate in vacuum the water (oil bath temperature 120-130° C/10 mm). Distill the oil at oil bath temperature 285° C/0.2. Fraction boiling 1 28-140/0.2 yields about 60 g 2-(3,5-diniethoxyphenyl}-3-methyl-2-octene (II). If saponified and used to synthesize aTHC, this might give an active product, thus disposing of the necessity of the next step. Hydrogenate 50 g (II) in 100 ml ethanol, 2-3 atmospheres H_2, 0.6 g 10% Palladium-Carbon catalyst for two hours, or until no more H_2 uptake (or use the $NaBH_4$-Ni method described at the start). Filter and dry, evaporate in vacuum, and distill the residual oil (110-17/0.1) to get 42 g of the octane (III). 40 g (III), 100 ml 48% HBr, 320 ml glacial acetic acid and reflux four hours. Pour on ice and take pH to 4.5 with ION NaOH and extract with ether. Extract the ether with 3X150 ml 2N NaOH; acidify the combined NaOH extracts with glacial acetic acid and extract with ether. Dry and evaporate in vacuum, and distill the oil (159/0.1) to get 20 g 5-1, 2-dimethylheptyl resor-cinol. *5-Alkyl Resorcinol; JACS* 6^,232(1939)

Convert bcnzoic acid to 3,5-dihydroxybenzoic acid (alpha-resor-cylic acid) (I). 50 g (I), 134 g dimethylsulfate, 60 g NaOH, 300 ml water; add 35 g NaOH and reflux to obtain about 50 g 3,5-dimethoxybenzoic acid (II) which is converted to dimeth-oxybenzoyl chloride (III) with PCl_s. Extract the (III) with ether and filter. Saturate the ether with NH_3 at 0° C and filter. Wash with ether and water and recrystallize from hot water to get 3,5-dimethoxybenzamide (IV). To a solution of 1 M of n-hexyl bromide (or 1,2-dimethylheptyl bromide, etc.) add 24.3 g Mg in 200 ml ether to prepare the Grignard reagent. Then rapidly add 46 g (IV); add 300 ml ether and reflux and stir two days, excluding moisture and air. Add a mixture of ice and water and 80 ml concentrated sulfuric acid. Separate and dry, evaporate in vacuum tlie ether layer to get about 50 g of the dimethoxyyalkyl benzyl ketone (V). Recrystallize from dilute ethanol. Add 0.2 M (V), 20.8 g 100% hydrazine hydrate, 75 ml ethanol; reflux six hours. Evaporate in vacuum and heat thu re-sidual oil with 82 g powdered K.OH in oil bath about 225° C until N_2 evolution ceases. Can distill or recrystallize from 95% ethanol to get the dimethoxyalkyl benzene (VI). 0.025 M (VI),

40 ml glacial acetic acid, 15 ml 48% HBr; reflux four hours and pour into ice water; decolorize with a little Na bisulfite, neutralize with $NaHCO_3$ and extract with ether. Wash the extract with 10% NaOH and separate and acidify the basic solution. Extract with ether and dry, evaporate in vacuum the extract to get the 5-alkyl resorcinol. Distill or recrystallize from water to purify. Dry, evaporate in vacuum the first ether extract to recover starting material.

OKvetolLAC 650,77(1960), JCS 311(1945), cf. JACS *89,6734* (1967)

Dissolve 100 g malonic acid in 360 g dry pyridine and heat 48-52° C for forty hours with 100 g n-hcxaldehyde (n-capronaldehyde) or homolog. Cool in ice bath and with good stirring add dropwise 150 ml ice cold concentrated sulfuric acid (keep temperature below 5° C). After addition add water to dissolve the precipitate and extract with ether two times. Dry, evaporate in vacuum the ether and distill (70/0.7 or 102/5) to get about 98 g 2-octenoic acid (I). 95 g (I) in 300 ml ether; cool to -5 C and slowly add a solution of an excess of diazomcthane in ether dried over KOH and let react for about one hour. Let stand twelve hours, evaporate in vacuum and distill (91/17) to get about 94 g clear methyl-2-octenoate (II),

To 16.3 g Na in 210 ml ethanol add 93 g ethyt-acetoacetate (ethyl-3-oxo-butanoate), heat to boil and add dropwise 92 g (II) over 20 minutes. Stir and reflux five hours and cool to precipitate. Filter, wash with elhanol and dissolve precipitate in 800 ml water. Cool to 0° C and slowly add 80 ml ice cold concentrated HCl to precipitate. Filter, wash with water and ligroin to get about 108 g 6-carbethoxy-4,5-dihydro-olivetol (III) (recrystallize from petroleum ether). To 104 g (III) in 260 ml glacial acetic acid at room temperature with good stirring, add dropwise over one hour 69 ml Bromine. Heat four to five hours at 60° C, cool and add 300 ml water and let stand twelve hours. Oil separates which will precipitate on agitation and rubbing. Filter, wash with water until colorless (recrystallize from ligroin, recrystallize from glacial acetic acid and precipitate with water) to get about 86 g 6-carbethoxy-2,4-dibromo-olivetol (IV). 0.035 g Palladium-Carbon catalyst in 25 ml hydrogenation bottle. Saturate with H_2 (pressure - 2.8 Kg/cm^3) and add 0.33g

(IV) in 5 ml glacial acetic acid, which'takes up 39.5 cm^3 H_2 at atmospheric pressure over I^1/* hours at 60-70° C. Filter and acidify at 0° C with ice cold 6N HCl. Extract with ether and dry, evaporate in vacuum. Recrystallize the oil from ligroin and then from glacial acetic acid by adding water to get about 0.2 g 6-carbethoxyolivetol (V). (IV) can also be hydrogenated at room temperature and atmospheric pressure over Hg Palladium-Car bon catalyst by dissolving 70 g in 500 ml 1N NaOH. Heat 35 g (V) with 45 g NaOH in 1 70 ml water for two hours or until no more CO; is evolved. Cool, acidify with 6N HCl and boil 3 min utes. Extract the oil with ether and dry, evaporate in vacuum the ether (can distill on Vigreux column 123/0.01, oil bath 160° C) and let oil stand in refrigerator until crystalline to get about 21 g olivetol. See CA 70,77495t(1969) for another var iant of this procedure.

*l[l],l'-DimethyhlivetolHCA 52,*1127(1969)

Prepare 3,5-dimethoxy benzyl alcohol by reducing the acid with lithium aluminum hydride as described elsewhere here, by hydrogenating the aldehyde (2-3 atmospheres H_2, room temperature, PtO_2 in ethanol—or by the $NaBH_4$ method), in five steps as described in JACS 70,666(1948), or prepare (II) directly by the diborane procedure.

Add with stirring 22.5 g $SOC1_2$ in 100 ml ether in 20 ml portions to a solution of 15 g 3,5-dimethoxybenzyl alcohol, 1 ml pyridine and 200 ml ether. Let stand and wash with 2X100 ml cold water; separate and dry, evaporate in vacuum the ether to get 1 6 g 3,5-ttimt;thoxybenzyl chloride (I). Recrystallize from petroleum ether. 16 g (I), 300 ml ethanol, 30 g NaCN, 75 ml water; reflux three hours and pour onto 400 g ice. After ice melts, filter and recrystallize precipitate from petroleum ether to get about 14 g 3,5-dimethoxybenzyl CN (II). 5g 50% NaH in mineral oil; wash three times with pentane or hexane; fill flask with N_3 or argon and add dimethoxyethane or dimethylformamide (freshly distilled from K if possible). Stir and add 9 ml methyl iodide. Carefully add 8 g (II) and stir twelve hours. Add ice water and neutralize with $NaHCO_3$ to pH 7-8. Extract with ether and dry, evaporate in vacuum the ether (can distill 1 70/ 0.1) to get about 9 g alpha, aIpha-dimethyl-3,5-dimetboxyphenylacetonitrile (III). Add 1.5 g (III) to a solution of 0,45 g Mg,

2.5 g n-propyl Br (freshly distilled if possible) in **30** ml **ether. Reflux sixty-five hours. Add** 2N sulfuric acid and **heat two hours on water bath. Cool and** extract **with ether and dry, evaporate in vacuum** (can **distill** 135/0.001) **to** get **about** 1.75 g **2-**methyl-2-(3,5-dimethoxyphenyl) **hexanone-3** (IV). **Dissolve** 4 g (IV) in **50** g **ethane** dithiol **and saturate at 0° C** with **HCl** gas **(take care to** exclude water). Stir **the solution in a sealed container** forty-eight **hours at room temperature** and then basify **with $NaHCO_3$. Extract** with ether **and** dry, **evaporate in vacuum (or dry and evaporate in vacuum two hours** at 70/12 and distill at **130/0.001) to get about 5 g of the thioketal (V). Reflux 5.3 g (V), 100 g Raney-Ni, 2 L ethanol (or use $NaBH_4$ procedure) for** thirty hours. Cool and **filter** (Celite), **evaporate in vacuum and** distill **residue** (115/0.001) to **get** 3,7 **g** of the **hexane which is** saponified as **described** for **the** dimethyl ether of **olivetol above to give about 2.5 g of** the title **compound** (can distill **150/0.001).**

***Olivetol* ACS 24,716(1970)**

Prepare 3,5-dimethoxybenzoic acid as described **elsewhere** here, **and** to a **solution of 18.2 g in 250 ml dry tetrahydrofuran under N_2, add 1 g 85% LiH, stir for fourteen hours and then reflux for** one-half **hour. Add a solution of about 1,3 M** butyllithium **in ether [Org. Rxns.** 6,352(1957)] with **stirring and ice cooling until the reaction mixture gives a positive Oilman test [JACS** *47,* 2002(1925)]**. Then add 500 ml ice water, extract** with ether **and dry, evaporate in vacuum** the organic phase to get a yellow oil which is **dissolved in an equal amount of absolute ethanol; left in refrigerator twelve hours to precipitate. Filter and evaporate in vacuum the ethanol to one-half volume** to give **more precipitate for a total of 18 g** l-(3,5-dimethoxyphenyl)-l penta-**none** (I). **5.64** g(I) in **200 ml methanol; 0.66** g 20%$Pd(OH)_2$ **on carbon [TL** 1663(1967)] **and hydrogenate at room temperature and atmospheric pressure over two to three** hours (or **use other reducing method as described** here). Filter and **evaporate in vacuum to get olivetol dimethyl ether** (II). 4.88 g (II), **40 ml HI (density 1.7, decolorized** with **red phosphorous) and stir three hours at 115-125° C under N_2. Dry, evaporate in vacuum or pour into 100 ml ice water and extract with methylene chloride; wash methylene chloride with water and dry, evaporate in vacuum (can distill 160-170/3-4) to get 3.5 g olivetol.**

5-Alkyl Resorcinols JOC ^,687(1968), JACS 71,1624,1628 (1949)

Illustrated for 1,2-dimethylheptyl compound.

110 g powdered 3,5-dimethoxybenzamide (preparation given elsewhere here), five times excess of rnethylMgl and reflux sixteen hours. Add 1.2 L concentrated HCl and 1200 g ice and let stand sixteen hours with occasional shaking. Extract with ether, dry, evaporate in vacuum and distill (115-128/0.3). Let stand in refrigerator to precipitate. Wash precipitate with petroleum ether and recrystallize from petroleum ether to get about 60 g 3,5-dimethoxyacetophenone (1). 83 g (I) in 50 ml methanol. Add dropwise with stirring to solution of 18 g $NaBH_4$ in 300 ml methanol and 1 g NaOH. Reflux 30 minutes and concentrate by distilling. Add about 100 ml water during distillation. Evaporate the methanol, cool and extract with ether. Dry, filter, concentrate, and distill (124/0.65) to get about 80 g 3,5-dimethoxyphenyl ethanol (II). 18 ml PBr_3 in 70 ml ether; add dropwise with stirring over one hour to 28.5 g (TI) in 70 ml ether cooled in an ice bath. Warm to room temperature; reflux two hours on steam bath; cool and pour into 200 g ice. Shake and extract with ether 3 times; wash ether with 10% $NaHCO_3$ and water and dry, filter. Concentrate on steam bath and then add with stirring under anhydrous conditions to 42 g diethyl-n-amylmalonate in 300 ml ethanol in which has been dissolved 4.6 g Na metal. Stir I'/i hours at room temperature and then heat to distill off the ether and complete the reaction. When the distillation head temperature reaches 78°C add water and continue distilling until temperature reaches 99° C. Cool, and extract with 3X250 ml ether and evaporate in vacuum the ether. Dissolve residue in 180 ml ethylene glycol and 35 g NaOH by stirring six hours at 160° C. Coot and add 1500 ml water and wash with ether. Acidify the aqueous phase and extract with 4X200 ml ether. Evaporate in vacuum the ether or evaporate on steam bath and dissolve the residue in 150 ml xylene. Evaporate residua! ether and water until head temperature reaches 140° C and reflux six hours. Evaporate in vacuum to get about 30 g oily alpha-amyl-beta-methyl-hydrocinnamic acid (III). 14.5 g (TIT), 5 g lithium aluminum hydride, 250 ml ether; reflux 6 hours. Cool and carefully add methanol, water and dilute HCl. Separate the aqueous layer, saturate with NaCl and extract with ether. Wash ether

with $NaHCO_3$ (acidify $NaHCO_3$ extract to precipitate starting material) and dry, evaporate in vacuum the ether to get about 12 g 2-amyl-3{3,5-dimethoxyphenyl)-butanol (IV). 11.7 g (IV) and 8.5 g p-toluenesulfonyl Cl each dissolved in 20 ml pyridine. Cool in ice bath and combine. Place in freezer about sixteen hours, pour over ice and extract with ether. Wash ether with cool, dilute HCl until HCl extract is acidic. The combined HCl extracts are then acidified and extracted with ether. Wash the ether with $NaHCO_3$, dry and then add dropwise with stirring to 3 g lithium aluminum hydride in 75 ml ether. Reflux 4Vi hours and work up as for (IV), (Can chromatograph the undistilled product on activated alumina and elute with 600 ml petroleum ether, then 200 ml methanol; concentrate and distill (94/0.001) the petroleum ether to get product; concentrate the methanol to give starting material). Yield is about 8 g 2-(3,5-dimethoxy-phenyl)-3-methyl-octane (V). Convert (V) to the title compound by refluxing in 48% HBr in glacial acetic acid as described elsewhere here.

An alternative route from (II) to (V) involves adding (II) and diethylmethylmalonate to prepare dimethyl-3,5-dimethoxyhydrocinnamic acid as described for the preparation of (III). Then dehydrate and hydrolyze to dimethyl-3,5-dimethoxycinnamic acid which is hydrogenated to the alcohol and converted in several steps to (V).

5-Alkylresorcinots Aust. J. Chem. 21,2979(1968) Reflux 6.9 g triphenylphosphinc and 6.6g lauryl bromide (or equimolar amount of homolog) in 40 ml xylene for 60 hours. Remove solvent and wash residue with 5X20 ml ether (by decanting) to get] Ig lauryl triphenylphosphonium bromide(I). To a stirred suspension of 5.6g(0.011M)(I) in 50 ml ether add 0.01M butyllithium solution [see Organic Reactions 5,258 (1954) for preparation] -Stir *Vz* hour at room temperature and slowly add 1.66g 3,5-dimethoxybenzaldehyde (preparation given elsewhere here) in 10 ml ether over *Vi* hour. After 15 hours, filter, wash filtrate with water and dry, evaporate in vacuum. Dilute residue with pentane, filter and remove solvent. Dissolve the residual oil in 25 ml ethyl acetate and hydrogenate over O.lg Adams catalyst at one atmosphere and room temperature for 2 hours. Filter and evaporate in vacuum to get the 5-

alkylresorcinol dimethyl ether which can be recrystallized from pentane and demethylated as described elsewhere here-

5-AlkylrtisoTcmols Aust. J. Chem. 21,2979(1968) Add 2.17g 3,5-dimethoxybenzoyl chloride [see BER 41,1329 (1908) or elsewhere here for preparation] in 2.5 ml ether over 10 minutes to a stirred solution of 0.4 2g diazomethane and 1.01 g triethylamine in ether at -5° C. Keep 10 hours at 0° C, filter, wash precipitate with 20 ml ether and evaporate in vacuum the combined filtrates to get 1.9g diazo-3,5-dimethoxyacetophenone(I). Recrystallize from benzene-cyclonexane. To 1.5g(I) in 15 ml ethanol add 1.23g pyridinium perchlorate in 2 ml pyridine. Reflux 2 hours, cool and add 5 ml water. Filter to get 1.5g 3,5-dimethoxyphenylacyl pyridinium perchlorate (II). Recrystallize from ethanol. To a stirred suspension of 0.13 g Na hydride in 10 ml dry, acid free dimethylacetamide at 10° C under nitrogen, add 1.79g (II) in 10 ml dimethylacetamide and shake for 15 minutes. Add 0.0075M propyl iodide or homolog and keep 12 hours at room temperature. Heat 2 hours at 90° C and cool to room temperature. Add 3g zinc dust and 5 ml glacial acetic acid; stir at room temperature four hours and filter. Add 20 ml water to filtrate and extract with 50 ml ether. Wash the ether layer with 2X50 ml 10% K_aCO_3, 50 ml water and 20 ml saturated NaCl. Dry and evaporate in vacuum to get oily 3, 5-dimethoxyphenylbutyl ketone (can chromatograph on 50g alumina and elute with 3:1 petroleum ethenether). Recrystallize from methanol. Hydrogenolysis [see Aust. J. Chcm. *18,* 2015(1965) or elsewhere here] gives the olivetol dimethyl ether.

5-Alkylresorcinols Aust. J. Chem. 24,2655(1971)

The method is illustrated for olivetol preparation, but substituted thiophens can be used to get olivetol homologs.

To a stirred solution of 45g 3,5-dimethoxybenzoyl chloride and 17.4g thiophen in 300 ml benzene at 0° C, add dropwise 10.5g freshly distilled stannic chloride. Stir one hour at room temperature and add 200 ml 3% aqueous HCl. Separate the benzene layer and wash the aqueous layer with benzene. Dry and evaporate in vacuum the combined benzene layers and distill the red residue (250° C bath/4.5) to get 45g 2-(3,5-dimethoxy-

benzoyl) thiophen(I), Recrystallize from petroleum ether. Add a solution of 21g $AlCl_3$ in 160 ml ether to a stirred suspension of 6.1g lithium aluminum hydride in 140 ml ether. After 5 minutes add a solution of 39g (I) in 300 ml ether at a rate giving a gentle reflux. Reflux and stir 1 hour; cool in an ice bath and treat dropwise with 50 ml water, then 50 ml 6N aqueous sulfur-ic acid. Separate the layers, extract the aqueous layer with 3X 100 ml ether and dry, evaporate in vacuum the combined ether layers. Can distill the residue (230° C bath/5mm) to get 27g oily 2-(3,5-dimethoxybenzyl) thiophen(II). Recrystallize from petroleum ether. Reflux a solution of 5g (II) in 700 ml ethanol with W-7 Raney Nickel prepared from Ni-Al alloy [see Org. Synthesis Coll. Vol. *Ill,* 176(1955)] for 6 hours. Filter, evaporate in vacuum and can distill (140/0.01) to get about 2.2g oily olivetol dimethyl ether which can be reduced to olivetol as described elsewhere here. The use of the noVel reduction methods described at the beginning of this section would render this method much simpler.

5-Alkylresorcinols German Patent 2,002,815 (30 July 1970) In a 2 liter, 3 necked flask with a stirrer, dropping funnel, thermometer, reflux head, nitrogen stream and mercury manometer (if available) stir 230 ml dry methanol and 32.4g sodium methoxide under nitrogen until dissolved. Add llOg diethylmalonate and stir 10 minutes. Add portionwise 75g 90% pure 3-nonene-2-one (for olivetol-preparation below) keeping the temperature below the boiling point (50-60° C). Stir and reflux 3 hours, then cool to room temperature, neutralize with about 50 ml concentrated HCl and let stand overnight. Evaporate in a vacuum and dissolve the residue in 200 ml IN HCl and 800 ml ethylacetate. Separate and wash the ethylacetate with 2X300 ml water and extract with saturated $NaHCO_3$ until a small portion gives no turbidity upon acidification (about 5X200 ml). Carefully acidify the combined NaHCOj extracts and then extract with 3X300 ml ether. Dry and evaporate in vacuum the ether (can dry under vacuum several days) to get 6-n-pentyl-2-OH-4-oxo-cyclohex-2-ene-l-methyl-carboxylate (I). 4.8g (I) and 100 ml glacial acetic acid are stirred vigorously at 75° C until dissolved. Cool and keep temperature between 5 and 10° C while adding a solution of 3.9g bromine in 10 ml glacial acetic acid

dropwise over 1 hour. Stir 1 hour at room temperature then 3 hours on a steam bath. Evaporate in vacuum and dissolve the residual oil in 200 ml ether. Wash with 2X25 m! 10% sodium dithionite, 2X25 ml saturated $NaHCO_3$ and water and dry, evaporate in vacuum to get olivetol (or analog) (can distill at 125-130/0.05).

Alternatively, to 4.8g (I) add 5.6g iodine in 200 ml glacial acetic acid. Stir and reflux 10 hours, evaporate in vacuum, dissolve residue in 250 ml ether and proceed as above to get olivetol.

A third alternative is to stir 12.2g (I) in 100 ml glacial acetic add at 25° C with vigorous stirring until well suspended. Cool and keep temperature at 5-10° C while adding dropwise 22.4g cupric bromide dissolved in 25 ml glacial acetic acid over 1 hour. Stir 1 hour at room temperature then 3 hours on a steam bath and evaporate in vacuum. Dissolve the residue in 200 ml water and 300 ml ether. Wash the ether layer with 2X50 ml 10% sodium dithionite, 2X35 ml saturated $NaHCO_3$ and 75 ml water and dry, evaporate in vacuum to get olivetol (or analog).

For the 1,2-dimethylheptyl homolog proceed as follows. Combine 15g 5,6-dimethylundec-3-ene-2-onc with 1 9g diethylmalonate as described above to get (1). Brominate 20.2g (I) with 12g bromine over 2 hours as described and stir 1 hour at room temperature. Add 500 ml water and let stand overnight at 5-10° C. Filter, wash precipitate with about 4X75 ml cold water and dry in vacuum at 50° C to get 26g 3-bromo-2-OH-4-oxo-6 (l,2-dimethylheptyl)-cyclohex-2-ene-l-methylcarboxyl-ate (II). In a 3 liter 3 necked flask with a stirrer, thermometer, reflux head and Dean-Stark trap, add 350g (II) and 522g pyri-dine hydrochloride and heat on oil bath at 90° C 4 hours. Heat with the heating mantle (removing volatiles with the Dean-Stark trap) until the internal temperature reaches 190-200° C and hold at this temperature 2 hours. Cool to room temperature and shake with 3 liters ether and 660 ml 1.2N HCl. Separate and wash the ether layer with 300 ml 1.2N HCl and then 2X300 ml water. Extract the ether solution with 4X350 ml 10% NaOH and then extract the combined NaOH extracts with 2X300 ml ether. Acidify the alkaline solution with about 700 ml concentrated HCl and extract with 3X800 ml ether. Wash the combined ether extracts with 3X300 ml 10% sodium dith-

ionite, 2X300 ml saturated $NaHCO_3$ and 300 ml water and dry, evaporate in vacuum the ether to get the 5-(l,2-dimethyl-heptyl) resorcinol.

To prepare the 3-nonene-2-one condense excess acetone with n-hexaldehyde (or 2,3-dimethyloctanal for 5,6-dimethyl-undec-3-ene-2-one) in the presence of NaOH in an inert medium if desired (benzene, toluene, xylene, etc.), at 10-70° C to get (I). Dehydrate (I) with sodium sulfate or cupric sulfate in an inert medium at reflux temperature or simply reflux in benzene, xylene or toluene.

5-AlkylresoTcinols JOC 37,2901(1972)

For 5-alkylresorcinols see Chem. and Ind. 685(1973) also.

This is an improved version of a previously given synthesis (LAC 6^0,71(1960}). The cthanol used is distilled from Ca ethoxide; dimethoxyethane from potassium. Cupric bromide is produced from cupric oxide and 5% excess of HBr, plus sufficient bromine to remove the milkiness on addition of a drop of the mixture to water; concentrate and dry, evaporate in vacuum over KOH flakes.

650g (5.3M) ethyl chloroacetate and 880g (5.3M) trie'thyl phosphite are mixed and placed in a 3 liter flask fitted with a thermometer and condenser under nitrogen. Heat and stir and slowly bring to 125° C. Discontinue heating as ethyl chloride evolution proceeds over *Vi* hour. Heat to 160° C over a 75 minute period and keep at 160° C 8 hours. Cool, distill (e.g., through 12" Vigrcux column) (74-7/0.03) to get 96% yield of triethylphosphonoacctate (I). In a 3 liter flask fitted with a stirrer, dropping funnel and condenser, place 45.3g NaH (1M in mineral oil) and 1 liter of dry ether. Flush with nitrogen and keep at positive nitrogen pressure. Stir in ice bath while 224 g (1M) (I) is added dropwise over 75 min. Stir and reflux 1 hour (H_2 evolution stops). Cool in ice-salt bath and add 1M of aldehyde (e.g., hexaldehyde for olivetol) over 1 hour. Continue to cool and stir an additional 10 minutes and then slowly bring to reflux and reflux for 10 minutes (ppt. prevents stirring). Decant the ether and dissolve the oil layer in 500 ml warm water and separate the upper organic layer. Extract the aqueous layer with 200 ml ether and extract the combined organic solutions with 200 ml saturated $NaHCO_3$. Dry and evaporate in vacuum (can

distill) to get the ethyl-|8-alkylacrylates in about 90% yield (II).

In a flask with nitrogen and fittings as in preceding step, add 156 g ethyl acetoactztate to Na ethoxidc from 25.3g Na and 500 ml dry ethanol, and stir and reflux ¥*2* hour. Add 1M of (II) drupwise over 90 minutes and reflux 20 hours. Cool in ice, filter, wash ppt with 500 ml ice cold absolute ethanol and several times with portions of ether and dry, evaporate in vacuum to get the dione Na salt (III) in about 80% yield (for olivetol precursor). In a 250 ml flask place 0.1M (III), 100 ml 1,2-dimeth-oxyethane and flush with nitrogen and stir at room temperature while 45g of cupric bromide is added portionwise over 5 minutes, under a nitrogen stream. Stir *Yz* hour and then reflux and stir 1 hour. Cool and evaporate (keep temperature below 50° C) but do not remove more than about 65 ml dimethoxyethane. Dilute the remaining solution with 200 ml benzene and filter. Wash the ppt. with 50 ml benzene and evaporate the combined benzene filtrates (keep temperature below 50° C). Dissolve the bromodione in 100 ml dime thy Iformamide and put in 500 ml flask under nitrogen. Stir and heat slowly until reflux and then heat to 150° C and reflux 4 hours. Cool, pour into 500 ml water, extract with 3X100 ml dichloromethane and dry, evaporate in vacuum to get the ethyl-6-alkyl-2,4-dihydroxybenzoate (IV). Add a solution of 24g NaOH in 200 ml water to (IV) and stir and reflux under nitrogen in hood for 3 hours. Cool in ice bath, acidify carefully with a cold solution of 20 ml concentrated sulfuric acid in 80 ml water while stirring under nitrogen in ice bath. Reflux under nitrogen 5 minutes, cool, extract 3 times with ether and dry, evaporate in vacuum the combined extracts to get about 80% yield of olivetol (or analog). The last step may not be necessary since (IV) may yield an active THC.

Dimethylheptylresorcinol CA 65,20062(1966)

This method is specifically designed to produce good yields of dimethylheptylresorcinol, which provides, after synthesis by any of the various routes, one of the most active THC analogs yet discovered. Note that the synthesis may not have to be carried all the way to the alkylresorcinol since the intermediate ketones etc. may give an active THC analog.

Mix 294g (1.6M) 1,3,5-trichlorobenzene, 184g (3.4M) Na metlioxide and 450g (3.3M) diglyme and reflux at 162° C for

42 hours. Cool to room temperature, filter and distill the solvent to get 70% yield of l-Cl-3$_f$5-dimethoxyhenzene (1). 43.2g (1) in 540 ml tetrahydrofuran is added dropwise to 7.3g Mg, a small crystal of iodine and a few drops of ethyl bromide (under nitrogen if possible) over *Vi* hour while the mixture is heated to 75° C. Reflux 2 hours and cool to room temperature to obtain the Grignard solution.

To anhydrous liquid ammonia in a cooled flask, add Fe(NO_3 }$_3$. $9H_2O$ and then small pieces of sodium and bubble air through the solution until reaction is observed. Add more sodium portionwise until 11.5g is in solution. To the solution at its reflux temperature, add 27.6g (0.5M) proprionitrile (or isobutyronitrile etc. for analogs) and add the resulting solution dropwise to 53.3g 1-Cl-pentane (or 0.5M analog such as 2-Br-hexane etc.) and let the ammonia evaporate. Add ether, then water to the residue and separate the aqueous layer and extract with ether. *Dry* and evaporate in vacuum the combined ether solutions to give 64% yield of 2-methylheptanonitrile (II) (or analog).

Add 34.0g (0.27M) (II) in tetrahydrofuran to the Grignard solution of (I) over ¥*i* hour, heat 6 hours at 60° C and hydrolyze with 1600 ml 50% sulfuric acid, keeping the temperature below 40° C. Evaporate in vacuum the solvent and add another 400 ml 50% sulfuric acid. Heat 1 hour at 95-100° C, cool, add ether, separate the aqueous layer and extract with ether. Dry and evaporate in vacuum the combined ether layers to get 71% yield 2-(3,5-dimethoxyben7,oyl) heptane (III) (can distill 133-8/0.2), which can be demethylated as described for the preparation of (VII) below and possibly used to synthesize an active THC analog (as can IV, V, or VI).

21.8g (0.082M) (III) is added dropwise (keeping the temperature at 15-20° C) to 3 molar methyl-MgBr in ether and refluxed 1 hour. Pour into a sulfuric acid-ice mix, add more sulfuric acid and stir. Separate and extract the aqueous layer with ether. Wash, dry, filter and evaporate in vacuum the combined ether layers to get 2-(3,5-dimethoxyphenyl)-3-methyl-octanol (IV), which is dehydrated by mixing with anhydrous oxalic acid and heating to 130-40° C. Extract the dehydrated reaction products with benzene to get the octenes (V). Add 25g (V), 2.5g

65% Ni on kieselguhr in dry hexane to hydrogenator and hydrogenate at 1750 psi and gradually increase the temperature to 125° C, After 3 hours, increase the pressure to 1850 psi and hold there 2Vi hours. Filter and evaporate in vacuum to get 2-{3,5-dimethoxyphenyl)-3-methyl-octane (VI).

Add 20g (0.08M) (VI) to 38% HBr in glacial acetic acid and stir and reflux for 6 hours. Pour onto ice and water, neutralize with solid sodium carbonate and extract with ether. Extract the ether with 10% aqueous NaOH, acidify the aqueous solution with HCl, extract with ether and dry, evaporate in vacuum (can distill) to get 2-(3,5-dihydroxyphenyl)-3-methyloctane (VII) (5-(t,2-dimethylheptyl)-resorcinol).

As an alternative process for getting from (HI) to (VI), combine 64,2g (0.18M) methyl trip henylphosphonium bromide in dry benzene with 11.6g (0.18M) (in 14% solution) butyllithium in benzene. Heat to 60° C and cool. 49.0g (0.176M) (III) in 40 ml dry benzene is added (keep temperature below 40° C) and then reflux 2 hours. Cool, filter and evaporate in vacuum to get the octene, which after catalytic hydrogenation as described for (V) yields (VI).

5-Alkylresorcinoh Aust. J. Chem. *21,*2979(1968)

Mix 50g 3,5-dihydroxybenzoic acid, 250 g K_3CO_3, 200 ml dimethylsulfate and one liter acetone and reflux 4 hours. Remove the acetone, add one liter water and one liter ether to the residue and extract. Wash the ether extract with 2X100 ml concentrated NH_4OH, 2X100 ml dilute HCl and 100 ml water and dry, evaporate in vacuum to get 48g methyl-3,5-dimethoxyben£oate (1), Recrystallize from aqueous methanol. To a stirred suspension of 19g lithium aluminium hydride in 200 ml ether add 78.4g (I) in 300 ml ether at a rate which gives gentle refluxing. Reflux *2[l]/2* hours, cool and add 50 ml wet ether; then 100 ml dilute sulfuric acid. Wash and dry, evaporate in vacuum the ether extract to get 62g oily 3,5-dimethoxybenzyl alcohol(II). Recrystallize from ether-pentane. To a cooled stirred slurry of 15gCrO_3 and 250 ml pyridine add 8.4g (II) in 25 ml pyridine and let stand 1 hour at room temperature. Add 60 ml methanol, let stand 2 hours, and dilute with 500 ml 5% NaOH and 500 ml ether. Extract the aqueous layer with ether and wash the combined ether layers with 500 ml water, 3X500 ml 5% sulfuric

acid, 500 ml water and 200 ml saturated NaCl and dry, evaporate in vacuum to get 7g 3,5-dimethoxybenzaldehyde(III). Recrystallize from ether-pentane. To a flask with a dropping funnel and condenser add 0.58g Mg turnings and 10 ml ether. Add a few drops of a solution of lauryl bromide (5.7g) or equimolar amount of homolog in 15 ml ether and start reaction by adding 2 drops methyl iodide. Add the remaining bromide solution with stirring and gentle refluxing over 15 minutes and then reflux 3 hours. Cool in an ice bath and add 3.1g (III) in 5 ml ether dropwise with stirring over 45 minutes. Reflux 4 hours, cool and dilute with ice water. Wash the organic layer with 2X 25 ml 3N sulfuric acid, 2X25 ml 10% K_2CO_3, 25 ml water, 25 ml saturated NaCl and dry, evaporate in vacuum to get 5g 3,5-dimethoxyphenyldodecyl methanol(IV) or homolog. Recrystallize from methanoL Hydrogenate 4.2g (IV) in 50 ml ethyl acetate with 5 drops concentrated sulfuric acid and 0.5g 10% Palladium-Carbon catalyst at room temperature and 5 atmospheres hydrogen for 4 hours. Filter and evaporate in vacuum to get the alkylresorcinol dimethyl ether.

Aust. J. Chem. 26,799(1973) gives a 2 step synthesis of 5-alkylresorcinols by condensation of beta-ketosulphones with 3, 5-dimethoxybenzyl bromide and then reduction. Aust. J. Chem. 26,183(1973} gives a synthesis from 3,5-diniethoxy-N.N-dimethylbenzylamine in 7 steps (but perhaps only 4 will reach a cpd. that can give an active THC analog).

5-Alkylresorcinoh CPB 20,1574(1972)

To a solution of 0.02M ethyl-0-ketocaprylate (or homolog) in 20 ml tetrahydrofuran, add 1.02g (0.02M) (53% oil) NaH with stirring and cooling and then add a solution of diketene (1.68g_t 0.02M) in 20 ml tetrahydrofuran dropwise, keeping the temperature between -5 and 0° C. Stir 1 hour at this temperature and then 1 hour at room temperature. Neutralize with 10% HCl and extract with ether. Dry and evaporate in vacuum to get about 38% yield of ethyl-olivetol carboxylate (I). (I) can be purified on silica gel, the impurities being eluted with petroleum ether (30-35° C) and the product with 8:1 petroleum ether:ether. Recrystallize from n-hcxane. Dissolve 0.2g (I) in 10 ml 10%NaOH and reflux 30 minutes. Acidify with 10% HCl and extract with

ether. Wash the extract with water and dry, evaporate in vacuum (can distill 126-129/3) to get 96% olivetol (or homolog).

For new, simple, high yield syntheses of 5-alkyl resorcinols see TL 4839(1973), 2511(1975) and CJC 52:2136(1974).

Notes

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Glossary

cyclize—to form into a circle. Specifically, to link the OH group of CBD to the carbon atom to form the 3 ring compound THC, from the 2 ring compound CBD.

decarboxylate—to remove *a,* carboxyl (-COOH) group from a molecule. Specifically, to remove the carboxyl group from THC acid or CBD acid, by heating, to give THC or CBD.

dioecious—having the reproductive parts for the two sexes on separate plants.

genotyp*—the genetic makeup or hereditary characteristics of an organism, usually contained in the DNA of the cell nucleus.

Jsomerize—to rearrange the atoms of a molecule such that the molecular weight remains the same but the chemical or physical properties change. Specifically, when CBD is cyclized to THC, it has undergone isomerization.

monoecious—having reproductive parts for both sexes on one plant, but in separate flowers for higher plants.

phenotype—the observable physical or chemical characteristics of an organism. Color, structure and chemical composition of a plant may all be phenotypic characters.

polymers—a complex chemical compound formed of many simpler units. Cellulose is a sugar polymer and gelatin is an amino acid polymer.

polyploid—having more than the normal of original number of sets of chromosomes. The cells of most organisms have two sets and are called diploid.

senescence—the final stages of the aging of an organism leading to its death.

synergize—the working together of two forces or chemicals to produce an effect greater than the sum of their individual effects. Specifically, THC and CBD together may synergke to produce redder eyes than the sum of the redness of the same amounts of the two, taken alone.

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Marijuana Chemistry Update

(Page numbers indicate placement of update in original edition)

pages
A new compound, A^7-cis-iso-tetrahydrocannabivarin, has been isolated from Thai marijuana (CFB 29,3720 [1981]). For the biosynthesis of propyl and other canrtabinoids see Phyto-chemistry 23, 1909 (1984). Further evidence that CBN and CBN acid are aging products is given by Acta Univ. Palacki Olomuc Fac. Med. 108, 29 (1985).

page 6
A study of Sadhus (holy men) in India who smoked ganja daily an average of eleven years found little or no obvious harm (Quarterly J. Crude Drug Res. 19 (2), 81 (1981).

page 10
In evaluating cannabinoid activity it should be noted that psychoactive drugs often have complex wavelike activity with multiple effects that wax and wane.

page 10
Some good work on the relationships between the high, peak blood levels and potency of reefer have appeared in Clin.

Pharmacol. Therap. 31,617 (1982) and Psychopharmacology 75,158 (1981). It has been shown (by Brazilian researchers!) that when CBD is present in twice the amount of THC, it decreases the anxiety and some other effects of THC but does not block the pulse rate increase and produces some effects opposite to those of THC [Psychopharmacology 76,245 (1982): see also 80, 325 (1983)].

page 12
Experiments with an automatic smoking machine showed 62 percent of the THC and THCA appearing in the tar and 2 percent in the ash with the rest destroyed [(J. Anal. Toxicol. *9,* 121 (1985). The basic fraction of the smoke condensate has little activity in mice (Toxicol Appl. Pharm. 72, 440 (1984).]

page 12
A recent study [Clinical Pharmacol. Therap. 28, 409 (1980)] found that about 18 percent of the THC smoked appeared in the blood versus only 6 percent of that eaten. However, the situation is more complex since eating produced effects at much lower blood levels than smoking or injection.

page 15
A recent s tudy of THC oil mixed in marijuana found that only storage in a freezer at minus 18 degrees centigrade prevented rapid degeneration. Storing in a refrigerator at 5 degrees centigrade, at room temperature under nitrogen, or at room temperature in the dark all led to decomposition of about 75 percent of the THC in twelve weeks. (J. P. S. 67, 876 (1978)).

page 17
The morphology of Brazilian hemp is described in Rev. Cienc. Farm 4,31 (1982). The morphology and cannabinoids of Egyptian plants are presented in Biological Abstracts 76 (2) #8474.

page 18
Crosses between *C. ruderalis* and *C. sativa* [Econ. Dot. 32,387 (1978)] are intermediate in most characters, but they have either high or low THC. Also, a careful study of twenty wild *C. sativa* strains in India and their seeds grown in the U-S- has appeared (see note for page 85).
Line 8 should read "stainable".

page 19
The figure shown here has been reversed in printing and the fiber variant is found on the right. Emboden [J Psychoactive Drugs 13,15, (81)] has forcefully stated the case for polyspecific nature of the genus *Canndbis*. I agree completely.

page 20
An analysis of the constituents of ten varieties of hemp seeds led to the conclusion that there was only one species (Biological Abstracts 76, #62453).

page 22
A study of wild Indian plants showed more glandular trichomes and more cannabinoids in plants from warm, dry and windy locations and at lower elevations [Planta Medica 37,219(1979)].

page 24
Nearly all the cannabinoids are found in the secretory sac above the capitate disc of the secretory cells [Botanical Gazette 142,316(1981)].
Much work has been done on *Cannabis* glandular hairs. See Amer. J. Bot. 6Z, 1397 (1980) and references therein, and Bulletin on Narcotics 33, (3) 63 (1981). For the THC content of bracts, see Bulletin on Narcotics 33, (2) 59 (1981). A careful study of seedlings showed the first appearance of THC at 66 hours [Bot. Gaz. 148,468 (87)]

page 25
The legends for figures 10 and 11 have been reversed.

page 29
In at least some plants drastic pruning or grafting or spraying with a combination of benzyladenine and alphanapthalene acetic acid will prevent senescence in spite of fruiting [Nature 271,354 (1978)].

page 31
For more recent cloning studies see Physiologic Vegetale 18, 207-221 (1980) and Planta Med. Phytother. 20,99 (86).

page 33
Plants grown under various filtered lights show less THC than for daylight conditions [Botanical Gazette 144,43 (1983)].
For tissue culture see Z. Pflanzenphysiologie 111, 395 (1983), and Agronomic (Paris) 6,487 (86) for tissue culture and clone preparation.

page 37
A more recent study [II Farmaco. Ed. Sci. 34, 841-^53 (1979)] has shown that some polyploid plants (produced by treating young plants with 0.5 percent colchicine) can have about twice the THC concentration of untreated plants but total yield per plant is probably less. This, coupled with the facts that many plants die, that higher potency plants will probably not breed true and that colchicine is poisonous make it doubtful that such treatment is worth the effort. For further discussion see Clarke's excellent *Marijuana Botany* (And/Or Press, 1981). For a recent Russian paper on the botany of hemp polyploids see Genetika (English Edition) 15,204 (1979).

page 45
A report 0. Natural Products 42,317 (1979)] on the extensive studies at the University of Mississippi shows enormous and nearly random variations in the cannabinoid content during weeks 19 to 25 of growth and deduces that it is impossible to simply classify cannabinoid variants. However, Like most studies this one did not sample the same individual plants with time but sampled several plants and pooled the results. In view of the tremendous differences between plants from the same batch of seeds, we will have to await further studies of cannabinoid variation in single plants and in clones where the entire cannabinoid content of the plant can be measured during growth, thus minimizing the spurious fluctuations due to changes in other constituents.

page 46
It should be noted that significant amounts of both cannabigerol (India, South Africa) and THCV (India, Sudan, Afghani-

Stan, Pakistan, Lebanon) have been shown to occur more widely and all phenothypes are less well-defined geographically than was originally thought. For THCV in Russian marijuana see BA 85, 26311 (87). A cannabigerol dominant type low in THC has been described [Planta Med. 43,277 (87)]

page 48

A recent study of Mexican and Japanese strains grown in Japan showed no difference between the cannabinoid contents of the sexes. The following data on the appearance and thin layer chromatography of marijuana smuggled into Britain show that it is possible to get a fairly good idea of its origin if all facts are considered.

page 58

Medium and low THC strains of monoecious fiber hemp cultivated in France showed approximately parallel changes in CBD and THC during growth [Physiologia Vegetale 18, 349 (1980)]

It has been claimed [Lloydia 36,144 (1973)] that the sexes are about equal in cannabinoid content in plants originating north of latitude 30 deg N while females are more potent in strains originating south of 30 deg N.

A study of five monoecious fiber strains grown in France showed two cannabinoid types: one with 0.34% THC and 0.63% CBD and one withO.02% THC and 0.86% CBD [Plantes Medicinales et Phytotherapie 13,116-121(1979)].

All three strains grown outdoors in Naples gave maximum THC at 25% of full sunlight for both males and females: BA 84 , 94197 (87). Twenty generations of clones of two South African varieties showed constant chemical phenotypes with

cool temperatues best for flowering and hot for growth, Native Sudanese strains have THC but almost no CBD while high CBD strains from Britain showed increased THC and lowered CBD in the first generation in the Sudan [Fitoterapia 57 , 165, 239 (86)] . For an update on Czech cannabinoid studies see Acta Univ. Palacki Olomuc. Fac. Med. 114,11 (86) , 116,15,31 (87). The second paper describes cartnabinoids in roots.

page 60
Cannabinoid content of hashish and marijuana seized in Sweden: Arch. Kriminol 174,167(1984); content of 39 slabs of Moroccan hash: J. Anal Toxicol 7,7(1983); content of 61 slabs of Lebanese hash (which showed you could tell the batch by cannabinoid profile): J. Chromatographic Sci. 22, 282(1984). See also Forensic Sci 11489(1978).

page 68
The cannabinoid content of different organs of various strains is given in J. Nat. Prods. 43,112(1980). It is shown that a single flowering top may contain one organ with high THC, low CBD and another with high CBD, low THC. Also, seeds and pollen are shown to contain no cannabinoids (though they are usually contaminated with glandular hairs from the bracts. A recent study of Japanese plants showed that young leaves from anywhere on the plant had a higher percent THC than older leaves [CPB 28,594 (1980)]). More details on the cannabinoid content of South African plants are given in J. Pharm. Pharmacol. 32,21(1980). Small amounts are present in roots [BA *85_,* 26314 (87)] BA 8JL 17922 (87) follows variation with vege-

tative growth.

page 69
In a given African strain, you can tell the propyl THC types by their longer internodes but the total concentration of THC was still greater than that of THCV and the highest THC was in males grown in the 22 degree -12 degree phytotron. Cool temperatures produced more intensive flowering but decreased growth and development [Physiologic Vegetale 18,207(1980)].

page 69
A recent study on South African plants [J. Pharmacy Pharmacol. 32,21(1980)] found three more or less distinct cannabinoid phenotypes. The first type, typified by plants from the Transkei district, had several percent pentyl THC and virtually no propyl THC. The second type, typified by plants from Pongola district, had approximately equal quantities of pentyl and propyl THC during vegetative growth, but with maturation, both males and females increased propyl THC to two to three times the pentyl THC. The third type, typified by plants from Tzaneen district, contained several times more pentyl THC when young but by six to twelve weeks the males had about three times and the females about thirty times more pentyl than propyl THC. By the time these latter females had aged three to six months, they matched the males with about three times more pentyl.

page 72
Several studies have analyzed the cannabinoids of mari-

juana seized in Europe in order to determine potency and its probable country of origin. J. Forensic Sci. Soc. analyzes 242 reefers containing from 6 to 1090 mg of resin which were seized in England and Bulletin on Narcotics 32(4), 47(1980) and 34(3)101(1982) reports on more British seizures. Analusis 13^111(1985) tries to determine origin using gas chromatography and IR spectra, while J. Forensic Sci. Soc. 26(1)35(1986) strives to elucidate origin by the dead insects included. See Bull, on Narcs. 32(4),55(1980) for Italian seizures.

page 81
Herba Hung 23^(12)95(1984) found that the THC/CBD ratio depended on photoperiod and monoecious-dioecious crosses often gave a low THC content. Botanical Gazette 146,32(1985) found random cannabinoid fluctuations through two years in three clones, but all cannabinoids increased or decreased simultaneously with no correlation between the three clones. Morphology and cannabinoid profile were constant. Once again this shows the dominance of genetics and the fallacy of those studies which purport to show dramatic variations of cannabinoid profile with environment. Of course, there may be strains in which cannabinoids do vary with environment but only cloning studies are relevant and they have so far failed to reveal such strains.

A study of plants grown for four generations in England from tropical seeds showed varying total yields from year to year but total THC contents comparable to those of the first generation. THCV levels declined in plants from Southern Africa and rose in many from Mo-

rocco and *Sri* Lanka. Moroccan plants also tended to show increased CBD (Bulletin on Narcotics 37 (4), 75 (85). A recent Study BON 34 (1). 45 (82) from the long Mississippi series compared seven strains grown in Mexico (native) and in Mississippi. The THC varied from 0.14 to 2.97 with 1.69 percent average in Mexico, with only one plant having more than traces of CBD. The Mexican plants grown in the U.S.A. in 1974 had less THC than the plants grown in 1976 leading to the suggestion that lower rainfall and temperature in 1976 were responsible, but once again I must point out that only cloning experiments could prove this and they have always led to the opposite conclusion. For instance, the study above (Botanical Gazette 146,32(1985)) of three clones cultivated for two years showed random (rather than cyclic) fluctuations in cannabinoid levels occurring independently from clone to clone. If environment were significant, fluctuations should have been simultaneous for all clones and for all plants within each clone —contrary to observations. See also the phenotypic constancy of clones over 20 generations in Planta Med. Phytother. 20, 99 (86).

Mean values of total THC content of plants grown in England

Country of origin Seedstock	1980	1981	1982	1983
Morocco 1.5	3.0	0.67	1.1	0.9
Sri Lanka 1.0	1.1	0.80	1.5	2.2

Bulletin on Narcotics, 37_(4),75(1985)

Zambia	1.5	0.84	0.73	1.6	1.2

page 81
For an analysis of Jamaican marijuana see West Indian Med, J. 34^8(1985). For the content of plants from seeds from all over grown in Hungary see Herba Hung. 19(1),95(1980) and 23/12),95(1984). The THC content of plants grown on the Danish island of Bornholm ranged from 0.1 to 4.2 percent with an average of 1.55 percent (Bulletin of Narcotics 37(4),87(1985)). When seven Italian strains were grown in maritime, insular or continental sites in Italy, the cannabinoid profiles varied considerably with site, sex and plant part, with the highest THC content in the continental site (Fitoterapia 54,195,237(1983)). Of course, the seeds which grew in one site may not have grown at all in the other sites and only cloning can control for this. Another Italian study followed 176 plants for CBD and THC weekly to conclude that you can tell drug or fiber type from the content of the young plant (Forensic Sci Int 24,37(1984)). Two related Italian studies are Bulletin on Narcotics 37(4),61,67(1985). Data on twenty wild Indian strains and their progeny grown in Mississippi are given in Planta Medica_37, 217(1979).

page 85
A Brazilian study has shown an increase of THC from 1.3 to 2.9 percent in two months when light was increased from ten to twelve hours per day. Bulletin on Narcotics 30,67(1978).
An analysis of twenty wild strains growing in India showed that higher concentrations of cannabinoids and more glandular hairs were found in plants in warm, dry, windy places and at lower elevations (Planta Medica

37,219(1979). When seeds from these wild plants were grown in Mississippi, the plants -were about twice as tall and had two to three times as many leaflets per leaf and less variation in total cannabinoid content than their wild Indian parents, but the size of the reproductive parts was about equal. Undoubtedly, natural selection was already at work and definitive studies will require cloning or complete genotyping.

page 85
A recent phytotron (growth chamber) study (Physiol, Vegetale 18,207(1980)) of cloned high propyl THC (THCV) and high pentyl THC types found that growth at 22 degrees C slightly increased the THC concentration, especially in males, whereas 32 degrees C slightly increased THCV concentration, especially in females. The difference was only about 25 percent. It was also found that flowering was stimulated and total growth decreased at 22 degrees relative to 32 degrees. As usual, the total content of cannabinoids was not given.

page 86
Crosses between *Cannabis ruderalis* and *Cannabis sativa* give plants with either high or low THC, but other characteristics are intermediate (Econ Bot 32*387(1978)). Crosses between two different cannabinoid types of Japanese fiber hemp over four generations give first generation plants with cannabinoids of both parents (CA. 93:91883z(l 980)).

There has been some interest in crossing early flowering *C. ruderalis* with C. *sativa* or C. *indica* to get potent strains

that will yield a crop in northern latitudes or will give several crops indoors (e. g. see *High Times* p 65 Nov. 1987). This is almost certainly a bad idea. Ruderalisis usually a small plant with little THC and attempts to separate its early flowering from its undesirable characteristics have not and are not likely to be successful. Selgnij and Clarke *(Best of High Times* Vol 6 p!4) have stated the situation admirably. In their years of experience, numerous backcrossings of the hybrids with *sativa-indica* stocks have continued to give less potent, lower yielding plants. The spread of ruderalis genes through U.S, sativa-indica stocks is likely to be a disaster. They also claim that the spread of indica genes though U.S. hemp has also decreased potency, flavor and varieties of high, beginning in the 70's when U.S. growers began extensively crossing the earlier flowering indica with sativa. It should be kept in mind that there is plenty of genetic variability in all marijuana and one could try to breed an early flowering variety of sativa just by picking out those plants which flower early. It should also be noted that there is likely to be considerable variety in the seeds from a single plant and that natural selection tends to force genetic change regardless of the grower's desires. Even indoors, the precise conditions of soil, moisture and temperature and light during each day and during the season are very different from those in the high plains of Afghanistan or the lowlands of Thailand. Very recent experiments have shown that genes can change in response to environment. Though these observations have so far been made only in simple organisms, it would not be at all surprising to see them extended to more complex ones.

page 90
A qualitative study of flavonoid variations in marijuana has recently appeared (Hot J Linnean Soc 79,249(1979)). A further study of cannabis volatiles has appeared (J. Forensic Sci Soc 26X035(1986)).

page 111
While any of the solvents indicated will extract the cannabinoids with high efficiency, the solvent of choice for preparing *oil* is hexane or a mixture of hexanes or if unavailable then cyclohexane. These are very nonpolar and follow the general principle of using the poorest solvent possible, thus leaving most undesired substances behind. One of the other less expensive and easier to obtain solvents can first be used to do the extraction and can then be in turn extracted by repeated washing with hexane and the hexane then separated and evaporated to yield the oil. Also, the other solvent could first be evaporated and the gummy residue then extracted with hexane. Petroleum ether is an excellent substitute for hexane (diethyl ether is *not* the same as petroleum ether and is much more dangerous to use). To get a highly pure oil, distillation with collection of the THC at about 200 degrees C in a vacuum of about 0.05 mm Hg is required.

page 113
A fast, efficient high yield oil extraction apparatus called the "Honeybee" appeared. The small version ($500) does one pound of marijuana in one hour and the large version ($750) does five pounds. The apparatus is airtight, saving lungs and solvent. It is also useful for extracting oils from

other plant materials for perfumes, flavorings etc. I have seen it used and it does perform as advertised. See High Times Magazine for availability of this and similar devices.

page 127
Bulletin on Narcotics 37(4),83(1985) gives a new tic method for cannabinoids.
Bulletin on Narcotics 34(3),109(1982) gives new spot tests. See also J. Chromatography 171,509(1979),

page 128
For a new colorimetric assay with fast blue BB salt see CA 93,80119d(1980>. For new spot tests see BON 34(3),109(1982) and Planta Medica (Suppl)163 (1980).

page 136
When thinking about structure-activity relationships, keep in mind the crude and preliminary nature of most of the data and the complex nature of cannabinoid actions. As discussed earlier, CBD has complex effects on the THC high and both decreases and prolongs the high and its effects on the experience may vary dramaticaly for different people. Also, cannabinoids with little psychoactivity often have other interesting biological actions such as antinausea, antiglaucoma, antibiotic, hormonal inhibitory, etc. See "Cannabinoids as Therapeutic Agents" R. Mechou-lam (ed) CRC Press (1986).. Aryl and aryloxy substituents at five prime decrease activity.
S-3-OH-ATHC is considerably more potent than the R isomer.

page 138

For excellent recent reviews of cannabinoid chemistry see The Total Synthesis of Natural Products Vol. *4,*1981 and J.Nat. Prods. 43,169(1980). For a new, high yield synthesis of THC as well as an improvement on the BF3-citral method see JCS Perkin Trans. 1(1X201(1979). Other recent papers on THC synthesis are JOC 45,751(1980), 44,677(1979); Acta Pharm, Suec. 16,23(1979); JMC 23,1068(1980); Indian I Chem 166,1112(1978), 175,250(1979); TFT 34,1985(1978); TL 4773(1979); Angew Chem. 92,130(1980).

THC analogs and derivatives: CJC 60,308(1982); JMC 28,783(1985); CJC 63,632(1985) N analogs: J. Het. Chem 18,23(1981). For 41 percent THC yield with high pressure see Z. Naturforsch, B 36,275 (1981). For the synthesis of A9cis and trans THC see Aust. J. Chem. 37,2339(1984). For analogs see JCS Perkin Trans. 1,2881(1984), 2873(1983),2867(1983),2825(1981), 729(1984), HCA 67,1233 (1984), J. Het. Chem 21,121(1984), HCA 63,2508 (1980), 66,2564 (1983), J. Med Chem 25,1447(1982), Arch Pharm (Weinheim) 315,551(1982). For a simple synthesis of a potent analog see J. Pharmacol ExptI Ther 223, 516(1982). For N-propyl and methyl homologs of AS and A9 THC see Biomed. Environmen. Mass Spectrom. 15, 389, 403 (88). For n-butyl A8 and A9 THC see Xenobiotica 18, 417 (88). for THC analogs see Mol. Pharmacology 33_, 297 (88). N-heteroatomic cannabinol analogs Heterocycles (Tokyo) 24, 2831 (86).

The best recent reference on the SAR is Structure Activity Relationships of the Cannabinoids edited by R. Rapaka-NIDA Research Monograph 79 (1987) published by the National Institute on Drug Abuse. Especially interesting is the article on nonclassical compounds by Melvin and Johnson.

page 140
The first method at the top of the page is method 3 for producing the optically active natural isomer and all of the following methods give racemic THC.

page 145
For an alternate route from limonene in about 50 percent yield see Aust. J. Chem, 33,451(1980).

page 163
For new syntheses of olivetol and analogs see JOC 42,3456(1977), 44,4508(1979), and Indian J. Chem. 166,970(1978).

page 171
A superb review (R. Clarke —*Marijuana Botany,* And/Or Press, 1981) has appeared. However, the statement on page 94 that cannabinoid levels are environmentally determined is wrong or confused and the assertion that males usually have the same ratios in lower amounts than females is subject to many qualifications.

Tips on Cloning and Home Growing from an Old Western Gardener

Dear Sir:

I grow only a few plants for my own use and have done so for the past eight years. I am retired on social security and couldn't afford to smoke if I did not grow my own. I grow my plants organically — horse manure and lime are the only things I put on the ground. I have had outstanding success. I haul horse manure in the summer when it is dry - put in a pile until fall and then spread it about a foot deep over the ground. I don't spade or anything —just make sure there are plenty of night crawlers in it. I start seedlings in the house the first of March and plant them outside 15 April. These I let bloom in the fall for winter smoking. For summer smoking I keep about three female clones through the winter — plant them in the garden the first of April. I find that from. May through August the tips of these clones are very good. I keep them low and bushy -12 to 14 growing tips on each plant. I have found that July and August is the best time to root clones. I keep them short and put them in a south window in the fall. I give them no extra light —just the natural winter sunlight. They are back to producing one petal to a leaf by Christmas time. Four months later they are potent enough to smoke so I have fresh smoking by the first of May. In May they are growing fast enough so you can harvest these tips once a week.

I believe that new grass is better than old. A friend of mine gave me a sample from plants that were nine months old. He harvested the complete plant and mixed it all together. It made you drunk and dizzy but not high. The next day I felt horrible. By smoking the growing tips after the plant is four months old I've found you have

good potency and for about three days you feel like a new man. By summer time the potency is strong enough to give you hallucinations — you feel like you can fly — your eyes dilate — the colors seem to jump right out at you. It quickens the mind and the senses, it relaxes you and you get a feeling of happiness. I've been to the garden of Eden, flew through the universe, saw the most fantastic and beautiful architecture you ever could imagine.

I sample my plants at four months by taking off a tip and smoking it. I air dry these as slowly as possible and never sun dry them. I smoke them with tobacco. When my plants are producing good potency tips faster than I can smoke them, I dry them, put them in plastic bread wrappers and put them in the freezer. I don't crush them, I leave the stem intact until I smoke them. In the fall I harvest only the blooms and the new growth that accompanies them. I smoke no fan leaves except the immature tips. I don't stress my plants in any way. This year I started one plant in January, one in February, and the rest in March. I want to see if the potency starts at four months at the tips in the seedlings as it does in the clones. I set them all out April 15 — that is when the temperature reaches 65 degrees days here in the Willameth valley and the last frost is over. I have been growing it eight years. The first year about eight inches was as high as they got — now they grow eight feet.

By the way, the seed was planted in June 1977 for my clones and I clone them every July or August since then. I've found once they bloom they are hard to root. In July my success ratio was four out of five shoots. This year I tried something different. I laid one of the clones down

flat on the ground when I planted it and covered all but the growing tips with sand. If it reverses -when it roots, it will be four months before it will be potent enough to smoke. Otherwise, I will have about a dozen clones that I can transplant that I know are females. You have to color code the clones when you done in July because you can't tell males from females. I clone about a dozen, pick out the three healthiest looking females from the most potent plants and throw the rest away. I put the shoots in Vigro root stimulant for about a week and a half or until I see white bumps forming on the stem. Then I just stick them in well-rotted horse manure, I keep them in the shade the first month or more. I clip them back to sixteen inches high and fourteen inches wide. I do this whenever they are getting too big. The stalk is about *I* /2 inch in diameter when I transplant them in spring outdoors. I use a two-gallon pot for each plant when they are in the house. What's nice about these clones is you have fresh smoking when other people are just planting their seed and the ripoff artists never get active until about August or September up here.

I'm so sold on my own plants I -won't even sample anybody else's. I smoke about a cigarette every three days with tobacco in a pipe. Other than the taste if s no different than pipe tobacco. I mean by this I don't choke, cough and my eyes -water, turn red in the faace and look like I'm dying. About ten minutes after I smoke it, my muscles relax, my eyes dilate, and the high begins. It comes on gradually. I've never timed it but I would say it lasts from fifteen to twenty minutes. The after effects are what is amazing. Before I started smoking it I had leg

energy and don't
years of age I would say it is the fountain™ youth
Almost every animal I know eats it. When I

Common visual features of *Cannabis* and cannabis resin imported into the United Kingdom

Conn try	Number of samples examined[0]	Features
		A. *Cannabis*
Ghana	120	Brown; often compressed into blocks or slabs; usually leafy with few identifiable flowering or fruiting tops
India	20	Brown with clumped resinous tops - typical *Cannabis indica;* dark green-brown and chopped or very immature green female plants (three varieties)
Jiiin.ikvi	350	Brown and very coarse with a high percentage of stalk and seed; some recent samples as compressed blocks
Kenya	100	Green or brown material
Morocco	25	Light green to yellow green and very finely chopped; no recognizable seed or stalk
Nigeria	190	Brown with small, characteristically twisted stems; often as small pieces rather than whole (fruiting) tops; some recent samples as compressed blocks
South Africa	60	Green; often in smalt rolls in brown paper (this variety is usually immature); brown mature (fruiting) variety also occurs
Thailand	110	Green or brown sticks of several seedless tops tied around bamboo [45] with a number of sticks compressed into a slab; some recent seizures have been loose herb and/or of lower quality [49]
Zambia	40	Green or brown material; the compressed "corn-cob" shape wrapped in coarse vegetable fibre is characteristic
		B. Cannabis resin
India	120	Dafk-brown, as sticks (often in bundles), balls and irregular shapes and (rarely) as pale-brown "twists"; often mouldy; sometimes encountered as wafers with a glossy surface
Lebanon	100	Red-brown ani powdery, a darker resin than Moroccan; as blocks (often 500 g) in white cotton bags with many different, often crudely made, ink stamps; resin bears imprint of cloth when unwrapped
Morocco	95	Yellow-brown and powdery in thin, rectangular slabs, wrapped in clear plastic; markings are rare, but include "12 Madeleines" and "6 Madeleines" and coin imprints; biscuity smell when fresh
Nepal	50	Dark-brown to black in colour; occasionally as large "Temple Balls" but more often as rough lumps (resembling dry soil) or thin, roughly prepared slabs in plastic; often mouldy with almost a perfumed smell and crumbles readily
Pakistan	250	Dense, dark-biown rectangular or square slabs with a greener interior; pliable with a pleasant smell when fresh, becoming hard, brittle and odourless with age; embossed marks on the resin in various languages or symbols [50]
Turkey	10	Usually as greenish-brown powder or (rarely) as small thin wafers of brittle material wrapped in thin plastic

"Original seizures of *Cannabis* varied from 100 g (o 1,000 kg.

BON 22, (2) 36 (1980)

CHROMATOGRAPHIC FEATURES OF CANNABIS ILLEGALLY IMPORTED INTO BRITAIN

Country	*Number of samples examined*	*TLC features*
		A. *Cannabis*
Ghana Jamaica Nigeria	SO ISO 100	Very little chemical difference; all teck CBD and have low THV:THC ratios. Ghana often shows both CBG and CBCh > THV, while Jamaica and Nigeria usually show THV > both CBG and CBCh
India	10	"Clumped" variety contains CBD and THCTHV s 1. Green-brown variety resembles Ghana, Jamaica, Nigeria group (no CBD). Immature variety contains CBD. THCTHV = 1, but is very weak in cannabinoid content
Kenya Zambia	25 10	Both show two varieties, neither having CBD. One has THC:THV a 1 with low CBG and CBCh. The other variety resembles the Ghana, Jamaica, Nigeria group
Morocco	10	TLC pattern identical to Moroccan cannabis resin
South Africa	20	No CBD. Greenish varieties sometimes show THCTHV » 1. More usually, the TLC is similar to the Ghana, Jamaica, Nigeria group. A few samples have an unidentified orange spot with Rf similar to THV
Thailand	25	Normally only THC and THC acid. No CBD and negligible THV
		B. Cannabis resin
India	35	Very variable. CBD:THC may vary from unity to very small CBG and CBCh a THV < THC
Lebanon	25	CBD > THC THV is very low Acids may be high and grossly overload the TLC plate, running as a yellow streak
Morocco	**15**	**CBD:THC a 1:2** **THV is low** CBG and CBCh > THV A yellow spot Rf s 0.9 is often noted before spraying The amount of cannabinoid acids is variable, appearing as a yellow streak after spraying
Nepal	**20**	**CBD may be very low and almost absent** **THC > THV a CBG and CBCh**
Pakistan	100	A similar pattern to Morocco sample, but the cannabinoid acids are less marked CBG and CBCh > THV (fresh samples are very rare)
Turkey	5	CBD:THCa1:4 CBG and CBCh > THV Cannabinoid acids may be very high and seriously distort the TLC pattern, yellow streaking running to R_f s 0.5 or more

BON 32. (2) 36 (1980)

Total THC content of seized cannabis

	1975			1976			1978		
Country or Href of origin	Number of samples	THC content f%) Range	Mean	Number of samples	THCcontent(%) Range	Mean	Number of samples	THCcontent /%) Range	Mean
Bangladesh		1.4- 4.4	3.0						
Colombia							3	2.5- 3.9	3.4
Ghana		0.7- 2,5	1.6	9	0.4- 2.8	1.3	6	1.4- 3,4	2.4
India				1	2.7	2.7	4	1.7- 7.8	5.5
Jamaica	Ih		1.8	9	0.7- 3.3	1.9	15	1.5- 5.0	3.7
Kenya	1		2.7	6	1.0- 4.2	2.2	13	1.0- 3.9	2,2
Morocco							2	0.9- 1.3	1.1
Nigeria	2 i		2,4		0.8- 5.9	3.4	16	2.3- 7.4	41
South Africa			4.1		0.6- 2.8	2.6	a	2.3- 5.5	3.6
Southern Rhodesia	2						2	2.7-12	7.3
Swaziland	10		2.3						
Thailand	2		7.S	1	5.1-17	9.3	13	0.4-	3.9
Zambia			2.5	1	2.6- 4.1	3.9	4	8.8 1.3-	2.3
Total	.30			4			86	4.0	
		0.2- 2.7							
		2.7							
		2.0- 2.8							
		2.3- 6.3							
		2.1- 2.4							
		3.8-17							
		2.2- 2.7							

Total THC content of seized cannabis resin

	1973			1976			197S		
	Number	THC content (%)		Number	THC content (%)		Number	THC content f%)	
ofon'rln	samples	Range	Mean	samples	Range	Mean	samples	Range	Mean
India	_			1	3.5	3.5	11	2.2-26	11
Iran	2	1.5- 2.7	2.1						
Lebanon	-			10	2.2- 8.0	4.4	3	1.0- 8.5	4.3
Morocco	6	4.0-16	9.5	2	3.8- 9.4	6.6	7	4.7- 9.2	7.4
Nepal	-			2	14	14	2	11	11
Pakistan	3	2.5- 7.3	4.6	5	3.9-12	7.2	19	3.2-16	6.2
Turkey	-			-			4	8.8-13	10
Total	11			20			46		

Total THC content of seized "hash oil"

	1977			1978		
		THC content (%;			THC con tent (%)	
of origin	of samples	Range	Mean	of samples	Range	Mean
India	5	20-48	33	1	40	40
Kenya	1	28-39	34	—		
Lebanon	—			2	16	16
Morocco	—			8	2-18	8.5
Pakistan	12	25-42	30	11	13-29	18
Total	19			22		

Total THC content of cannabis seized in England

Country of origin	1979 Number of samples	1979 THC content (%) Range	1979 THC content (%) Mean	1980 Number of samples	1980 THC content (%) Range	1980 THC content (%) Mean	1981 Number of samples	1981 THC content (%) Range	1981 THC content (%) Mean
Colombia	1		6.8	–			1		8.0
Ghana	—			1		3.4	–		
Grenada	—			—			1		1.8
India	5"	1.2-11	3.3	3	8.4-12	11	2	11-11	11
Jamaica	14	2.1-4.2	3.0	4	4.5-6.1	5.3	2	4.4-5.7	5,1
Kenya	5	2.2-4.1	3.4	7	1.9-5.8	3.1	4	2.3-4.2	3,4
Malawi	—			1		3.8			
Nigeria	15	2.4-8.4	4.5	6	2.4-7.7	4.9	4	4.5-5.3	4,8
South Africa	10	1.3-4.2	3.1	7	2.3-6.4	3.8	13	2.8-7.6	4.4
Sri Lanka	1		1.0	—			2	1.8-2.8	2.3
Swaziland	1		3.6	—			1		3.1
Thailand	4	5.3-8.1	6,7	1		II	4	2.8-12	6.1
Uganda	—			1		5.0	—		
United Republic oCTanzania	2	1.7-6.2	4.0	—			—		
United Stales	1		4.8	9	0.6-8.2	26	2	7.2-9.7	8.5
Zambia	2	2.3-7.7	5.0	1		3.0	2	1.9-5.6	3.8
Zimbabwe	3	1.2-4.6	3.0	1	1.2—4.1	2.4	3	2.3-5.9	3.9
Total	64			44			41		

Total THC content of hashish seized in England

Country of origin	1979 Number of samples	1979 THC content (%) Range	1979 THC content (%) Mean	1980 Number of samples	1980 THC content (%) Range	1980 THC content (%) Mean	1981 Number of samples	1981 THC content (%) Range	1981 THC content (%) Mean
Egypt	—			—			1		11
India	8	5.1-18	12.5	—			12	3.8-21	11
Lebanon	7	5.0-13	S.8	2	9.1-12	11	5	6.1-12	K.S
Morocco	2	6.8-7.1	7.0	1		8.2	—		
Nepal	—			1		12	—		
Pakistan	8	3.9-13	6.0	3	7.0-11	8.5	6	10-14	12
Turkey	1		8.7	1	8.8	8.8	1		5.8
Total	~26~			~F			23		

Total THC content of seized cannabis oil*

Country of origin	1979 Number of samples	1979 THC content (%) Range	1979 THC content (%) Mean	1980 Number of samples	1980 THC content (%) Range	1980 THC content (%) Mean	1981 Number of samples	1981 THC content (%) Range	1981 THC content (%) Mean
India	1		40	–			2	40-70	55
Jamaica	1		5.3	—			—		
Lebanon	—			1		23	2	17-19	18
Morocco	—			—			1		10
Pakistan	1		39	1		42	—		
Nepal	-			-			2	20-35	28
Total	3			~2~			7		

" Manufactured from cannabis resin except sample from Jama ca, which was manufactured from cannabis.

BON3A(3), 101 (1982)

Marijuana Chemistry

Genetics, Processing & Potency

by Michael Starks

Marijuana Chemistry explains the psychoactive constituents of *cannabis,* and the effect of growth conditions, harvesting and processing, and method of ingestion on potency. This new edition of the widely respected classic features 64 pages of updates based on current research and black market studies.

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Michael Starks other works include *Psychedelic Chemistry, fiistory of Psychoactive Plants,* and *History of Drugs in the* koines.

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PsychedeliC Chemistry

Michael Valentine Smith

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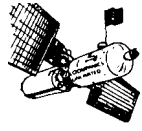

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Drawings by Laurel D. Marotta

To Albert Hofmann and Ludwig Wittgenstein, who opened the doors of perception.

PUBLISHER'S WARNING

This is NOT a manual for the compleat idiot. The procedures referred to and described in this work assume a thorough knowledge of advanced lab techniques in organic chemistry, and should not be undertaken lightly by amateurs. Inexpert procedures can, among other things, asphyxiate you, blow you up, set you (or your house) on fire, and if the end product is imperfectly prepared, poison you and your friends. If you don't know what you are doing, take this book to someone who does. We would rather that we both made a new friend than that we lost you as an old one.

•*The Publisher*

/ shuddered as I took note of the strange things that were going on inside me. An exquisite pleasure had invaded me... Immediately it had made the vicissitudes of life indifferent, its disasters inoffensive, its brevity illusory, — in much *the same way as love operates, filling me with a precious essence: or rather this essence was not in me, it was me. I had ceased to feel mediocre, contingent, or mortal.*

-Marcel Proust

What's made Milwaukee famous has made a loser out of me.

-Jerry Lee Lewis

Them that dies is the lucky ones.

-Long John Silver

A little poison now and then: That makes for agreeable dreams. And much poison in the end, for an agreeable death.

-Friedrich Nietzsche

They are made for life, not for thought. Yes, and he who thinks, what's more, he who makes thought his business, he may go far in it, but he has bartered the solid earth for the water all the same, and one day he will drown.

-Herman Hesse

No one's mouth is big enough to utter the whole thing.

-Alan Watts

Reason craps out in an instant when it is out of its safe, narrow bounds.

-Don Juan

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Port Townsend, WA 98368

Note

Orders for certain chemicals used to make psychedelics (especially large orders in suspect areas) are sometimes checked by narcs. Indole, lithium aluminum hydride, trimethoxybenzaldehyde, phenyl-2-propanol, diethylamine, olivetol and ergotamine are among those watched. The vast majority of the homologs and analogs described here are, however, legal to manufacture and use.

For lists of federally proscribed drugs, see the *Code of Federal Regulations 21:* part 300 to end, the *U.S. Pharmacopoeia* 19:690 or write to the Drug Enforcement Administration, Dept. of Justice, 1405 1st St. N.W., Washington, D.C. 20537. There are also state laws to contend with.

A current list of DEA watched chemicals appears in the back of this book.

PREFACE TO THE FIRST EDITION

The whole field of psychedelics, including areas of botany, chemistry, and pharmacology, is still in a primitive state. Thousands of potential psychedelics have been synthesized which have not been tested on man, some of the more promising of which are indicated in these pages. Also, anyone conversant with contemporary advances in synthetic methods could devise better ways to synthesize most psychedelics. 1 have endeavored to gather here all the more useful information on the synthesis and structure activity relationships of the compounds loosely referred to as psychedelics, of which LSD, mescaline, and the active constituents of *Cannabis* are the most notorious prototypes. In each section, the simplest methods, or those giving the highest yields, are given first. The many synthetic routes contained in the literature, but omitted here, will usually be found to involve greater difficulty, or lower yield. Each synthesis is an abbreviated, reworded, and often translated extract from a longer paper. While I have tried to make them accurate and coherent, a fuller understanding as well as a correction of the inevitable blunders may be achieved by consulting the original papers cited. Occasionally, material will be found which is not contained in the cited work, and which is my attempt to supplement the description.

Though possessing little knowledge of chemistry, I have undertaken this task because the only previous efforts of which I am aware are so dismally inadequate. It is my fondest hope that some highly skilled chemist will use the present effort as an outline in producing a thoroughly competent work on psychedelic chemistry. Such a document should significantly accelerate the psychedelic revolution.

PREFACE TO THE SECOND EDITION

The scenario for the psychedelic revolution was completed in the late sixties and nothing surprising has emerged since. Though the vast majority of substances discussed here are clearly relatively harmless and have tremendous potential for medical and psychological therapies as well as for facilitating personal growth, there has been only a feeble trickle of official research on them. This is due to the anti-drug laws, coupled with the cowardice and stupidity of officialdom that is almost invariable. One exception is Grof's superb book delimiting the parameters of psychedelic psychotherapy (REALMS OF THE HUMAN UNCONSCIOUS), but for the most part the field has been abandoned to unofficial research.

I have included much new material that has come to my attention since the first edition of this book, but with the field of organic chemistry growing as it is, there are undoubtedly syntheses that have eluded me. I would appreciate readers calling attention to these.

I am indebted to Gyna Parthenos and her manuscript *A NEW METHOD OF LSD PRODUCTION* (unpublished) for some of the intriguing new material in the LSD chapter.

Preface to the First Edition ix
Preface to the Second Edition x
Glossary 1
Psychedelics and Society 2
Marijuana: THC and Analogs 8
Magic Mushrooms and Other Indole Trips 38
Mescaline and Friends 76
Harmaline and Other Beta-carbolines 94
Muscimole and Other Isoxazoles 97
L S D 103
Cocaine 138
Miscellaneous Psychedelics 163
Literature and Chemical Hints 168
Miscellany on Underground Laboratories 174
Role of the *DEA* Laboratories in Drug Busts 185
DEA Watched List of Chemicals 193

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GLOSSARY

cyclize - to form into a circle. Specifically, to link the OH group of CBD to the carbon atom to form the 3 ring compound THC, from the 2 ring compound CBD.

decarboxylate - to remove a carboxyl (-COOH) group from a molecule. Specifically, to remove the carboxyl group from THC acid or CBD acid, by heating, to give THC or CBD.

isomerize - to rearrange the atoms of a molecule such that the molecular weight remains the same, but the chemical or physical properties change. Specifically, when CBD is cyclized to THC, it has undergone isomerization.

polymers - a complex chemical compound formed of many simpler units. Cellulose is a sugar polymer and gelatin is an amino acid polymer.

synergize - the working together of two forces or chemicals to produce an effect greater than the sum of their individual effects. Specifically, THC and CBD together may synergize to produce redder eyes than the sum of the redness of the same amounts of the two, taken alone.

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~- PSYCHEDELICS AND SOCIETY

Primitive man likely began altering his consciousness with psychedelics very soon after he first evolved into a creature that we could term human. Virtually every area of the world possesses some plants with psychedelic properties, and man seems to have a remarkable ability to.find just which roots and leaves are most effective in blowing his mind. Unfortunately, Western Europe and North America contain few psychedelic plants, and even though primitive man may have brought marijuana seeds and the opium poppy into these regions, he would have found them to be poor psychedelics when grown in a cold, wet climate. In any case, psychedelic use largely disappeared in Western societies and did not reappear for several thousand years.

Man has undoubtedly suffered considerably from the abuse of various consciousness altering drugs, in particular alcohol and the opiates; but less well known, at least in the West, are the benefits which psychedelics have produced. It is gradually becoming evident that the world owes much of its early art, music, literature, indeed perhaps the very fabric of many ancient cultures directly to the effects of the psychedelic state. Many millions of Westerners have recently gained personal experience with the euphoria, aphrodisia, relaxation, and stimulation of creative imagination which can result from psychedelic use. The failure of many otherwise enlightened people to accept psychedelics has many causes, one of the more important of which is probably that they are often among the fortunate few to escape the neuroses, psychoses, abuse of amphetamines, tranquilizers, barbituates, and alcohol, which is the fate of the majority of the straight world.

While there are good reasons for supposing that psychedelics have much to offer society and at worst have considerably less potential for doing damage than many legal drugs such as tobacco and alcohol, an adequate analysis of the total impact of psychedelics will not be possible for at least several decades and perhaps not until they are legal. Legality could come about very soon in some areas, since a town can pass laws against manufacture, possession and sale which provide very light penalties (e.g., a $1 fine) for conviction.

Presumably, anyone busted could be prosecuted under city laws and thus double jeopardy might prevent state or federal laws from being effective.

Even though such laws will eventually be declared unconstitutional because of conflict with state or federal laws, others could be passed, and there are other legal grounds for challenging drug laws.

For a useful article on ways of cross-examining the official chemist in drug cases, see Contemporary Drug Problems 2,225 (1973), and Microchemistry 4:555-67 (I960).

Drug Damage

For virtually every drug there is a portion of the population which will have an undesirable response. Medical journals are replete with descriptions of drug damage and fatalities. In the US, penicillin and aspirin each account for some 200 deaths yearly, and it was recently estimated that prescription drugs are implicated in the deaths of some 29,000 Americans a year. The most toxic drug commonly ingested in large amounts is probably nicotine; about three cigarettes contain a lethal dose (although some brands now require two packs or more for a lethal dose). In contrast, the psychedelics seem to be relatively safe and non-toxic. Some people, perhaps one in a hundred, can develop a temporary psychosis which rarely lasts more than a few hours or days, and which generally seems to indicate pre-existing psychopathology. In a more enlightened future, psychedelics may be universally applied to expose latent mental illness. There is no sound evidence that any psychedelic damages human brains, genes, embryos, etc. *Of course, all drugs are best avoided in the early months of pregnancy, and excessive or prolonged use may have undesirable effects.*

Psychedelics may cause subtle psychological changes leading to apathy, fuzzy thinking, paranoia, etc., but the many studies noting such effects in users are almost all worthless, since they lack adequate controls. Psychiatric complications are common side effects of many prescription drugs (e.g., see "Psychiatric Complications of Medical Drugs," R. Shaden (Ed.), 1972); and Heusghem and Lechat "Les Effets Indesireables des Medicaments" (1973).

Opiates (Heroin, Demerol, morphine, opium, etc.), non-hallucinogenic amphetamines (Methedrine, Preludin, "bennies," etc.) and barbituates ("reds," "yellows," etc.) are all addictive, lend

themselves to intravenous injection, and when used heavily usually lead to bodily damage and frequently to death. Intravenous injection of anything under unsterile conditions is a bad idea, since it will almost invariably lead eventually to tetanus, hepatitis, bacterial or fungal infection of the heart and arteries, partial paralysis, etc. The death rate among intravenous addicts is extremely high (a recent English study found the rate for smack heads thirty times higher than for a control group) and the best that can be said for these drugs is that they are a rather expensive and unreliable way of committing suicide.

Medical Use of Psychedelics

It is often said that psychedelics have no recognized medical use. Anyone who examines the technical literature with even a modicum of critical competence realizes that this is true simply because there has been virtually no adequate research. Psychedelics clearly have tremendous potential in medicine (e.g., psychotherapy, antidepressants, appetite stimulators, analgesics, aphrodisiacs, etc.) as well as in biology and psychology. Psychotherapy is the most obvious area of application, and though many studies have been done, very few deserved publication. Careful selection of subjects, adequate *<
controls, and careful followups are uncommon, and the techniques used usually border on the idiotic. For example, the use of LSD in the treatment of alcoholism: Four different studies reported in 1969 found, in contrast to other work, that LSD was of no use in the treatment of alcoholism. These four studies shared the following characteristics: 1) there was little or no preparation for the drug experience, and a large dose was given the first time; 2) the drug was given in a hospital setting; 3) the patient had to trip alone, and had no one present whom he l(Jved or trusted; 4) there was little or no effort to use psychotherapy before, during, or after the drug experience; 5) perhaps the most important, the LSD was given only once. Since all five of these conditions are contrary to what experience has shown to be the most effective ways of using psychedelics, the negative results of the studies are hardly surprising. To varying degrees, such inadequacies are present in most medical research with psychedelics, and progress in this area can be expected to be very slow, especially in view of the legal hindrances due to neanderthaloid legislators.

For a recent discussion of the potential value of LSD psychotherapy and the relative lack of adverse side effects, see Psych. Bulletin 79,341(1973). Above all, see Stanislav Grof's definitive study REALMS OF THE HUMAN UNCONSCIOUS (1976).

Synthetic vs. Organic

Many people believe that organic or natural psychedelics such as peyote, magic mushrooms and marijuana are safer or produce better trips than synthetic compounds. This is almost certainly false, since any plant material contains hundreds of compounds, many of which have a definite toxicity, but few of which have psychedelic properties (they tend to make you sick, not stoned). The various impurities or the additives (e.g., amphetamine, belladona, strychnine) sometimes found in synthetic preparations are probably no more toxic than many of the compounds found in the psychedelic plants, and like these compounds, such additives or impurities probably have relatively little effect on the trip.

There is a great deal of superstition regarding purification of psychedelics. Actually, any impurities which may be present as a result of synthetic procedures will almost certainly be without any effect on the trip. If there are 200 micrograms of LSD in a tablet, there could only be 200 micrograms of impurities present even if the LSD was originally only 50% pure (assuming nothing else has been added), and few compounds will produce a significant effect until a hundred to a thousand times this amount has been ingested. Even mescaline, which has a rather specific psychedelic effect, requires about a thousand times this amount.

It is possible that iso-LSD may block LSD effects somewhat and inhibit the cosmic trips that can result from high doses; this is however unproven. Nevertheless, the prime reasons for a lack of cosmicity are undoubtedly low doses and the development of tolerance. A single exposure to LSD or other psychedelics may produce an adaptation or tolerance that lasts the rest of your life (seeing the ocean for the first time is not a repeatable experience). Furthermore, as seems to be the case with the active chemical (THC) and its inhibitor (CBD) in marijuana, the presence of the inhibitor may sometimes result in a more pleasant experience. Only careful studies in which varying amounts of iso-LSD are added to LSD will decide the issue.

Trip Differences

If a psychedelic is taken several days in succession, some degree of tolerance (failure to produce a trip) develops. If a different psychedelic is then taken and this also fails to produce a trip, the two compounds are said to produce cross tolerance, which strongly indicates that they act in the same way and create roughly the same kind of trip. LSD, mescaline, and psilocybin (and probably the

hallucinogenic amphetamines) all produce cross tolerance, and there are some studies which indicate that people are unable to tell them apart. In comparing trips, it should be kept in mind that mescaline has seldom and psilocybin very rarely been available on the black market. Virtually all "psilocybin," as well as most of the "mescaline" has been LSD or one of the hallucinogenic amphetamines (when they haven't been atropine, PCP, speed, etc.)

PharmChem Dept. AA, 3925 Bohannon Drive, Menlo Park, CA 94025, will qualitatively analyze any sample mailed in for $10 and will give results by phone (415-328-6200) five days after the sample is received. Anonymity can be achieved by assigning an arbitrary 6 digit number to your sample and giving only this number when you call. They would like to know what you think your sample is, its street price and general area of origin. Envelopes with significant size specimens should be marked "Hand Cancel". The feds won't let anyone give out quantitative results anymore. PharmChem desires that letters be marked "Hand Cancel" and that you allow 5 days after receipt for results. Their rates are now $ 10 for a qualitative and $15 for a quantitative analysis (for the latter, you must first get from them a controlled drug transfer form to send with the sample and the $15).

Perhaps the only reliable way to identify a psilocybin trip is by its short duration; most trips are completely over in six hours or less. THC, DMT, glycolate esters and very likely muscimole probably do not produce cross tolerance with each other or with the LSD-mescaline-psilocybin group, as would be expected from the distinct kinds of trips produced by'each of the former compounds. Other than the synthesis of new compounds, the most fertile source of new trips lies in the combination of varying amounts of known psychedelics.

Although tranquilizers tend to inhibit the effects of psychedelics if taken shortly before or during a trip, pretreatment (several hours to several days) with a tranquilizer will often enhance the effects. This enhancement is highly variable depending on the type and amount of tranquilizer and psychedelic, time between ingestion, etc. Prior administration of some tranquilizers is also useful in combatting the nausea which, though transient, is a common unpleasant side effect of most psychedelics. Certain phenothiazines (Stelazine, Compazine, Prolixin, Vesprin, Trilafon) are most effective as antiemetics. Immediate relief of nausea may be obtained from various nonprescription products, of which Emertrol is perhaps the best.

With most psychedelics, their activity can probably be considerably enhanced by prior (or possibly concomitant) use of a monoamine oxidase inhibitor (e.g., isocarboxazid (Marplan), nialamide (Niamid), phenelzine (Nardil), and tranylcypromine **(Parnate)).** Some compounds (e.g., DMT) which have no oral activity, can probably become orally active. These compounds are often prescribed as antidepressants, but it is not a good idea to use them frequently or in large doses. For antidotes to the hallucinogens see Amer. J. Hosp. Pharm. 30,80(1973).

Useful Books

THE ALKALOIDS, R. Manske and S. Holmes (eds). 16 volumes, 1951-76.

CHEMISTRY OF THE ALKALOIDS, S. Pelletier (ed), 1970.

ETHNOPHARMACOLOGIC SEARCH FOR PSYCHOACTIVE DRUGS, D. Efron (ed.), 1967.

THE HALLUCINOGENS, A. Hoffer and H. Osmond, 1967.

MARIJUANA - THE NEW PROHIBITION, J. Kaplan (1970). (The only competent study of legalization)

PSYCHOPHARMACOLOGICAL AGENTS, Vol. 1, M. Gordon (ed.), 1964; Vol. 4, 1976.

PSYCHOTROPIC DRUGS AND RELATED COMPOUNDS, E. Usdin and D. Efron, 1967, and supplement.

SOMA: DIVINE MUSHROOM OF IMMORTALITY, R. Wasson, 1968.

THE NATURAL MIND, A. Weil, 1972.

FLESH OF THE GODS, P. Furst (ed.), 1972.

THE BOTANY AND CHEMISTRY OF HALLUCINOGENS, R. Schultes and A. Hofmann, 1973.

NARCOTIC PLANTS, W. Emboden, 1972.

MARIJUANA:
THC and ANALOGS

History

Cannabis sativa has been a cherished friend of an ever-increasing proportion of mankind since prehistoric times. The genus Cannabis contains only this one species, but its appearance and psychedelic properties vary tremendously depending on growth conditions. It seems to have originated in Asia, but its "medicinal" properties and the long fibers in its stem used to make rope (hemp) have led to its being carried all over the world. The early American colonists brought seeds with them and George Washington, "the father of our country," was among its cultivators.

There is evidence for *Cannabis* use as early as 5,000 B.C. in Central Europe and there are probable references to it in the earliest writings of China and Egypt. The frozen tombs of the inhabitants of Siberia in about 500 B.C. have yielded quantities of seeds along with a variety of devices for burning them. A very hot, dry climate appears necessary for producing grass with high psychedelic activity, which may account for the failure to use *Cannabis* as an intoxicant in Northwestern Europe. #

Cultivation

Grass seems to grow best in loose, well fertilized soil (manure, superphosphates). The soil should be well tilled, and the seeds (actually drupes or achenes, a type of nut) sown about one inch apart in rows about one foot apart and covered with about % inch of soil. Some say it is best to use dark (not green) seeds, and to soak them overnight in water before sowing. They can be sown in flatboxes and transplanted when about two to six inches high (about two weeks). After the plants have their first two leaves they can be thinned by pulling up those which look the weakest.

Cannabis is usually dioecious (male and female flowers on separate plants). The female plants are widely believed to contain **more** THC than the males, but this varies from strain to **strain. In India,** the males are apparently weeded out before

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they have a chance **to pollinate the females** and **initiate seed development in the belief that the unfertilized females produce stronger grass. This is unproven, and** even if **true, the** total **yield** of THC from a field of males plus fertilized females may well be greater. The males are generally taller and thinner until almost mature (3 - 4 months), when the females may become taller. Males tend to yellow and die some weeks before the females. Harvest takes place around September in Europe and Japan and around July in North Africa. The sex of the plants can be influenced by soil conditions, some experiments giving more males in moist, heavily manured soils. Long light periods tend to masculinize, whereas plants grown under short day conditions (for example, those seeded in northern latitudes in winter) tend to produce intersexual flowers, males changing to females; a condition also resulting from debudding males. It has recently been found that male flowers tend to change to females after early spraying with Ethrel (2-choloro-ethane-phosphonic acid). Under some conditions, flowering may occur in as Jjttle as two weeks. A sizable portion of the leaves can be harvested after about two months and the plants will continue to grow. The effects of these various manipulations on the THC yield of a single plant, or the crop as a whole, have yet to be determined. "The Induction of Flowering," L. Evans (ed.), 205(1969) is a good reference on *Cannabis* flowering.

Pinching off the shoot tip when the plants are just beyond the seedling stage, and pinching off subsequently developing side shoots at about weekly intervals thereafter in order to keep the plant only a few feet tall, can produce plants so altered in shape, color and leaf morphology as to be unrecognizable as cannabis. The resins are said to accumulate on the surface of such distorted plants to such an extent that it looks crystalline, and the resulting grass is supposed to be as strong as hashish.

For definitive references on the cultivation and chemistry of marijuana, see MARIJUANA GROWERS GUIDE, And/Or Press (1978) and MARIJUANA POTENCY, And/Or Press (1977).

THC Extraction

Some samples of grass have considerable THC acid. In order to extract this it is first necessary to decarboxylate it by heating it to 110° for fifteen rriyiutes. Grass grown commercially for its fiber content, as well as that grown in northern Europe or much of the U.S.A., contains mostly the inactive cannabidiol and cannabidioiic acid. These compounds can be extracted and used to synthesize the

active **THC and THC acid (by smoking, not active** orally) in one step. See TET 21,1228(1965) or the following. To extract, add 50g grass/liter petroleum ether or benzene; soak twelve hours with occasional shaking; filter and extract petroleum ether three times with a solution containing 5% NaOH and 5% Na_2S0_3. Acidify the aqueous extracts with cold dilute sulfuric acid and extract with ether or chloroform which is dried, evaporated in a vacuum to yield the cannabidiolic acid. THC and cannabidiol remain in the petroleum ether which can be dried and evaporated in a vacuum and the **residue added to grass.** THC **acid is** converted **to THC** by **boiling in benzene for** seven **hours.**

THC Extraction for Smuggling or Converting Poor Grass to Good

This is recommended to anyone who wants to smuggle or otherwise conceal grass or hash. One hundred kilos of grass will convert to about two or three kilos of resin, which can later be **redissolved** and absorbed on alfalfa, etc. See *Lloydia* 33,453(1970) for a method of large scale extraction.

Cover grass or hash with methanol, benzene, petroleum ether, or isopropyl (rubbing) alcohol. Allow to soak for about twelve hours, filter and repeat soaking with fresh solvent. This process can be speeded up by gently heating the solvent plus grass (no flames) for about three hours, adding more solvent if necessary. Evapoipte the combined solvent extracts until a resin is obtained or until syrupy and absorb the syrup on grass, etc. Repeat the process until no more resin is obtained, or until smoking some of the residual grass indicates that all the THC has been extracted. Methylene chloride works very well. Unleaded gas, preferably without additives (white gas), paint thinner or remover, or turpentine should be satisfactory. For a detailed discussion, see MARIJUANA POTENCY, And/Or Press (1977).

Dosage

Smoking seems to destroy most of the THC, but even so, this is several times more efficient than eating it, since the smoking dose of A^1 THC is about 2mg and the eating dose about lOmg. Based on a 5% THC content, lg of hash efficiently used should (by smoking) stone about 25 people.

Partial tolerance to THC develops rapidly and most users observe that they get much higher the first time a given batch of grass is smoked than on subsequent occasions. However, for unknown

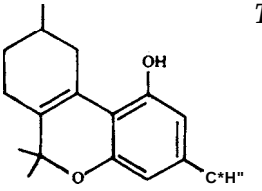
reasons, tolerance to grass of different origin seems less, leading some people to desire a different batch for each day of the week.

Official THC Tests

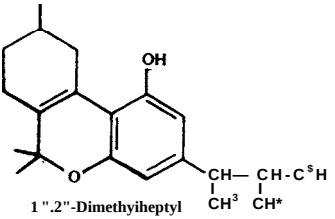
One-tenth gram powdered grass, 5ml petroleum ether; grind in mortar and let soak fifteen minutes. Filter and add 1ml of the petroleum ether carefully to 2 ml 15% HC1 in absolute ethanol. Red color at boundary of two layers indicates THC. After shaking, the upper layer is colorless and the lower orange-pink which turns colorless after addition of 1 ml of water. Alternatively, evaporate the petroleum ether, add 2 ml Duquenois reagent (12 drops acetaldehyde, 1 g vanillin, 50 ml ethanol), 2 ml HC1 and stir. Let stand 10 minutes and add 2 ml chloroform; shake and let separate. A purple chloroform layer indicates THC.

Also useful but less specific is the fact that THC gives a purple color with 5% KOH in ethanol. A few grains of sucrose will often intensify color development in these tests. (See *Bulletin on Narcotics* 22,33(1970)).

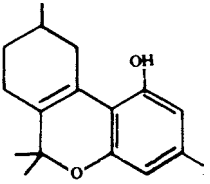
THC Chemistry



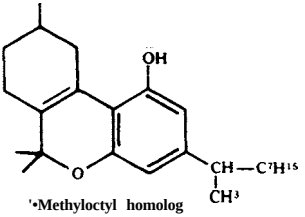
A^3-THC
<AV°«-THC)



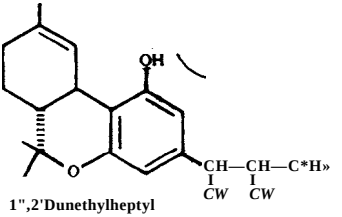
1 ".2"-Dimethyiheptyl
homolog of A'.THC(DMHP)



Hexyl homolog of A^3 THC
(synhexyl, pyrahexyl, parahexyl)



'•Methyloctyl homolog
of A^3-THC (MOP)



1",2'Dunethylheptyl
homolog of A'-THC

Some widely tested synthetic cannabinoids

Is It Legal?

The A^1 and $A^{!}(^6)$ THCs with the n-pentyl in the 5' position (obtained by using olivetol in the syntheses) are naturally occurring and hence illegal, but the A^3 THCs and the numerous isomers, homologs and analogs of the A^1 and $A^*(^6)$ compounds are probably legal.

Apparently, recent federal legislation outlaws delta-1, delta-1(6), delta-3,4-THC's, both cis and trans and D and L and compounds. This still leaves hundreds of legal cannabinoids.

Structure-Activity Relationships

THC refers to tetrahydrocannabinol, and A refers to the position of the double bond. Various numbering systems are used, so the following equivalences should be noted: A*THC = A*3,4-trans-THC = A^9THC and A^6THC = AH^6)THC = A^8THC = A^6-3,4-trans-THC.

Little careful human testing has been done, so data given here and elsewhere on the relative psychedelic activity of various cannabinoids is often only a rough guess. A^1 THC and **A^6THC** have about the same activity which is about five times that of A^3THC. Cannabidiol, cannabidiolic acid, cannabinol, cannabigerol and cannabichromene all have very little or no activity. Only the *X* (-) isomer of THC seems to be active. When the n-pentyl at the 5' position is replaced by 1,2-dimethylheptyl, potency and duration of action increases about five times, giving the most active THC analog yet tested. #

It should be noted that recent testing has indicated that a 1,1-dimethylheptyl or 1-methyloctyl and probably similar side chains give THCs of equal or greater activity than the 1,2-dimethylheptyl cpd. However, the difficulty of synthesizing these compounds plus their very long action (up to several days or more) makes it doubtful whether they deserve all the interest they have generated among psychedelic enthusiasts. More concern should be devoted to the shorter side chains, since they would presumably allow one to get very stoned but to be straight again within a few hours, thus allowing the drug to be more easily manipulated.

Substituting N, O, or S atoms at various places or saturating the double bond to produce hexahydrocannabinol probably retains activity. (See CA 74,125667(1971) for S analogs.) Alkoxy side chains at 5' retain activity. Unsaturated side chains are as active as saturated ones. Ether moieties at the 5' position, but not at the 3',

retain activity. Activity is retained if an additional alkyl is placed at 4' but lost if placed at 6'. Activity is greatly decreased or lost if the H at the 4' or 6' positions is replaced by carboxyl, carbomethoxyl, acetyl or acetoxyl; if the hydroxyl is replaced by H; if the OH is at 5' and the side chain at 4'. Methyl and/or ethyl at 1 and 5 retains activity, as does removal of the methyl at 1. An hydroxyl in the side chain is active, but not on the first carbon of the side chain. Esterifying the OH retains activity, but etherifying eliminates activity.

THC can be synthesized via cannabigerol and cannabichromene in low yield (TET 24,4830(1968), TL 5349,5353(1969), Proc. Chem. Soc. 82,(1964)). For several moderately difficult routes leading to A*(^{6}) THC via cannabinol in about 10% yield, see LAC 685,126(1965). For a synthesis of *A^{l}(^{6})* THC from cinnamyl derivatives and isoprene see J ACS 89,4551(1967). A rather difficult synthesis of A^1 and A$^{!}$(^{6}) THC is given in J ACS 89,5934(1967). For a variety of THC analogs of unknown activity see BSC 1374, 1384(1968); JCS 952(1949); JACS 63,1971, 1977,2766(1941), 64,694,2031,2653(1942), 67,1534(1945), 70,662(1948), 71,1624(1949), 82,5198(1960); CA 75,48910 (1971); TL 3405(1967); JMC 11,377(1968); CT 2,167(1967); CA 76,126783(1972).

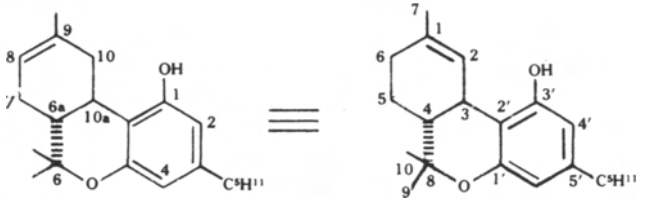
Since 0 or 1 and perhaps 2 double bonds anywhere in the lefthand ring below, as well as changes in the size and position of the alkyl groups will probably all produce compounds with THC activity, many compounds similar to menthadieneol, menthatriene, verbenol, epoxycarene, pulegone and 4-carbethoxy-l-Me-3-cyclohexanone can be used in the methods below to get active THC analogs (e.g., isopipertinol will work (TL 945 (1972))). Also, 5-chlororesorcinol and 5-methylresorcinol (orcinol) have been shown to give weakly active THC's (see CA 76,33946(1972), US Patent 3,028,410 (1962), and TET 23,3435(1967) for syntheses of orcinol and related compounds). Unfortunately, recent data indicate that orcinol gives a THC with very low activity. It appears that delta-5 and delta-7 THC have very little activity. If the methyl groups at carbon **o** in THC are changed to longer alkyl groups, the activity decreases, but the replacement of the alkyl groups by hydrogen or other groups has not been carried out. Open chain analogs also have activity (see CT 2,167(1967)).

For new information on the structure-activity relationships of cannabinoids see JMC 16,1200(1973), Arzneim, Forsch 22,1995

(1972), and Chem. Revs. 76,75(1976).

For THC analogs see JMC 19,445-71,549-53(1976); Eur. JMC 10,79(1975); Phytochem. 14,213(1975); CA 82,57564,170672-3(1975); Diss. Abst. 34B,1442(1973); J. Labelled Cpds. 11,551 (1975); Compt. Rend. Acad. Sci. 281C,197(1975).

For THC in one step from chrysanthenol see Experientia 31,16(1975).



A*-THC A'-THC

Two commonly used numbering systems for the same molecule

The following gives the synthesis of a water soluble THC derivative which is equipotent with THC and perhaps more rapidly acting (see Science 177,442(1972)). Stir equimolar amounts of THC, dicyclohexylcarbodiimide *d*\

(1974).

Method 1

This method gives about 50% yield for THC and about 90% for the l',l'-dimethylpentyl analog.

Olivetol 4.74 g (or equimolar amount of analog), 4.03 g (+) cis or trans p-methadien (2,8)-ol-l (the racemic compound can be used but yield will be one-half), 0.8 g p-toluenesulfonic acid in 250 ml benzene; reflux two hours (or use 0.004 Moles trifluoracetic acid and reflux five hours). Cool, add ether, wash with $NaHC0_3$ and dry, evaporate in vacuum/to get about 9 g of mixture (can chromatograph on 350 g silica gel-benzene elutes the THC; benzene: ether 98:2 elutes an inactive product; then benzene: ether 1:1 elutes unreacted olivetol; evaporate in vacuum to recover olivetol).

Method 2

Dissolve the olivetol or analog and p-menthadienol or p-methatriene (1,5,8) in 8 ml liquid $S0_2$ in a bomb and fuse 70 hours at rodm temperature. Proceed as above to get about 20% yield.

/(-)-AH^6) THC JACS 89,4552(1967), JCS (C) 579(1971), cf. Diss. Abst. 35B,3843(1974), and Phytochemistry 14,213 (1975).

Convert (-) alpha-pinene to (-) verbenol (see precursors section). Add 1M(-) verbenol (racemic verbenol will give one-half yield), 1M olivetol or analog with methylene chloride as solvent. Add BF_3 etherate and let stand at room temperature one-half hour to get approximately 35% yield after evaporating in vacuum or purifying as above to recover unreacted olivetol. Solvent and catalyst used in Method 1 above will probably also work. Either cis or trans verbenol cam **be used.** The **JCS paper adds 1 g** BF_3-etherate to a solution of 1 g olivetol **and** 1.1 g verbenol in 200 ml methylene chloride and let stand two hours at room temperature. JACS 94,6164(1972) recommends two hours at -10° C, then one-half hour at room temperature and the use of cis rather than trans verbenol (the latter gradually decomposes at room temperature). The reaction is also carried out under nitrogen, using twice as much verbenol as olivetol, 0.85 ml BF_3 etherate and 85 ml methylene chloride/g verbeneJ' (both freshly distilled over calcium hydride) to give ca. 50% yield. See also JACS 94,6159(1972) for the use of citral and Arzneim. Forsch. 22,1995(1972) for use of p-TSA.

In the synthesis of THC with verbenol, the cis isomer is preferable

to the trans since the latter decomposes at room temperature. Pinene or carvone give active THCs (JMC 17,287(74)).

Method 3

f(-)-A^1 and AH^6) THC JACS 92,6061(1970), U.S. Patent 3,734,930.

1M (+)-trans-2-carene oxide (2-epoxycarene), 1M olivetol or analog, 0.05 M p-toluenesulfonic acid in 10L benzene; reflux two hours and evaporate in vacuum (or can separate the unreacted. olivetol as above) to get about 30% yield THC. Olivetol can also be separated as described below. For synthesis of 2-epoxycarene (A^4 carene oxide) from A^4 carene (preparation given later) see p-methadieneol preparation (Method 2). 3-carene oxide gives 20% yield of *AH*^{6}) THC.

Methods for Racemic THC

A^3 THC JACS'63,2211(1941)

1M pulegone, 1M olivetol of analog, 0.3 M $POCl_3$, reflux four hours in 1 L benzene and evaporate in vacuum or pour into excess saturated $NaHC0_3$ and extract with dilute NaOH to recover unreacted olivetol. Dry, and evaporate in vacuum the benzene layer to get the THC.

AH^6) THC from Cannabidiol HCA 52,1123(1969)

Reflux lg cannabidiol, 60 mg p-toluenesulfonic acid (or 0.003 M trifluoroacetic acid) in 50 ml benzene for 1 *Vz* hours. Evaporate in vacuum to get about 0.7 g THC. Alternatively, add 1.8g cannabidiol to 100 ml 0.005N HC1 and reflux four hours. Proceed as above to get about 0.5 g THC (cf. JACS 94,6159 (1972)).

Nitrogen Analogs of A^3 THC CA 72,66922(1970); JACS 88,3664(1966), TL 545(1972).

5.4 g olivetol or 0.03M analog, 5.8 g 4-carbethoxy-N-benzyl-3-piperidone hydrochloride or 0.03M analog (JACS 71,896(1949) and 55,1239(1933) give an old and clumsy synthesis, and Heterocyclic Compounds, Klingenberg (Ed.), part 3, chaps. 1X-XI1 (1962) gives information on related compounds) in 10 ml concentrated sulfuric acid. The concentrated sulfuric acid should be added dropwise, with cooling (cf. U.S. Patent 3,429,889). Add 3 ml $POCl_3$ and stir at room temperature for 24 hours. Neutralize with $NaHC0_3$ to precipitate 2.3g (I). Filter; wash precipitate with

$NaHC0_3$ and recrystallize from acetonitrile. Dissolve 4.3 g (I) in 30 ml anisole and add 0.1 M methyl Mgl in 50 ml anisole. Stir 12 hours and evaporate in vacuum or acidify with sulfuric acid, neutralize with $NaHC0_3$ and filter; wash to get 2.4 g N-benzyl analog of THC. For other N-analogs of unknown activity see JOC 3(5,2995(1968). Recover unreacted olivetol as usual.

The 5-aza analogs given in the JOC ref. seem to be active but they use the pyrone intermediate from certain routes of THC synthesis for a precursor. See U.S. Patent 3,493,579 (03 Feb 1970) for quinuclidine analogs and JOC 38,440(1973) for a different approach to N-analogs. See JOC 39,1546(1974) and HCA 56,519(1973) for other N-analogs.

AH[6]) THC U.S. Patent 3,576,887

This synthetic route allows one to proceed from the alkylresorcinol dimethyl ether without using a compound of the verbenol or cyclohexanone type.

Synthesis of olivetol aldehyde (Aust. J. Chem. 21,2979 (1968)). To a stirred solution of phenyllithium (1.6g bromobenzene and 0.16g Li) in 50 ml ether, add 0.01M olivetol dimethyl ether (or analog - see elsewhere here for preparation) in 5 ml ether and reflux 4 hours. Add 5 ml N-methylformanilide, reflux 1 hour and wash with 2X50 ml dilute sulfuric acid, 50 ml water, 25 ml saturated NaCl and dry, evaporate in vacuum the ether (can dissolve in benzene and filter through lOOg of alumina) to get 60% yield of the dimethylolivetol aldehyde (1) (recrystallize from ether-pentane). Can recover unreacted starting material by refluxing the vacuum distillate 3 hours with excess 10% HC1, removing the organic layer and extracting the aqueous layer with ether: wash and dry, evaporate in vacuum the combined ether layers.

An alternative method for (1) (JACS 65,361(1943)). In a 200 ml 3 neck round bottom flask with a stirrer, a reflux condenser, a dropping funnel and a nitrogen inlet tube, introduce a rapid stream of nitrogen and in the stream issuing from the central neck, cut 1.5g of lithium into ca. 70 pieces and drop into the flask containing about 25 ml dry ether. Place the fittings in position, slow the nitri^gen stream and add Vi of the solution of 9.2g n-butyl-chloride in 25 ml dry ether. Start the stirring and add the rest of the n-butyl-chloride at a rate giving a gentle reflux. Continue stirring and reflux 2 hours and add 15 ml olivetol dimethyl ether in 25 ml dry ether. Reflux 2 hours and add dropwise a solution of 15 ml N-methylformanilide in 25 ml

dry ether with stirring at a rate sufficient to produce refluxing. Continue stirring 1 hour, treat with 3% sulfuric acid and then pour into excess of this acid. Remove upper layer and extract aqueous layer twice with ether. Wash combined ether layers with dilute aqueous $NaHC0_3$ and water and dry, evaporate in vacuum the ether (can distill 148-52/0.3) to get 78% (I).

JACS 65,361(1943). A mixture of 6.5g (I) (or analog), 20 ml pyridine, 1 ml piperidine and 9g malonic acid is warmed on a steam bath 1 hour. Add another 1 g malonic acid and heat another *Vi* hour. Reflux *Vi* hour and pour into excess iced 10% HC1, stirring occasionally over 2 hours. Filter and dry to get 6 g 2,6-dimethoxy-4-n-amycinnamic acid (II) (recrystallize from ethanol).

lOg (II), 40 ml 80% isoprene and 40 ml dry xylene or toluene is heated in an autbclave at 185° C for 15 hours. Cool, dilute with 160 ml petroleum ether and shake with 100 ml saturated aq. Na_2C0_3. Let stand and separate the middle layer. Wash the middle layer with a mixture of petroleum ether and dilute aq. Na_2C0_3 and again separate the middle layer and treat with 75 ml 10% HC1 and 75 ml ether. Shake, separate the aqueous layer and wash the ether 3 times with water. Dry and evaporate in vacuum the ether and dissolve the residue in petroleum ether. The solid which ppts. after about 10 minutes is unchanged (II). Filter and let stand in refrigerator overnight and dry and evaporate in vacuum to precipitate about 7 g of the l-methyl-5 (2,6-dimethoxy-4-n-amylphenyl)-l-cyclohexene-4-COOH (III) (recrystallize from petroleum ether).

lg (III) in 5 ml dry ether is added to 10 ml 3M MeMgl (from 0.2 lg Mg and 1.2g methyl iodide) in ether, heated to 130° C to evaporate the solvent and the oil kept at a bath temperature of 165° C for *Vz* hour. Cool in dry ice-acetone bath and cautiously add ammonium chloride-ice water mix to decompose the excess Grignard reagent. Acidify with dilute HC1 and extract with ether. Wash with NaCl, dilute K_2C0_3, NaCl and dry, evaporate in vacuum to get the dimethyl derivative (IV). Reflux (IV) in 25 ml benzene with 100 mg p-toluenesulfonic acid for 1 hour with a Dean-Stark trap and dry, evaporate in vacuum (or wash with $NaHC0_3$, NaCl first) to get the THC or analog.

Hydrolysis of benzopyrones (for synthesis see elsewhere here) will produce compounds of type (III) which will work in this synthesis. The hydrolysis proceeds as follows (JCS 926(1927)): Add lOg of the benzopyrone to 20g 30% NaOH, cool and shake 1 hour with 19 ml methylsulfate. Extract the oil with ether and dry, evaporate in

vacuum to get the ester. Acidify the aqueous solution and filter, wash, dissolve ppt. in sodium carbonate and acidify, filter to get the free acid. Both the acid and the ester will work in this synthesis.

For a possible route to benzopyrones via condensation of isoprene and 3-CN-5-OH-7-alkyl-coumarin see J ACS 82,5198(1960). See JMC 16,1200(1973) for another ref. on the pyrone route t£ THC.

A[3] ***THC Analogs*** **TET 23,77(1967)**

11.6g 5-(l,2-dimethyl)-heptyl resorcinol or equimolar amount of olivetol or other analog, 9.2g 2-carbethoxy-5-methyl cyclohexanone (4-carbethoxy-l-methyl-3-cyclohexanone), 5 g $POCl_3$, 70 ml dry benzene (protect from moisture with $CaCl_2$ tube). Boil 5 minutes (HC1 evolution) and let stand at room temperature 20 hours. Pour into 10% $NaHC0_3$, separate the benzene layer and wash with 3X50 ml 10% $NaHC0_3$. Dry and evaporate in vacuum the benzene and recrystallize from 50 ml ethyl acetate to get 6.6 g of the pyrone (I). 4.5g(I), 150 ml benzene; add dropwise to a solution prepared from 7.8 g Mg, 18 ml methyl iodide, and 90 ml ether. Reflux 20 hours and add 45 ml saturated NH_4CI. Separate the organic layer and extract the aqueous phase with benzene. Combine the organic layer and benzene and dry, evaporate in vacuum to get the THC analog.

A^ ***THC analogs from Resorcinol*** **TET 23,83(1967)**

22g resorcinol, 36 g 4-carbethoxy-l-methyl-3-cyclohexanone, 20 g polyphosphoric acid; heat to 105° C and when the exothermic reaction which occurs subsides, heat at 140° C for one-half hour. Pour onto ice-water; filter; wash with water and recrystallize-ethanol to get 34 g of the pyrone (I). 6.4g (I), 8 ml caproyl-CI or analog (for preparation see above reference, page 84); heat on oil bath (can use mineral oil) at 120° C until the exothermic reaction subsides (HCI **evolution). Cool and pour into ethanol. Filter to get 8 g precipitate (II). 3.2g (II), 4.4g dry $A1C1_3$; heat on oil bath at 170° C for one hour. Cool and add HCI; filter and dissplve precipitate in 7 ml 2N NaOH. Filter and acidify with HCI to precipitate 1.4 g (III) (recrystallize-ethanol). Test this for activity. Use benzoyl-Cl or benzoic anhydride to esterify the OH group (this may nd^ be necessary), methyl MgBr or methyl Mgl to methylate the keto group, and sulfuric acid to dehydrate and hydrogenate as described elsewhere here to get the THC analog. Since the resulting THC analog has the side chain at the 6' position, it may not be active. This paper also gives a synthesis for THC analogs with the side**

chain in the 4' position, but again their activity in man is unknown. Verbenol, etc., should work in this synthesis, thus obviating the need for the methylation step.

AH[6]) THC JACS 88,367(1966)

1M olivetol or analog, 1M citral in 10% BF_3 etherate in benzene about eight hours at 5-10° C. Extract unreacted olivetol with dilute NaOH and evaporate in vacuum the ether to get about 20% yield of the trans THC, and 20% of the cis THC which can be converted to the active trans isomer by reacting with BBr_3 in methylene chloride at -20° C for *Vh* hours. (TL 4947(1969)). Alternatively, the reaction can be carried out in 1% BF_3 etherate in methylene chloride . to get 20% & THC.

A3 *THC Analogs* JACS 63,1971(1941) U CA 82,170672-3 (1975)

7.6g 5-n-heptyl resorcinol or equimolar amount analog, 6.6g (0.037M) 4-carbethoxy-l-methyl-3-cyclohexanone or analog, 5.8g POCI3 in 60 ml benzene. Reflux 5 hours, cool and pour into $NaHC0_3$ to get about 6 g THC analog and 1 g more by concentrating the mother liquor, or proceed as described elsewhere here to recover unreacted resorcinol. 3-carbethoxy-l-methyl-2 or 4- ' cyclohexanone, 2-carbethoxy-cyclohexanone, etc. will probably also give active THC analogs.

A[3] THC Analogs JCS 952(1949)

1.75 g 2-Br-4-methyl-benzoic acid, 1.5 g olivetol or analog, 10 ml IN Na OH and heat to boiling; add 0.5ml $CuS0_4$. Filter; wash with ethanol and recrystallize from ethanol to get (I). 10 g (I) in 150 ml benzene; add to methyl-Mgl prepared from 47.5 g methyl iodide, 8 g Mg, 120 ml ether. Reflux fifteen hours, cool and pour on ice. Add saturated NH_4C1 and separate the ether. Wash two times with water and dry and evaporate in vacuum the ether to get the THC.

Precursors For THC Synthesis

p-Menthatriene (1,5,8) BER 89,2493(1956)

90g d(+) carvone (*f* (-) carvone or racemic carvone probably will work also) in 150 ml ether; add dropwise with stirring to 7.5 g lithium aluminum hydride in ether. Heat one hour on water bath; cool and carefully add water and then ice cold dilute sulfuric acid. Separate the ether and extract the aqueous layer with ether; dry and evaporate in vacuum the combined ether to get about 60 g product (can distill 65/14).

(+) Cis and Trans p-Menthadien-(2,8)-OL-l

Method 1: LAC 674,93(1964) cf. BSC 3961(1971), JOC 38,1684(1973)

136g(+) limonene in 2 liters methanol; 2g bengal rose dye. Illuminate with a high voltage Hg lamp (e.g., HgH 5000) for fourteen hours or until about 1M of 0_2 is taken up. Evaporate the methanol at 0-10° C to about 500 ml and then stir with ice cooling and add this solution dropwise to solution of 250 g Na_2S0_3 in 1.5 liters water and continue stirring for twelve hours. Heat two hours at 70° C and extract with ether and dry, evaporate in vacuum (can distill with addition of Na_2C0_3 at 40-70/0.2) to get about 100 g mixture containing about 40% product which can be purified by fractional distillation.

Method 2: HCA 48,1665(1965)

Convert (+) A^3 carene to (+) trans-4-acetoxycarane (I) via (+) trans-4-OH-carane. Reflux 50 g (I) for 45 minutes (180° C oil bath under N_2 or Argon). Cool and can distill (57/10) to get about 25 g mixture of A^3 and A^4 carene (residue is unchanged starting material) containing about 60% A^4 isomer.

Alternatively, to 150 ml ethylene diamine add portionwise with stirring at 110° C under Argon or N_2, 5.3 g Li metal; after one hour add dropwise 110 g (+) A^3 carene. After one hour cool to 4° C and add water. Extract with ether, wash the ether five times with water and dry, evaporate in vacuum to get 100 g of a mix containing about 40% (+) A^4 carene (can separate by fractional distillation).

A^4 carene can also be obtained from A^3 carene as follows: (JCS (C) 46(1966)): Dissolve 1 g A^3 carene in 50 ml propionic acid and heat at a suitable temperature (e.g., one-half hour at room temperature may do) in presence of !/2g Palladium-Carbon catalyst (5%) in ethanol and filter, evaporate in vacuum (can distill 63.5/19.5). See J.Soc. Cosmet. Chem. 22,249(1971) for a review of (+) A^3 carene chemistry.

A^2 *Carene oxide (2-epoxycarene)* LAC 687,22(1965), (cf. TL 2335(1966), and CA 68:22063(1968))

To 136 g A^4 carene in 330 ml methylene chloride and 120 g anhydrous sodium acetate, add dropwise with vigorous stirring ir\an ice bath, 167 g of 50% peracetic acid and continue stirring for ten hours. Heat to boiling for two hours, cool, wash with water, sodium carbonate, water, and dry, evaporate in vacuum the methylene chloride to get about 100 g p-menthadieneol. Apparently (CA

68,22063(1968)) substituting sodium carbonate for sodium acetate results in the production of A^2 carene oxide (2-epoxycarene) in about 50% yield (can distill 63/7).

4-Carbethoxy-Lmethyl-cyclohexanone LAC 630,78(1960)

Cool 20 g of sodium metal in 325 ml ethanol to -15° C in an ice-salt bath and add in small amounts over one hour a solution of 100 g 3-methyl-cyclohexanone and 150 g diethyloxalate (keep temperature below -10° C). Keep three hours in cold and then twelve hours at room temperature. Add solution of 1.3 L of water, 60 ml 2N sulfuric acid. Separate the yellow-brown oil and extract the water with ether or $CHC1_3$ until the yellow is removed. Combine the oil atad the extract and distill the solvent and the unchanged starting material (100° C bath, 13 mm). Slowly heat the residue in a one-half liter flask with air cooling. $C0_2$ evolution starts at 160° C. Continue heating to 220° C and keep at this temperature for *Wi* hours or until a test with 1% ethanol-$FeCl_3$ solution shows the end of the reaction by a violet color (unconverted material gives a brown color). Can distill two times in Vigreux column to give about 83 g of oily colorless product.

(-) Verbenol JCS 2232(1961)

Racemic alpha-pinene will yield racemic verbenol which will give one-half the yield of (-) verbenol.

27 g (-) alpha-pinene in 500 ml dry benzene; heat and keep temperature at 60-65° C throughout. Add with stirring over 20 minutes 84 g dry (dry over $P_?0_5$) lead tetra-acetate. Stir one-half hour; cool and filter and add filtrate to water. Filter and evaporate in vacuum the benzene layer (can distill 96-7/9) to get 21.2 g cis-2-acetoxy-pin-3-ene(I). 5 g (I) in 25 ml glacial acetic acid; keep at 20° C for one-half hour and add water and extract with ether. Wash the extract with aqueous Na_2C0_3 and evaporate in vacuum the ether (can distill 97-8/9) to get 4.3 g trans verbenyl acetate (11). Hydrolyze (11) with NaOH to give the (-) cis and trans verbenol. For other methods of producing verbenol see CA 37,361(1943), CA 57,16772(1962) and BSC 2184(1964), JCS (B) 1259(1967). The last paper also gives a method for converting (-) beta-pinene to (-) alpha-pinene. See also CA 65,2312(66).

5-Alkyl Resorcinols from Acyl Resorcinols CA 72,66922(1970)

Compounds Mil may be able to give active THC analogs if used in place of olivetol for synthesis.

45 g l-(3,5-dimethoxyphenyl)-l-hexanone(l) or analog (for

preparation see the following methods) in 400 ml ether and 0.3 M methyl-Mgl in 150 ml ether react to give 49 g 2-(3,5-dimethoxyphenyl)-2-heptanol(II). Heat 49 g (II) with 1 ml 20% sulfuric acid to 105-125° C/30mm for IV2 hours to get 34 g of the 2-heptene compound (III). 33 g (III) in 100 ml ethanol, 6 g Raney-Ni, 1500 PSI hydrogen, 150° C to get 26 g of the 2-heptane (IV). 26 g (IV), 118 ml 57% hydrogen iodide; add 156 ml acetic anhydride and heat at 155° C for two hours to get 22 g of the resorcinol.

5-Alkyl Resorcinals **BER 69,1644(1936)**

25 g ethyl-3,4,5-trimethoxybenzoyl acetate and 2.1 g Na in 100 ml ethanol; warm to react. Add 2 g n-propyl iodide (or n-amyl iodide, etc.) and heat twelve hours on steam bath; neutralise and distill off the ethanol. Extract with ether and dry, evaporate in vacuum to get about 32 g of the alkyl acetate (I). Heat 22 g (I) in 5% KOH in ethanol for one hour at 50° C to get 14 g 3,4,5-trimethoxyvalerophenone (II), which crystallizes on standing. 11 g (II), 600 ml ethanol, 60 g Na; warm and after Na is dissolved, add 2 L water. Acidify with HC1, distill off the ethanol and extract with ether. Dry, evaporate in vacuum the ether to get 7.8 g olivetol dimethyl ether (or analog) (III). 7.2 g (III), 70 ml hydrogen iodide; boil two hours and distill (164/760) to get olivetol.

Olivetol **HCA 52,1132(1969)**

Reduce 3,5-dimethoxybenzoic acid with lithium aluminum hydride to 3,5-dimethoxybenzyl alcohol (I), to 10.5 g (I) in 100 ml methylene chloride at 0° C add 15 g PBr_3; warm to room temperature and stir for one hour. Add a little ice water and then more methylene chloride. Separate and then dry, evaporate in vacuum the methylene chloride. Add petroleum ether to precipitate about 11.5 g of the benzyl bromide (II). To 9.25 g (II), 15 g Cul, 800 ml ether at 0° C, add butyl (or other alkyl)-Li (16% in hexane), and stir for four hours at 0° C. Add saturated NH_4C1 and extract with ether. Dry and evaporate in vacuum the ether (can distill 100/0.001) to get about 4.5 g olivetol dimethyl ether (III) or analog. Distill water from a mixture of 90 ml pyridine, 100 ml concentrated HC1 until temperature is 210° C. Cool to 140 ° C and add 4.4 g (III); reflux two hours under N_2. Cool and pour into water. Extract with ether and wash with $NaHC0_3$. Make pH 7 and dry, evaporate in vacuum to get 3.8 g olivetol which can be chromatographed on 200 g silica gel (elute with $CHC1_3$) or distill (130/0.001) to purify.

5-Alkyl Resorcinols **TET 23,77(1967)**

Since the method as given originally leads to 4-alkyl resorcinols which do not produce an active THC, it is here modified to give the 5-alkyl isomers. The method is illustrated for 1.2-dimethyl-heptyI resorcinol which gives a much more active THC than olivetol.

Convert 3,5-dihydroxyacetophenone (5-acetyl resorcinol) to 3,5-dimethoxyacetophenone(I) in the usual way with dimethylsulfate.

To 24 g Mg, 1 crystal I_2, 100 ml ether, add dropwise under N_2, 180 g 2-Br-heptane in 100 ml ether over one hour and then reflux two hours. Add over IV2 hours a solution of 90 g (I) in 200 ml tetrahydrofuran and reflux 10 hours. Cool and add 180 ml saturated NH_4C1; decant the solvents and extract the residue with tetrahydrofuran. Combine the solvents and the tetrahydrofuran and dry, evaporate in vacuum. Add a few drops 20% sulfuric acid to the residual oil and evaporate in vacuum the water (oil bath temperature 120-130° C/lOmm). Distill the oil at oil bath temperature 285° C/0.2. Fraction boiling 128-140/0.2 yields about 60 g 2-(3,5-dimethoxyphenyl)-3-methyl-2-octene(H). If saponified and used to synthesize a THC, this might give an active product, thus disposing of the necessity of the next step. Hydrogenate 50 g (II) in 100 ml ethanol, 2-3 atmospheres H_2, 0.6 g 10% Palladium-Carbon catalyst for two hours, or until no more H_2 uptake (or use the $NaBH_4$-Ni method described at the start). Filter and dry, evaporate in vacuum, and distill the residual oil (110-17/0.1) to get 42 g of the octane **(III).** 40 g **(III),** 100 ml 48% HBr, 320 ml glacial acetic acid and reflux four hours. Pour on ice and take pH to 4.5 with ION NaOH and extract with ether. Extract the ether with 3X150 ml 2N NaOH; acidify the combined NaOH extracts with glacial acetic acid and extract with ether. Dry and evaporate in vacuum, and distill the oil (159/0.1) to get 20 g 5-1, 2-dimethylheptyl resorcinol.

5-Alkyl Resorcinols JACS 61,232(1939)

Convert benzoic acid to 3,5-dihydroxybenzoic acid (alpha-resorcyclic acid) (I). 50 g (I), 134 g dimethylsulfate, 60 g NaOH, 300 ml water; add 35 g NaOH and reflux to obtain about 50 g 3,5-dimethoxybenzoic acid (II) which is converted to dimethoxybenzoyl chloride **(III)** with $PC1_5$. Extract the **(III)** with ether and filter. Saturate the ether with NH_3 at 0° C and filter. Wash with ether and water and recrystallize from hot water to get 3,5-dimethoxy-benzamide (IV). To a solution of 1 M of n-hexyl bromide (or 1,2-dimethylheptyl bromide, etc.) add 24.3 g Mg in 200 ml ether to

prepcire the Grignard reagent. Then rapidly add 46 g (IV); add 300 ml ether and reflux and stir two days, excluding moisture and air. Add a mixture of ice and water and 80 ml concentrated sulfuric acid. Separate and dry, evaporate in vacuum the ether layer to get about 50 g of the dimethoxyalkyl benzyl ketone (V). Recrystallize from dilute ethanol. Add 0.2 M (V), 20.8 g 100% hydrazine hydrate, 75 ml ethanol; reflux six hours. Evaporate in vacuum and heat the residual oil with 82 g powdered KOH in oil bath about 225° C until N_2 evolution ceases. Can distill or recrystallize from 95% ethanol to get the dimethoxyalkyl benzene (VI). 0.025 M (VI), 40 ml glacial acetic acid, 15 ml 48% HBr; reflux four hours and pour into ice water; decolorize with a little Na bisulfite, neutralize with $NaHC0_3$ and extract with ether. Wash the extract with 10% NaOH and separate and acidify the basic solution. Extract with ether and dry, evaporate in vacuum the extract to get the 5-alkyl resorcinol. Distill or recrystallize from water to purify. Dry, evaporate in vacuum the first ether extract to recover starting material.
Olivetol LAC 630,77(1960), JCS 311(1945), cf. JACS 89,6734 (1967)

Dissolve 100 g malonic acid in 360 g dry pyridine and heat 48-52° C for forty hours with 100 g n-hexaldehyde (n-capronaldehyde) or homolog. Cool in ice bath and with good stirring add dropwise 150 ml ice cold concentrated sulfuric acid (keep temperature below 5° C). After addition add water to dissolve the precipitate and extract with ether two times. Dry, evaporate in vacuum the ether and distill (70/0.7 or 102/5) to get about 98 g 2-octenoic acid (I). 95 g (1) in 300 ml ether; cool to -5° C and slowly add a solution of an excess of diazomethane in ether dried over KOH and let react for about one hour. Let stand twelve hours, evaporate in vacuum and distill (91/17) to get about 94 g clear methyl-2-octenoate (II).

To 16.3 g Na in 210 ml ethanol add 93 g ethyl-acetoacetate (ethyl-3-oxo-butanoate), heat to boil and add dropwise 92 g (II) over 20 minutes. Stir and reflux five hours and cool to precipitate. Filter, wash with ethanol and dissolve precipitate in 800 ml water. Cool to 0° C and slowly add 80 ml ice cold concentrated HC1 to precipitate. Filter, wash with water and ligroin to get about 108 g 6-carbethoxy-4,5-dihydro-olivetol **(III)** (recrystallize from petroleum ether). To 104 g **(III)** in 260 ml glacial acetic acid at room temperature with good stirring, add dropwise over one hour 69 ml Bromine. Heat-four to five hours at 60° C, cool and add 300 ml water and let stand twelve hours. Oil separates which will precipitate on agitation and

rubbing. Filter, wash with water until colorless (recrystallize from ligroin, recrystallize from glacial acetic acid and precipitate with water) to get about 86 g 6-carbethoxy-2,4-dibromo-olivetol (IV). 0.035 g Palladium-Carbon catalyst in 25 ml hydrogenation bottle. Saturate with H_2 (pressure - 2.8 Kg/cm^2) and add 0.33g (IV) in 5 ml glacial acetic acid, which takes up 39.5 cm^3 H_2 at atmospheric pressure over 1 *Vi* hours at 60-70° C. Filter and acidify at 0° C with ice cold 6N HC1. Extract with ether and dry, evaporate in vacuum. Recrystallize the oil from ligroin and then from glacial acetic acid by adding water to get about 0.2 g 6-carbethoxyolivetol (V). (IV) can also be hydrogenated at room temperature and atmospheric pressure over $^1/2$g Palladium-Carbon catalyst by dissolving 70 g in 500 ml IN NaOH. Heat 35 g (V) with 45 g NaOH in 170 ml water for two hours or until no more $C0_2$ is evolved. Cool, acidify with 6N HC1 and boil 3 minutes. Extract the oil with ether and dry, evaporate in vacuum the ether (can distill on Vigreux column 123/0.01, oil bath 160° C) and let oil stand in refrigerator until crystalline to get about 21 g olivetol. See CA 70,77495t(1969) for another variant of this procedure.

rj'-Dimethylolivetol HCA 52,1127(1969)

Prepare 3,5-dimethoxy benzyl alcohol by reducing the acid with lithium aluminum hydride as described elsewhere here, by hydrogenating the aldehyde (2-3 atmospheres H_2, room temperature, $Pt0_2$ in ethanol -• or by the $NaBH_4$ method), in five steps as described in J ACS 70,666(1948), or prepare (II) directly by the doborane procedure.

Add with stirring 22.5 g $SOCl_2$ in 100 ml ether in 20 ml portions to a solution of 15 g 3,5-dimethoxybenzyl alcohol, 1 ml pyridine and 200 ml ether. Let stand and wash with 2X100 ml cold water; separate and dry, evaporate in vacuum the ether to get 16 g 3,5-dimethoxybenzyl chloride (I). Recrystallize from petroleum ether. 16 g (I), 300 ml ethanol, 30 g NaCN, 75 ml water; reflux three hours and pour onto 400 g ice. After ice melts, filter and recrystallize precipitate from petroleum ether to get about 14 g 3,5-dimethoxybenzyl CN (II). 5 g 50% NaH in mineral oil; wash three times with pentane or hexane; fill flask with N_2 or argon and add dimethoxyethane or dimethylformamide (freshly distilled from K if possible). Stir and add 9 ml methyl iodide. Carefully add 8 g (II) and stir twelve hours. Add ice water and neutralize with $NaHC0_3$ to pH 7-8. Extract with ether and dry, evaporate in vacuum the ether (can distill 170/0.1) to get about 9 g alpha, alpha-dimethyl-3,5-

dimethoxyphenylacetonitrile (III). Add 1.5 g (III) to a solution of 0.45 g Mg, 2.5 g n-propyl Br (freshly distilled if possible) in 30 ml ether. Reflux sixty-five hours. Add 2N sulfuric acid and heat two hours on water bath. Cool and extract with ether and dry, evaporate in vacuum (can distill 135/0.001) to get about 1.75 g 2-methyl-2-(3,5-dimethoxyphenyl) hexanone-3 (IV). Dissolve 4 g (IV) in 50 g ethane dithiol and saturate at 0° C with HCl gas (take care to exclude^ water). Stir the solution in a sealed container forty-eight hours at room temperature and then basify with $NaHC0_3$. Extract with ether and dry, evaporate in vacuum (or dry and evaporate in vacuum two hours at 70/12 and distill at 130/0.001) to get about 5 g of the thioketal (V). Reflux 5.3 g (V), 100 g Raney-Ni, 2 L ethanol (or use $NaBH_4$ procedure) for thirty hours. Cool and filter (Celite), evaporate in vacuum and distill residue (115/0.001) to get 3.7 g of the hexane which is saponified as described for the dimethyl ether of olivetol above to give about 2.5 g of the title compound (can distill 150/0.001).

Olivetol ACS 24,716(1970)

Prepare 3,5-dimethoxybenzoic acid as described elsewhere here, and to a solution of 18.2 g in 250 ml dry tetrahydrofuran under N^2, add 1 g 85% LiH, stir for fourteen hours and then reflux for one-half hour. Add a solution of about 1.3 M butyllithium in ether (Org. Rxns. 6,352(1957)) with stirring and ice cooling until the reaction mixture gives a positive Gilman test (JACS 47,2002(1925)). Then add 500 ml ice water, extract with ether and dry, evaporate in vacuum the organic phase to get a yellow oil which is dissolved in an equal amount of absolute ethanol; left in refrigerator twelve hours to precipitate. Filter and evaporate in vacuum the ethanol to one-half volume to give more precipitate for a total of 18 g 1-(3,5-dimethoxyphenyl)-! pentanone (I). 5.64 g (I) in 200 ml methanol; 0.66 g 20% $Pd(OH)_2$ on carbon (TL 1663(1967)) and hydrogenate at room temperature and atmospheric pressure over two to three hours (or use other reducing method as described here). **Filter** and evaporate in vacuum to get olivetol dimethyl ether (II). 4.88 g (II), 40 ml HI (density 1.7, decolorized with red phosphorous) and stir three hours at 115-125° C under N_2. Dry, evaporate in vacuum or pour into 100 ml ice water and extract with methylene chloride; wash methylene chloride with water and dry, evaporate in vacuum (can distill 160-170/3-4) to get 3.5 g olivetol. __^

5-Alkyl Resorcinols JOC 33,687(1968), JACS 71,1624,1628 (1949)

Illustrated for 1,2-dimethylheptyl compound.

110 g powdered 3,5-dimethoxybenzamide (preparation given elsewhere here), five times excess of methylMgl and reflux sixteen hours. Add 1.2 L concentrated HC1 and 1200 g ice and let stand sixteen hours with occasional shaking. Extract with ether, dry, evaporate in vacuum and distill (115-128/0.3). Let stand in refrigerator to precipitate. Wash precipitate with petroleum ether and recrystallize from petroleum ether to get about 60 g 3,5-dimethoxyacetophenone (1). 83 g (1) in 50 ml methanol. Add dropwise with stirring to solution of 18 g $NaBH_4$ in 300 ml methanol and 1 g NaOH. Reflux 30 minutes and concentrate by distilling. Add about 100 ml water during distillation. Evaporate the methanol, cool and extract with ether. Dry, filter, concentrate, and distill (124/0.65) to get about 80 g 3,5-dimethoxyphenyl ethanol (II). 18 ml PBr_3 in 70 ml ether; add dropwise with stirring over one hour to 28.5 g (II) in 70 ml ether cooled in an ice bath. Warm to room temperature; reflux two hours on steam bath; cool and pour into 200 g ice. Shake and extract with ether 3 times; wash ether with 10% $NaHC0_3$ and water and dry, filter. Concentrate on steam bath and then add with stirring under anhydrous conditions to 42 g diethyl-n-amylmalonate in 300 ml ethanol in which has been dissolved 4.6 g Na metal. Stir 1 *Vz* hours at room temperature and then heat to distill off the ether and complete the reaction. When the distillation head temperature reaches 78° C add water and continue distilling until temperature reaches 99° C. Cool and extract with 3X250 ml ether and evaporate in vacuum the ether. Dissolve residue in 180 ml ethylene glycol and 35 g NaOH by stirring six hours at 160° C. Cool and add 1500 ml water and wash with ether. Acidify the aqueous phase and extract with 4X200 ml ether. Evaporate in vacuum the ether or evaporate on steam bath and dissolve the residue in 150 ml xylene. Evaporate residual ether and water until head temperature reaches 140° C and reflux six hours. Evaporate in vacuum to get about 30 g oily alpha-amyl-beta-methyl-hydrocinnamic acid (III). 14.5 g (III), 5 g lithium aluminum hydride, 250 ml ether; reflux 6 hours. Cool and carefully add methanol, water and dilute HC1. Separate the aqueous layer, saturate with NaCl and extract with ether. Wash ether with $NaHC0_3$ (acidify $NaHC0_3$ extract to precipitate starting material) and dry, evaporate in vacuum the ether to get about 12 g 2-amyl-3(3,5-dimethoxyphenyl)-butanol (IV). 11.7 g (IV) and 8.5 g p-toluenesulfonyl CI each dissolved in 20 ml pyridine. Cool in ice bath and combine. Place in freezer about sixteen hours, pour over ic^/and extract with ether.

Wash ether with cool, dilute HC1 until HC1 extract is acidic. The combined HC1 extracts are then acidified and extracted with ether. Wash the ether with $NaHC0_3$, dry and then add dropwise with stirring to 3 g lithium aluminum hydride in 75 ml ether. Reflux 4 Vz hours and work up as for (IV). (Can chromatograph the undistilled product on activated alumina and elute with 600 ml petroleum ether, then 200 ml methanol; concentrate and distill (94/0.001) the petroleum ether to get product; concentrate the methanol to give starting material). Yield is about 8 g 2-(3,5-dimethoxyphenyl)-3-methyl-octane (V). Convert (V) to the title compound by refluxing in 48% HBr in glacial acetic acid as described elsewhere here.

An alternative route from (11) to (V) involves adding (II) and diethylmethylmalonate to prepare dimethyl-3,5-dimethoxyhydrocinnamic acid as described for the preparation of (III). Then dehydrate and hydrolyze to dimethyl-3,5-dimethoxycinnamic acid which is hydrogenated to the alcohol and converted in several steps to (V).

5-Alkylresorcinols Aust. J. Chem. 21,2979(1968)

Reflux 6.9 g triphenylphosphine and 6.6 g lauryl bromide (or equimolar amount of homolog) in 40 ml xylene for 60 hours. Remove solvent and wash residue with 5X20 ml ether (by decanting) to get 11 g lauryl triphenylphosphonium bromide (I). To a stirred suspension of 5.6 g (0.011M)(I) in 50 ml ether add 0.01M butyllithium solution *(see Organic Reactions 8,258(1954) for preparation). Stir *Vz* hour at room temperature and slowly add 1.66 g 3,5-dimethoxybenzaldehyde (preparation given elsewhere here) in 10 ml ether over Vi hour. After 15 hours, filter, wash filtrate with water and dry, evaporate in vacuum. Dilute residue with pentane, filter and remove solvent. Dissolve the residual oil in 25 ml ethyl acetate and hydrogenate over O.lg Adams catalyst at one atmosphere and room temperature for 2 hours. Filter and evaporate in vacuum to get the 5-alkylresorcinol dimethyl ether which can be recrystallized from pentane and demethylated as described elsewhere here.

5-Alkylresorcinols Aust. J. Chem. 21,2979(1968)

Add 2.17 g 3,5-dimethoxybenzoyl chloride (see BER 41,1329 (1980) or elsewhere here for preparation) in 2.5 ml ether over 10 minutes to a stirred solution of 0.42g diazomethane and 1.01 g triethylamine in ether at -5° C. Keep 10 hours at 0° C, filter, wash precipitate with 20 ml ether and evaporate in vacuum the combined filtrates to get 1.9g diazo-3,5-dimethoxyacetophenone(I). Re-

crystallize from benzene-cyclohexane. To 1.5g(I) in 15 ml ethanol add 1.23g pyridinium perchlorate in 2 ml pyridine. Reflux 2 hours, cool and add 5 ml water. Filter to get 1.5g 3,5-dimethoxyphenylacyl pyridinium perchlorate (II). Recrystallize from ethanol. To a stirred suspension of 0.13 g Na hydride in 10 ml dry, acid free dimethylacetamide at 10° C under nitrogen, add 1.79g (II) in 10 ml dimethylacetamide and shake for 15 minutes. Add 0.0075M propyl iodide or homolog and keep 12 hours at room temperature. Heat 2 hours at 90° C and cool to room temperature. Add 3g zinc dust and 5 ml glacial acetic acid; stir at room temperature four hours and filter. Add 20 ml water to filtrate and extract with 50 ml ether. Wash the ether layer with 2X50 ml 10% K_2C0_3, 50 ml water and 20 ml saturated NaCl. Dry and evaporate in vacuum to get oily. 3,5-dimethoxyphenylbutyl ketone (can chromatograph on 50 g alumina and elute with 3:1 petroleum etheriether). Recrystallize from ethanol. Hydrogenolysis (see Aust. J. Chem. 18,2015(1965) or elsewhere here) gives the olivetol dimethyl ether.

5-Alkylresorcinols Aust. J. Chem. 24,2655(1971)

The method is illustrated for olivetol preparation, but substituted thiophens can be used to get olivetol homologs.

To a stirred solution of 45g 3,5-dimethoxybenzoyl chloride and 17.4g thiophen in 300 ml benzene at 0° C, add dropwise 10.5g freshly distilled stannic chloride. Stir one hour at room temperature and add 200 ml 3% aqueous HC1. Separate the benzene layer and wash the aqueous layer with benzene. Dry and evaporate in vacuum the combined benzene layers and distill the red residue (250° C bath/4.5) to get 45g 2-(3,5-dimethoxybenzoyl) thiophen(I). Recrystallize from petroleum ether. Add a solution of 21g $A1C1_3$ in 160 ml ether to a stirred suspension of 6.1g lithium aluminum hydride in 140 ml ether. After 5 minutes add a solution of 39g(I) in 300 ml ether at a rate giving a gentle reflux. Reflux and stir 1 hour; cool in an ice bath and treat dropwise with 50 ml water, then 50 ml 6N aqueous sulfuric acid. Separate the layers, extract the aqueous layer with 3X100 ml ether and dry, evaporate in vacuum the combined ether layers. Can distill the residue (230° C bath/5mm) to get 27g oily 2-(3,5-dimethoxybenzyl) thiophen (II). Recrystallize from petroleum ether. Reflux a solution of 5g (II) in 700 ml ethanol with W-7 Raney Nickel prepared from Ni-Al alloy (see Org. Synthesis Coll. Vol 111,176(1955)) for 6 hours. Filter, evaporate in vacuum and can distill (140/0.01) to get about 2.2g oily olivetol dimethyl ether which can be reduced to olivetol as described elsewhere here. -

The use of the novel reduction methods described at the beginning of this section would render this method much simpler.

5-Alkylresorcinols **German Patent 2,002,815 (30 July 1970)**

In a 2 liter, 3 necked flask with a stirrer, dropping funnel, thermometer, reflux head, nitrogen stream and mercury manometer (if available) stir 230 ml dry methanol and 32.4g sodium methoxide under nitrogen until dissolved. Add HOg diethylmalonate and stir 10 minutes. Add portionwise 75g 90% pure 3-nonene-2-one (for olivetol-preparation below) keeping the temperature below the boiling point (50-60° C). Stir and reflux 3 hours, then cool to room temperature, neutralize with about 50 ml concentrated HC1 and let stand overnight. Evaporate in a vacuum and dissolve the residue in 200 ml IN HC1 and 800 ml ethylacetate. Separate and wash the ethylacetate with 2X300 ml water and extract with saturated $NaHC0_3$ until a small portion gives no turbidity upon acidification (about 5X200 ml). Carefully acidify the combined $NaHC0_3$ extracts and then extract with 3X300 ml ether. Dry and evaporate jn^ vacuum the ether (can dry under vacuum several days) to get 6-n-pentyl-2-OH-4-oxo-cyclohex-2-ene-l-methyl-carboxylate(I). 4.8 g (I) and 100 ml glacial acetic acid are stirred vigorously at 75° C until dissolved. Cool and keep temperature between 5 and 10° C while adding a solution of 3.9g bromine in 10 ml glacial acetic acid dropwise over 1 hour. Stir 1 hour at room temperature then 3 hours on a steam bath. Evaporate in vacuum and dissolve the residual oil in 200 ml ether. Wash with 2X25 ml 10% sodium dithionite, 2X25 ml saturated $NaHC0_3$ and water and dry, evaporate in vacuum to get olivetol (or analog) (can distill at 125-130/0.05).

Alternatively, to 4.8g (I) ad 5.6g iodine in 200 ml glacial acetic acid. Stir and reflux 10 hours, evaporate in vacuum,^fssolve residue in 250 ml ether and proceed as above to get olivetol.

A third alternative is to stir 12.2g (1) in 100 ml glacial acetic acid at 25° C with vigorous stirring until well suspended. Cool and keep temperature at 5-10° C while adding dropwise 22.4g cupric bromide dissolved in 25 ml glacial acetic acid over 1 hour. Stir 1 hour at room temperature then 3 hours on a steam bath and evaporate in vacuum. Dissolve the residue in 200 ml water and 300 ml ether. Wash the ether layer with 2X50 ml 10% sodium dithionite, 2X35 ml saturated $NaHC0_3$ and 75 ml water and dry, evaporate in vacuum to get olivetol (or analog).

For the 1,2-dimethylheptyl homolog proceed as follows. C/efmbine

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15g 5,6-dimethylundec-3-ene-2-one with 19g diethylmalonate as described above to get (I). Brominate 20.2g (I) with 12g bromine over 2 hours as described and stir 1 hour at room temperature. Add 500 ml water and let stand overnight at 5-10° C. Filter, wash precipitate with about 4X75 ml cold water and dry in vacuum at 50° C to get 26g 3-bromo-2-OH-4-oxo-6(l,2-dimethylheptyl)-cyclohex-
" 2-ene-l-methylcarboxylate(II). In a 3 liter 3 necked flask with a stirrer, thermometer, reflux head and Dean-Stark trap, add 350^(11) and 522g pyridine hydrochloride and heat on oil bath at 90° C 4 hours. Heat with the heating mantle (removing volatiles with the Dean-Stark trap) until the internal temperature reaches 190-200° C and hold at this temperature 2 hours. Cool to room temperature and shake with 3 liters ether and 660 ml 1.2N HC1 and then 2X300 ml water. Extract the ether solution with 4X350 ml 10% NaOH and then extract the combined NaOH extracts with 2X300 ml ether. Acidify the alkaline solution with about 700 ml concentrated HC1 and extract with 3X800 ml ether. Wash the combined ether extracts with 3X300 ml 10% sodium dithionite, 2X300 ml saturated $NaHC0_3$ and 300 ml water and dry, evaporate in vacuum the ether to get the 5-(I,2-dimethyl-heptyl) resorcinol.

To prepare the 3-nonene-2-one condense excess acetone with n-hexaldehyde (or 2,3-dimethyloctanal for 5,6-dimethyl-undec-3-ene-2-one) in the presence of NaOH in an inert medium if desired (benzene, toluene, xylene, etc.), at 10-70° C to get (I). Dehydrate (I) with sodium sulfate or cupric sulfate in an inert medium at reflux temperature or simply reflux in benzene, xylene or toluene.

5-Alkylresorcinols JOC 37,2901(1972)

For5-alkylresorcinols see Chem. and Ind. 685(1973) also.

This is an improved version of a previously given synthesis (LAC 630,71(1960)). The ethanol used is distilled from Ca ethoxide; dimethoxyethane from potassium. Cupric bromide is produced from cupric oxide and 5% excess of HBr, plus sufficient bromine to remove the milkiness on addition of a drop of the mixture to water; concentrate and dry, evaporate in vacuum over KOH flakes.

650g (5.3M) ethyl chloroacetate and 880g (5.3M) triethyl phosphite are mixed and placed in a 3 liter flask fitted with a thermometer and condenser under nitrogen. Heat and stir and slowly bring to 125° C. Discontinue heating as ethyl chloride evolution proceeds over *Vi* hour. Heat to 160° C over a 75 minute period and keep at 160° C 8 hours. Cool, distill (e.g., through 12"

Vigreux column) (74-7/0.03) to get 96% yield of triethyl-phosphonoacetate (I). In a 3 liter flask fitted with a stirrer, dropping funnel and condenser, place 45.3g NaH (IM in mineral oil) and 1 liter of dry ether. Flush with nitrogen and keep at positive nitrogen pressure. Stir in ice bath while 224 g (IM) (I) is added dropwise over 75 min. Stir and reflux 1 hour (H_2 evolution stops). Cool in ice-salt bath and add IM of aldehyde (e.g., hexaldehyde for olivetol) over 1 hour. **Continue** to cool and stir an additional 10 minutes and then slowly bring to reflux and reflux for 10 minutes (ppt. prevents stirring). Decant the ether and dissolve the oil layer in 500 ml warm water and separate the upper organic layer. Extract the aqueous layer with 200 ml ether and extract the combined organic solutions with 200 ml saturated $NaHC0_3$. Dry and evaporate in vacuum (can distill) to get the ethyl- /9 -alkylacrylates in about 90% yield (II).

In a flask with nitrogen and fittings as in preceding step, add 156 g ethyl acetoacetate to Na ethoxide from 25.3g Na and 500 ml dry ethanol, and stir and reflux *Vi* hour. Add IM of (II) dropwise over 90 minutes and reflux 20 hours. Cool in ice, filter, wash ppt. with 500 ml ice cold absolute ethanol and several times with portions of ether and dry, evaporate in vacuum to get the dione Na salt **(III)** in about 80% yield (for olivetol precursor). In a 250 ml flask place 0.1M **(III),** 100 ml 1,2-dimethoxyethane and flush with nitrogen and stir at room temperature while 45g of cupric bromide is added portionwise over 5 minutes, under a nitrogen stream. Stir *Vi* hour and then reflux and stir 1 hour. Cool and evaporate (keep temperature below 50° C) but do not remove more than about 65 ml dimethoxyethane. Dilute the remaining solution with 200 ml benzene and filter. Wash the ppt. with 50 ml benzene and evaporate the combined benzene filtrates (keep temperature below 50° C). Dissolve the bromodione in 100 ml dimethylformamide and put in 500 ml flask under nitrogen. Stir and heat slowly until reflux and then heat to 150° C and reflux 4 hours. Cool, pour into 500 ml water, extract with 3X100 ml dichloromethane and dry, evaporate in vacuum to get the ethyl-6-alkyl-2,4-dihydroxybenzoate (IV). Add a solution of 24g NaOH in 200 ml water to (IV) and stir and reflux under nitrogen in hood for 3 hours. Cool in ice bath, acidify carefully with a cold solution of 20 ml concentrated sulfuric acid in 80 ml water while stirring under nitrogen in ice bath. Reflux under nitrogen 5 minutes, cool, extract 3 times with ether and dry, evaporate in vacuum the combined extracts to get about 80% yield of olivetol^or

analog). The last step may not be necessatv since (IV) may yield an active THC. /

Dimethylheptylresorcinol **CA 65,20062(1966)**

This method is specifically designed to produce good yields of dimethylheptylresorcinol, which provides, after synthesis by any of the various routes, one of the most active THC analogs yet discovered. Note that the synthesis may not have to be carried all the way to the alkylresorcinol since the intermediate ketones etc. may give an active THC analog.

Mix 294g (1.6M) 1,3,5-trichlorobenzene, 184g (3.4M) Na methoxide and 450g (3 3M) diglyme and reflux at 162° C for 42 hours. Cool to room temperature, filter and distill the solvent to get 70% yield of l-Cl-3,5-dimethoxybenzene (I). 43.2g (I) in 540 ml tetrahydrofuran is added dropwise to 7.3g Mg, a small crystal of iodine and a few drops of ethyl bromide (under nitrogen if possible) over *Vi* hour while the mixture is heated to 75° C. Reflux 2 hours and cool to room temperature to obtain the Grignard solution.

To anhydrous liquid ammonia in a cooled flask, add $Fe(N0_3)_3$. 9HjO and then small pieces of sodium and bubble air through the solution until reaction is observed. Add more sodium portionwise until 11.5g is in solution. To the solution at its reflux temperature, add 27.6g (0.5M) proprionitrile (or isobutyronitrile etc. for analogs) and add the resulting solution dropwise to 53.3g 1-Cl-pentane (or 0.5M analog such as 2-Br-hexane etc.) and let the ammonia evaporate. Add ether, then water to the residue and separate the aqueous layer and extract with ether. Dry and evaporate in vacuum the combined ether solutions to give 64% yield of 2-methyl-heptanonitrile (II) (or analog).

Add 34.Og (0.27M) (II) in tetrahydrofuran to the Grignard solution of (I) over *Vi* hour, heat 6 hours at 60° C and hydrolyze with 1600 ml 50% sulfuric acid, keeping the temperature below 40° C. Evaporate in vacuum the solvent and add another 400 ml 50% sulfuric acid. Heat 1 hour at 95-100° C, cool, add ether, separate the aqueous layer and extract with ether. Dry and evaporate in vacuum the combined ether layers to get 71% yield 2-(3,5-* dimethoxybenzoyl) heptane (III) (can distill 133-8/0.2), which can be demethylated as described for the preparation of (VII) below and possibly used to synthesize an active THC analog (as can IV, V, or VI).

21.8g (0.082M) (III) is added dropwise (keeping the temperature

at 15-20° C) to 3 molar methyl-MgBr in ether and tefluxed 1 hour. Pour into a sulfuric acid-ice mix, add more sulfuric^^rtid and stir. Separate and extract the aqueous layer with ether. Wash, dry, filter and evaporate in vacuum the combined ether layers to get 2-(3,5-dimethoxyphenyl)-3-methyl-octanol (IV), which is dehydrated by mixing with anhydrous oxalic acid and heating to 130-40° C. Extract the dehydrated reaction products with benzene to get the octenes (V). Add 25g (V), 2.5g 65% Ni on kieselguhr in dry hexane to hydrogenator and hydrogenate at 1750 psi and gradually increase the temperature to 125° C. After 3 hours, increase the pressure to 1850 psi and hold there *2Vi* hours, filter and evaporate in vacuum to get 2-(3,5-dimethoxyphenyl)-3-methyl-octane (VI).

Add 20g (0.08M) (VI) to 38% HBr in glacial acetic acid and stir and reflux for 6 hours. Pour onto ice and water, neutralize with solid sodium carbonate and extract with ether. Extract the ether with 10% aqueous NaOH, acidify the aqueous solution with HC1, extract with ether and dry, evaporate in vacuum (can distill) to get 2-(3,5-dihydroxyphenyl)-3-methyloctane (VII) (5-(l,2-dimethylheptyl)-resorcinol).

As an alternative process for getting from (III) to (VI), combine 64.2g (0.18M) methyltriphenylphosphonium bromide in dry benzene with 11.6g (0.18M) (in 14% solution) butyllithium in benzene. Heat to 60° C and cool. 49.0g (0.176M) (III) in 40 ml dry benzene is added (keep temperature below 40° C) and then reflux 2 hours. Cool, filter and evaporate in vacuum to get the octene, which after catalytic hydrogenation as described for (V) yields (VI).
5-Alkylresorcinols Aust. J. Chem. 21,2979(1968)

Mix 50g 3,5-dihydroxybenzoic acid, 250 g K_2C0_3, 200 ml dimethylsulfate and one liter acetone and reflux 4 hours. Remove the acetone, add one liter water and one liter ether to the residue and,/ extract. Wash the ether extract with 2X100 ml concentrated NH_4OH, 2X100 ml dilute HC1 and 100 ml water and dry, evaporate in vacuum to get 48g methyl-3,5-dimethoxybenzoate (I). Recrystallize from aqueous methanol. To a stirred suspension of 19g lithium aluminium hydride in 200 ml ether add 78.4g (I) in 300 ml ether at a rate which gives gentle refluxing. Reflux 2V2 hours, cool and add 50 ml wet ether; then 100 ml dilute sulfuric acid. Wash and dry, evaporate in vacuum the ether extract to get 62g oily 3,5-eimethoxybenzyl alcohol (II). Recrystallize from ether-pentane. To a cooled stirred slurry of 15g $Cr0_3$ and 250 ml pyridine add 8.4g (II) in 25 ml pyridine and let stand 1 hour at room temperature. Add 60

ml methanol, let stand 2 hours, and dilute with 500 ml 5% NaOH and 500 ml ether. Extract the aqueous layer with ether and wash the combined ether layers with 500 ml water, 3X500 ml 5% sulfuric acid, 500 ml water and 200 ml saturated NaCl and dry, evaporate in vacuum to get 7g 3,5-dimethoxybenzaldehyde **(III).** Re-**crystallize from ether-pentane. To a flask with** a **dropping funnel and** condenser add 0.58g Mg turnings and 10 ml ether. Add a few drops of a solution of lauryl bromide (5.7g) or equimolar amount of homolog in 15 ml ether and start reaction by adding 2 drops methyl iodide. Add the remaining bromide solution with stirring and gentle refluxing over 15 minutes and then reflux 3 hours. Cool in an ice bath and add 3.1g **(III)** in 5 ml ether dropwise with stirring over 45 minutes. Reflux 4 hours, cool and dilute with ice water. Wash the organic layer with 2X25 ml 3N sulfuric acid, 2X25 ml 10% K_2C0_3, 25 ml water, 25 ml saturated NaCl and dry, evaporate in vacuum to get 5g 3,5-dimethoxyphenyldodecyl methanol (IV) or homolog. Recrystallize from methanol. Hydrogenate 4.2g (IV) in 50 ml ethyl acetate with 5 drops concentrated sulfuric acid and 0.5g 10% Palladium-Carbon catalyst at room temperature and 5 atmospheres hydrogen for 4 hours. Filter and evaporate in vacuum to get the aklylresorcinol dimethyl ether.

Aust. J. Chem. 26,799(1973) gives a 2 step synthesis of 5-alkylresorcinols by condensation of beta-ketosulphones with 3,5-dimethoxybenzyl bromide and then reduction. Aust. J. Chem. 26,183(1973) gives a synthesis from 3,5-dimethoxy-N,N-dimethylbenzylamine in 7 steps (but perhaps only 4 will reach a cpd. that can give an active THC analog).

5-alkylresorcinols CPB 20,1574(1972)

To a solution of 0.02M ethyl- *0* -ketocaprylate (or homolog) in 20 ml tetrahydrofuran, add 1.02g (0.02M) (53% oil) NaH with stirring and cooling and then add a solution of diketene (1.68g, 0.02M) in 20 ml tetrahydrofuran dropwise, keeping the temperature between -5 and 0° C. Stir 1 hour at this temperature and then 1 hour at room temperature. Neutralize with 10% HC1 and extract with ether. Dry and evaporate in vacuum to get about 38% yield of ethyl-olivetol carboxylate (I). (I) can be purified on silica gel, the impurities being eluted with petroleum ether (30-35° C) and the produce with 8:1 petroleum ethenether. Recrystallize from n-hexane. Dissolve 0.2g (I) in 10 ml 10% NaOH and reflux 30 minutes. Acidify with 10% HCI and extract with ether. Wash the extract with water and dry, evaporate in vacuum (can distill 126-129/3) to get 96% olivetol (or

homolog).

For new, simple, high yield syntheses of 5-alkyl resorcinols see TL 4839(1973), 2511(1975) and CJC 52:2136(1974). A supenor, high yield, 3 step synthesis of olivetol and analogs has recently appeared in JOC 42:3456(1977).

V

MAGIC MUSHROOMS AND OTHER INDOLE TRIPS

Various trees, vines, etc. and mushrooms containing dimethyltry ptamine (DMT) and analogs have been used by the natives of Central and South America for millennia. Precise chemical and botanical identification have been made on a number of species, the first and most famous of these being certain species of mushrooms of the genus *Psilocybe,* species of which are found in the U.S.A., Canada, Scotland, Australia, etc. as well as Central America. Psychedelic species of the closely related genera *Conocybe, Stropharia, Pholiota, Copelandia* and *Panaeolus* are found widely scattered around the world. Not all species of each genus necessarily contain significant amounts of hallucinogens, but it seems that most do. A general test is that the stem of indole containing species tends to turn blue several hours after it is picked and slightly crushed. These are generally found in late summer and fall in the U.S.A. Pictures are given in many mushroom books including R. Heim, LES CHAMPIGNONS HALLUCINOGENES DU MEX1QUE (1958), and L. Enos, A KEY TO THE AMERICAN PSILOCYB1N MUSHROOM (1971).

It turns out that the home cultivation of psilocybin mushrooms is quite easy. See Oss and Oeric PSILOCYBIN: MAGIC MUSHROOM GROWER'S GUIDE (1976 - And/Or Press) or THE COMPLEAT PSILOCYBIN MUSHROOM CULTIVATOR'S BIBLE (1976 - Hongero Press). Strains of *Stropharia cubensis* being grown on the West Coast are sufficiently strong that I have seen people who were very experienced with acid get higher than they had ever been on three fresh mushrooms. Remember that psilocybin is cross-tolerant with LSD,,so you won't get off as well if you've done acid recently.

Puffballs of the genus *Lycoperdon* are also hallucinogenic, and activity has been claimed for *Boletus satana,* which occurs in the southeastern U.S.

In THE TEACHINGS OF DON JUAN, Don Juan seems to have taught Carlos to smoke the mushrooms, which might provide a

different or heavier trip than ingesting them since they undoubtedly contain many compounds like DMT and 5-methoxy-DMT which are not orally active.

Puffballs seem to usually produce only auditory hallucinations. L. *marginatum* found over much of Europe and America is active (1 or 2 constitutes a dose).

New Guinea "mushroom madness" is apparently due to species of *Boletus, Russula* and *Heimiella.* See R. Heim NOUVELvES INVESTIGATIONS SUR LES CHAMPIGNONS HALLUCINOGENES (1967). Also see FIELD GUIDE TO THE PSILOCYBIN MUSHROOM (available from P.O. Box 15667, New Orleans, LA 70175).

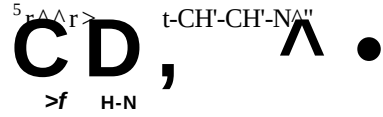
Psilocybin (4-phosphoryloxy-N,N-dimethyltryptamine) and psilocin (4-hydroxy-DMT) are among the active indoles in the mushrooms. Upon ingestion, psilocybin is hydrolyzed to psilocin; consequently there is no point in carrying the synthesis past the psilocin step. All the active naturally occurring compounds in this group seem to have the dimethylamine moiety, which is usually obtained in the course of chemical synthesis by using dimethylamine (DMA). If however, the DMA is replaced by diethylamine (DEA), dipropylamine (DPA), methylethylamine (MEA), pyrrolidine, etc., the potency and duration of action might be considerably increased. Likewise, an increased activity might be seen when the OH position of psilocin is replaced by methoxy or acetoxy. Human data are lacking for most of these compounds, but judging from animal experiments, the order of potency should be roughly as follows (MET is methylethyltryptamine, DET is diethyltryptamine):.

4 or 5 acetoxy-MET>4 or 5 MET >4 or 5 methoxy-DET >4 or 5 5-acetoxy-DMT

methoxy-DMT >4-OH-DMT >DMT DET

Compounds with a low relative activity (e.g., DMT, DET, 5 methoxy-DMT) have very little activity orally and must be smoked or sniffed. Unfortunately, these compounds taste and smell like burning plastic when smoked and are harder to smoke than hash. There is, however, no evidence for the notion that they are damaging. With the exception of DMT, DET, psilocin and psilocybin, most of these compounds are probably legal in most states.

Psilocin



In the case of the unsubstituted N, N-diakyltryptamines, duration of action increases as the chain gets longer in the order DMT, DET, DPT, and seems to decrease with further increase in length. The trip produced by a good dose of DMT typically lasts about one-half hour, whereas that for DPT can last three to four hours or more. There is some evidence that DET produces a better (i.e., more meditative and euphoric) trip than DMT.

If the alkyl side chain at the 3 position of the indole nucleus is shortened (e.g., gramine) or lengthened (e.g., 3-(3-dimethylamino)-propyl indole) activity seems to decrease strikingly. Also, as the substituents are moved around the benzene ring of indole, activity decreases greatly in the order 4,5,6,7. For example, whereas 4-OH-DMT(psilocin) is active at about 5 mg orally (i.e., about as active as STP), 5-OH-DMT(bufotenin) is not psychedelic at all.

The effects of 5-methoxy-DMT are unpleasant for most people (smoking it gives me nausea plus the feeling that I'm being sat on by an elephant), but it is not known whether other substituents in the 5 position or in the 4 and 5 positions simultaneously will be similarly distressing.

DMT, DET, etc. are remarkably fast acting (peaking in ca. 2 minutes after a good toke or snort) and produce very strong visual effects (my first toke of DMT produced a large grinning green dragon with red ruby eyes that lasted as long as the Stones' "Sympathy for the Devil"). It is unfortunate that it is usually DMT rather than the longer acting DET or DPT that is available, especially since the latter cpds. are no more difficult to produce. Also, it is rumoured that N,N-dibutyl and longer alkyls are not only active but (along with the dipropyl, diisopropyl etc. cpds.) orally active.

Ken Kesey has reputedly said that alpha-methyltryptamine, in oral doses of ca. 30 mg, peaks in about 12 hours, produces a trip similar to psilocybin, but nicer, and is the "Rolls Royce of psychedelics," but others find it unpleasant. Alpha-ethyltryptamine produces minimal LSD-type effects at 150 mg orally, but effects of

these when smoked or inhaled are unknown. N,N-disubstituted tryptamines which have substituents in the alpha or beta positions should also be quite interesting.

Identification of Indoles

Keller Test

Add a little of the powdered substance (about 0.2 mg to **lSwl** glacial acetic acid containing 0.5% $FeCl_3$, layer underneath with 1 ml concentrated sulfuric acid and shake. The color varies with the indole, being olive green for psilocin and red-violet for psilocybin.

Van Urk Test

Prepare Van Urk reagent by adding 0.5 g p-dimethylamino-benzaldehyde, 100 ml water, 100 ml concentrated sulfuric acid. Dissolve 1 mg substance in 1 ml ethanol and mix with 2 ml Van Urk reagent and illuminate for 10 minutes with an ultraviolet lamp (black light). Psilocin gives a blue-grey, psilocybin a red-brown color.

Colors produced in these two tests by many indole derivatives are given in HCA 42,2073(1959).

Quick, Easy, On-the-Spot Test

JPS 56,1526(1967)

Saturate strips of filter paper with 2% p-dimethylamino-benzaldehyde in 45% ethanol; air dry and store in tightly stoppered amber bottles (or keep in stoppered container in dark) which will keep them useful for several months. Put a little of the suspect substance in a few drops of ethanol (gin may do, but do a control), wet a filter paper strip in this and allow to dry. Put one drop concentrated HC1 on the dried paper (don't let it touch anything). Alternatively, the powder can be placed directly on the strip and the HC1 dropped on it. A violet red or violet blue spot indicates indole derivatives such as LSD. With DMT or psilocybin the color is redder. The color must be observed soon after adding the 1JC1 since it rapidly changes.

Dialkyltryptamine Syntheses

Dialkyltryptamines HCA 42,2073(1959) and many others

To 25 g indole (or 50 g 4-benzyloxyindole or 0.21 M other indole) in 1 L dry ether at 0° add a solution of 50 ml (75 g) oxalyl chloride in 1 L dry ether carefully and with good stirring a little at a time over *Vi* hour and stir until bubbling ceases (about one-half hour more). Some indoles require a longer reaction time (e.g., 4-Cl-indole requires fifteen hours refluxing) and some will not react (e.g., 4-Br-indole). Add portionwise, carefully with stirring at 0°, a solution of

225 ml (160 g) diethylamine (DEA) (or 0.46M dipropylamine, pyrrolidine, etc.) in 100 ml dry ether at 0°. Stir and let warm to room temperature; cool, filter, and wash precipitate two times with ether to get (I). This can be recrystallized by dissolving in the minimum volume of 1:1 methanohbenzene (or 95% ethanol), gently heated, cooled to 0° and filtered (or add petroleum ether to induce precipitation). Dissolve 25 g (or 0.102 M) (I) in the least volume (about 200 ml) THF and add very carefully and slowly (preferably dropwise) to 20 g lithium aluminum hydride dissolved in the least volume (about 200 ml) tetrahydrofuran at room temperature. Stir and heat under reflux for about fifteen hours. Cool to 0° and slowly and carefully add a little cold methanol and water until no more bubbles are formed. Filter, wash precipitate with hot tetrahydrofuran and add washings to filtrate. Dry, evaporate in vacuum the tetrahydrofuran (or add petroleum ether) to precipitate the dialkyltryptamine. To purify, add 500 ml saturated sodium sulfate and filter. Wash precipitate with tetrahydrofuran; acidify with a few ml 0.1 M HC1 and shake with ether. Separate the organic layer and neutralize with 0.1 M NaOH. Extract with $CHC1_3$ and dry, evaporate in vacuum the extract (or can evaporate until a few ml left and precipitate by adding petroleum ether). The 4-benzyloxy-DET which would be produced if 4-benzyloxyindole is used as the starting material is probably a good psychedelic. If however, it is desired to change this to 4-OH-DET, add 37.5 g 4-benzyloxy-DET in 1.2 L methanol to 20 g 5% Palladium catalyst on alumina (or 14 g 10% Palladium-Carbon) with 2.8 kg/cm^2 H_2 in a Parr hydrogenator and shake twelve hours. Filter, evaporate in vacuum. Other hydrogenating methods might also split off the benzene ring. Other methods (LAC 576,69(1952)) must be used for reducing a methoxy group to a OH group (another demethylation method is given here later).

If (I) has an alkyl group in position 1 (as in some of the following syntheses), reduction will give the indolylhydroxylamine. This may be active, but if the indolamine is desired (I) (substituted or not) may be reduced with the diborane method given later in this section. *Dialkyltryptamines* JCS (C) 2220(1967)

This procedure gives about 20% yield with indole, but the yield with substituted indoles (e.g., 4-OH-indole for producing psilocin) has not been reported.

Cool 32 g ethyl iodide to 0°; dissolve in 50 ml anisole (other solvents won't work) and add 8 ml to 5.28 g Mg turnings in 50 ml anisole, and add the rest gradually. Warm gently to start the

reaction, and if necessary add a crystal of iodine or a small amount of ether for a rapid rate. Stir well and heat at 50-60° for one hour (under N_2 if possible). Cool to 10° and add dropwise over one-half hour 12 g (0.1 M) indole in 50 ml anisole (keep temperature below 25°). Stir forty-five minutes at 50° and cool to -5°. Finely grind 0.2 * M (34 g) l-Cl-2-diethylaminoethane-HCl (or the corresponding diisopropyl, pyrrolidyl, etc. compounds) and suspend in about 20 ml benzene at 0°. The free base in benzene can also be used, if obtainable. Stir and take pH to 8.5 with 40% NaOH. Add anhydrous potassium carbonate until the water layer is semisolid. Decant the benzene and extract the residue with 4X15 ml benzene. Dry the combined benzene extracts with KOH pellets for less than an hour and quickly proceed to the next step. Add the benzene solution (about 80 ml) slowly over one hour to the above solution of indole in anisole at -5°. Stir three hours at -5° and let sit five hours at -5°. Then let warm to room temperature and dry, evaporate in vacuum (or to purify, break up the precipitate and pour the solution on 500 ml saturated aqueous NH_4C1. Stir one-half hour; separate the organic layer and extract the aqueous layer with ether. Combine the organic solutions and extract three times with 10% HCl. Wash HCl extract with ether; cool to 0°, basify with 40% NaOH and extract three times with ether. Dry, evaporate in vacuum this second ether extract to get the oily DET or analog).

4-Substituted Dialkyltryptamines CT 279(1970)
(cf. JOC 30,339(1965))

Beta-carbomethoxypropionyl chloride (Org. Synth. 25,19 (1945)). Dissolve 400 g succinic anhydride in 190 ml methanol in 1 L round bottom flask and reflux (steam bath) one-half hour. Stir until homogeneous (about twenty minutes) and reflux one-half hour. Evaporate in vacuum and cool the residual liquid to precipitate about 500 g methyl-hydrogen succinate (1). Dissolve 264 g (1) in 200 ml $SOCl_2$ in a 1 L round bottom flask with a reflux condenser and warm ' at 30-40° in water bath for three hours. Evaporate in vacuum the $SOCl_2$ (can heat flask in steam bath) to get 270 g of the title compound (can distill 92/18).

Add excess diethylamine to beta-carbomethoxypropionyl-Cl in dry ether to get (see above JOC reference) 3-carbo-methoxy-N,N-diethylpropionamide (1). 206 g (I) in 3 L, three-necked round bottom flask in ice bath with stirrer, dropping funnel and reflux head. Keep temperature at 10-20° and add 169 g $POCl_3$ dropwise over fifteen minutes. Remove ice bath and stir fifteen minutes and replace ice

bath. Add 250 ml ethylene chloride, cool to 5°. Stir and slowly add 67 g pyrrole in 250 ml ethylene chloride over 1 hour. Remove ice bath and reflux fifteen minutes (HC1 evolution). Cool to room temperature and add solution of 750 g sodium acetate trihydrate in 1 L water dropwise at first, then as rapidly as possible. Reflux fifteen minutes with stirring, cool and remove ethylene chloride in separatory funnel. Extract aqueous phase with 3X200 ml ether and wash combined ethylene chloride and ether with 3X100 ml saturated aqueous Na carbonate (add carefully at first). Dry, evaporate in vacuum the organic phase to get 132 g methyl (pyrrolyl-2')-4-keto-4 butyrate (11) (can distill 135-45/0.2) (recrystallize from cyclohexane). Alternatively, (Chem. Commun. 1429(1968)), condense 1,3-cyclohexanedione and aminoacetaldehyde dimethylacetal in benzene with p-toluenesulfonic acid. Azeotropic removal of water gives a compound which, when treated with 3N HC1, gives compound (IV). But it has been claimed that this alternative method does not work.

94 g (II), 1.5 L diethylene glycol, 93 g hydrazine hydrate and heat at 100° fifteen minutes. Add 150 g potassium carbonate a little at a time and raise temperature slowly. Heat four hours at 190-200° and pour onto 5 kg ice. Acidify and then extract with 5X400 ml ether. Wash extract with a little saturated NaCl and evaporate in vacuum to get about 48 g 4-(pyrroly-2')-butyric acid (III) (recrystallize-cyclohexane). Can purify the oily compound by filtering through 80 g silica and 80 g Celite (elute with benzene). 24 g (111) in 400 ml 1,2-dichloroethane; cool to -5° and add 15.8 g triethylamine and 17 g ethyl chloroformate. Let stand 1 hour at 15°; filter and wash precipitate with 100 ml dichloroethane. Add 0.5 L anhydrous $ZnCl_2$ (freshly fused) and let stand two hours at -5°. Add 0.5 L 2N HC1, decant and wash the aqueous phase three times with $CHC1_3$; dry, evaporate in vacuum (can chromatograph as for (III)) to get about 11 g 4,5,6,7-tetrahydro-4-indolone (IV). 7.35 g (IV), 5 g 10% palladium-carbon, 700 ml mesitylene and reflux eight hours or more. Filter hot, wash precipitate with methanol, cool and evaporate in vacuum (can chromatograph as for (III)) to get 5 g 4-OH-indole (V) (recrystallize from petroleum ether), which can be converted to the diakyltryptamine by any of the methods described here *or as* follows (the first step leading to (VI) may not be necessary). 5 g (V), 20 ml pyridine, 10 ml acetic anhydride and heat in water bath 10 minutes. Pour on ice, stir and add $NaHC0_3$. After one-half hour extract with ethyl acetate, wash

extract with NaCl and dry, evaporate in vacuum to get about 6.3 g 4-acetoxy-indole (VI). 6 g (VI), 150 ml ether; cool in ice-salt bath and add carefully 6 ml oxalyl-Cl. After four hours add 20 g dry dimethylamine or equimolar amount other amine and stir twenty hours. Filter, wash precipitate with ether and then water to get about 2.8 g 4-acetoxy-3-indolyl-N, N-dimethylglyoxylamide (Vila) (recrystallize-isopropanol). Shake the ether with water and filter to get about 5 g of the 4-OH compound (Vllb) (recrystallize-isopropanol). 7.8 g (Vila or b or mixture obtained by evaporating in vacuum the ether above), 17 g lithium aluminum hydride, 150 ml tetrahydrofuran or dioxane; reflux seventeen hours, carefully add water and stir until bubbling ceases and evaporate in vacuum to get about 4.7 g of psilocin or analog (about 5% overall yield). For other methods of synthesizing (IV) see JOC 36,1232(1971) and references therein. For another method of reducing (IV) see Chem Het. Cpds. (Russian), 572(1972).

4-Substituted Dialkyltryptamines HCA 42,2073(1959), 38,1452 (1955), CT 276(1970)

Method is illustrated for 4-benzyloxyindole (I) but will probably work for most other substituted indoles.

A: Convert (I) to 4-benzyloxygramine (II) as described elsewhere here.

B: Add 30 g (II) over one-half hour to 420 ml methyl iodide and let stand fifteen hours at 5°. Separate the iodomethylate which precipitates, dry briefly at 50° and heat with vigorous stirring at 80° for two hours with 60 g NaCN in 1 L water. Extract with $CHC1_3$, dry and evaporate in vacuum the extract and dissolve the residue in 250 ml ether. Filter, evaporate in vacuum to a few ml and precipitate the acetonitrile (III) by adding petroleum ether. The acetonitrile can also be prepared directly from the indole via the Grignard reagent as given elsewhere here.

B (Alternative): 0.05 M (II), 0.76 ml glacial acetic acid in 75 ml tetrahydrofuran (dry) are added slowly with stirring and cooling over one-half hour to a solution of 25.2 ml dimethylsulfate and 0.76 ml glacial acetic acid in 30 ml dry tetrahydrofuran. After two hours, filter and wash the precipitate with ether. Dissolve precipitate in 10% aqueous solution of KCN and heat one hour at 70°. Filter, wash precipitate with water and dry to get (III).

C: 0.04 M (III) in 200 ml 33% ethanol solution of DMA or other amine, 2.5 g Raney-NI, 40°, 100 kg/cm^2 (about 100 atmospheres)

H . Heat about three hours; filter and evaporate in vacuum to get the dialkyltryptamine.

C (Alternative): 5.8 g (111), 12 g KOH, 36 ml ethanol, 28 ml water; reflux fifteen hours, add 15 ml glacial acetic acid, filter and add 150 ml water to precipitate 4-benzyloxyindole acetic acid (IV). Filter, wash precipitate with water and recrystallize from methanol.

D. 1.76 g (IV), 1.4 g $PC1_5$, 50 ml ether at 0°. Stir until dissolved and add dropwise to solution of 5.36 g DEA (or equimolar amount other amine) in 10 ml ether. Let warm to room temperature, let stand one-half hour and precipitate by adding water. Filter, dry, evaporate in vacuum the ether and add the residue to the precipitate to get the diethylacetamide (V) (recrystallize-benzene).

D (Alternative): 20.6 g (IV) in 50 ml methanol; add excess diazomethane in ether, evaporate in vacuum and dissolve the oil in 90 ml dry hydrazine. Heat at 135° 1 *Vi* hours, add 150 ml water and cool to precipitate the hydrazide (recrystallize-aqueous methanol). 14.7 g of the hydrazide in 250 ml tetrahydrofuran or dioxane and add 50 ml IN $NaN0_2$. Cool to 4° and add dropwise over 4 minutes with vigorous stirring, 60 ml IN HC1; let stand fifteen minutes at 4° and add 500 ml water. Extract the oily azide with ether and dry, evaporate in vacuum. Add 77 ml (0.75 M) DEA (dry) to the azide and let stand three hours at 5° with care to exclude moisture. Evaporate in vacuum and take up the residue in $NaHC0_3$. Extract with $CHC1_3$ and dry, evaporate in vacuum the extract to get (V).

E. 0.7 g (2.28 mM) (V) in 20 ml dry tetrahydrofuran; add slowly to a well stirred solution of 0.35 g lithium aluminum hydride in 20 ml tetrahydrofuran and keep one hour at 40°. Carefully add 5 ml water and stir twenty minutes. Add 15 ml 20% NaOH and extract with ether. Dry, evaporate in vacuum the extract to get 4-benzyloxy-DET or analog (recrystallize-ether).

E (Alternative): To 0.4 g (V) in 15 ml tetrahydrofuran add 2.9 ml 1 M borane in tetrahydrofuran and reflux one hour. Cool and heat with 5 ml 2N HC1; evaporate in vacuum to get about 0.15 g product.

4-Nitro and 4-Amino-Dialkyltryptamines CJC 41,2585(1963)

153 g alpha-CI-butyryl-CI, 16 g Pd on $BaS0_4$, 1.66 ml sulfur-quinoline (Org. Synthesis 21,84(1941)), 900 ml toluene; reflux and stir while bubbling H_2 through for seven hours or until HC1 evolution ceases (can bubble effluent HO through water to monitor evolution).

Filter, wash toluene with water, $NaHC0_3$, water and dry, evaporate in vacuum to get 100 g gamma-Cl-butyraldehyde (I) (can distill 28/2). 10 g (I), 20 g 3-nitro-phenylhydrazine; dissolve in the minimum volume of hot ethanol containing 10% glacial acetic acid. Heat on steam bath one hour; cool and add water until dark oil separates. Evaporate in vacuum the ethanol and decant the water to **get the** oily gamma-Cl-butyraldehyde-3-intro-phenylhydrazone(II). 29 g (11), 300 ml concentrated HCl, Z00 ml benzene; stir three hours, replace benzene with fresh benzene and stir four hours. Combine the two benzene portions, wash with water and dry, evaporate in vacuum to get 4 g 3-(beta-Cl-ethyl)-4 and 6-nitroindole **(III).** 3.56 g **(III),** 200 ml ethanol, 200 ml 34% aqueous DMA (or other amine) and let stand at room temperature for one week. Evaporate in vacuum the ethanol, filter, dissolve the precipitate in dilute HCl and filter. Basify the filtrate with dilute NaOH to precipitate 3 g 4 and 6-nitro-DMT (IV). 5.2 g (IV), 350 ml ethanol, 100 ml IN NaOH; heat to 50° and add a solution of 3 g Na dithionite in 15 ml 0.2N NaOH. filter hot and evaporate in vacuum to get 2 g 4 and 6 amino-DMT (can purify by dissolving in HCl, filter, basify, extract with ether and dry and evaporate in vacuum the extract).

5-Acetyl-DMT JMC 7,144(1964)

40 g p-aminoacetophenone, 250 ml water, 143 ml concentrated **HCl.** Slowly **add** 21 g $NaN0_2$ in 200 ml water and keep temperature at 0-5°. **Add** 70 g ethyl-alpha-(2-dimethyl-amino-propyl)-acetoacetate, then 63 g sodium acetate and keep pH at 5.5-6.0 with 3N NaOH. Stir in cold two hours; basify with NaOH and extract with 3X400 ml $CHC1_3$. Dry, evaporate in vacuum the extract to get 70 g ethyl-alpha-keto-delta-dimethylaminovalerate (I) (recrystallize-benzene-petroleum ether). 50 g (I), 430 g polyphosphoric acid and heat slowly with stirring. Foaming starts about 60°. Slowly raise temperature to 105° and keep two hours. Cool to 70°; pour into 700 ml ice water; stir to dissolve; cool, basify, extract with 3X400 ml $CHC1_3$ and dry, evaporate in vacuum to get 10 g 5-acetyl-2-**carbethoxy-DMT (II). Test for activity. 11.2 g (II) in 190 ml** 20% HCl; reflux four hours; cool and filter. Basify with 40% KOH and extract with 4X125 ml $CHC1_3$ and dry, evaporate in vacuum to get 5-acetyl-DMT.

1-Methyl-DET BSC 1056(1962)

135 g acetoacetic acid in two-necked flask fitted with two

condensers atop one another, the upper air cooled only, and a dropping funnel with a tube running to the bottom of the flask. Heat to boiling and add-over forty minutes, as a vapor, 80 g DEA dried (e.g., with Na wire). The residue can be distilled (120-140/12) and redistilled (123-4/12) to give 100 g N,N-diethylacetoacetamide (1). 15.7 g (1) in 80 ml $CHC1_3$ and add dropwise 16 g Br_2 in 10 ml $CHC1_3$. Heat gently to a boil for one-half hour and cool to precipitate. Filter, wash precipitate with $CHC1_3$ and dry to get 25 g gamma-Br-diethylacetoacetamide (II) (use crude since decomposes on distillation). 4.72 g (II), 4.28 g N-methyl-aniline, 20 ml dimethyl formamide and let stand twelve hours (or 90 ml ethanol and reflux eighteen hours) at room temperature. Slowly add 300 ml water and extract the oil which forms with benzene. Wash with water and dry, evaporate in vacuum the benzene extract to get 4 g precipitate (recrystallize-80% ethanol). 4 g precipitate, 4 g $ZnCl_2$ finely ground; heat in oil bath and keep temperature 100-110° for forty-five minutes. Cool and dissolve precipitate in 40 ml 4N HC1 and 160 ml benzene. Separate the benzene and wash with water; basify and dry, evaporate in vacuum to get 1.3 g l-methyl-3-indoIe-N, N-diethylacetamide (III) (recrystallize-ethanol). Test for activity. Recover N-methyl-aniline by basifying the water or ethanol, extract precipitate with ether, wash extract to neutrality and dry, evaporate in vacuum. 1.1 g (III), 0.38 g finely ground lithium aluminum hydride, 300 ml ether and reflux two days. Carefully add a little water and filter, evaporate in vacuum to get 1-methyl-DET (recrystallize-ethanol). (Ill) can probably also be reduced by the method described in the chemical hints section or even more simply as follows: Dissolve 1M $NaBH_4$ and 0.1 M (III) in 500 ml pyridine or other solvent and reflux eight hours or more.

Alpha-alky I-DMT TET 29,971(1973)

21.6g(0.1M) alpha-bromopropionyl (or butyryl etc.) bromide is added dropwise over 1 hour to a well stirred mixture of 11.7 g (0.1M) indole and 8.1 ml (0.1M) pyridine in 300 ml toluene at 60°. Stir 1 hour, cool and pour into 500 ml water. Separate the oil and dissolve in methanol. Let stand 1-24 hours until crystals separate. Filter (recrystallize from acetonitrile) to get 18.4 g (72%) 3-(2-bromopropionyl)indole(I). 5.2 g (0.02M) (I), 7 ml 33% aq. dimethylamine and 3 g Nal in 100 ml ethanol are refluxed for 20 hours, concentrated to 25 ml and poured into 200 ml aqueous 0.5M HC1. Extract with ether and basify with concentrated NH_4OH. Recrystallize from ethanol to get ca. 3g(50%) 3-(2-dimethyl-

aminopropionyl)indole(Il). 2.7g (II) in 50 ml tetrahydrofuran is added to a well stirred mixture of 2.7 g lithium aluminum hydride in 60 ml tetrahydrofuran. Reflux 23 hours, carefully add 5 ml 2N KOH, filter and wash the the ppt. with ether and dry, evaporate in vacuum the ether to get 1.65 g (66%) alpha-methyl-DMT (recry.-benzene-n-hexame).

Alphamethyl-DET JMC 9,343(1966)

46.8 g (0.4 M) indole in 100 ml toluene; add to 54.5 g ethyl-bromide and 12.5 g Mg turnings in 125 ml ether. After one-half hour convert the indoyl-Mg-Br to 3-indoyl-2-propanol with propylene oxide (CA 56,3455(1962)). 8.8 g of the indolyl-propanol, 200 ml ether; add 4.4 g PBr_3 and let stand four hours. Add excess DEA and stir for a few minutes. Evaporate in vacuum or extract with dilute HC1 and basify the extract with NaOH to precipitate the alpha-methyl-DET.

Dialkyltryptamines from Tryptamines BCSJ 11,221(1936)

Illustrated for 5-methoxy-tryptamine (1). 1.5 g (1), 30 ml ethanol; add 5 g methyl iodide (or equimoiar amount ethyl iodide) and 4.5 g dry sodium carbonate and heat five hours on water bath. Filter hot, heat precipitate with ethanol and filter hot again. Evaporate in vacuum to get 2.5 g l-methyl-5-methoxy-DMT.

Dialkyltryptamines AP 294,486(1961)

Convert indole to indolyl-3-methyl-ketone (I) by treating indolyl-Mg-Br (preparation already described) with acetyl-Cl, by treating indole in $POCl_3$ with dimethylacetamide (Vilsmeier reaction), or by reacting indole with diketene (ACS 22,1064(1968)). 15.9 g (1) in 50 ml methanol; cool, stir and add dropwise 16 g Br_2. Reflux 1 *Vi* hours on water bath; cool, filter, wash with ether and recrystallize-methanol to get 18 g indolyl-3-Br-methyl-ketone (II). Dissolve 11.9 g (II) in 60 ml warm isopropanol and add 11 g 38% aqueous DMA (or equimoiar amount other amine); reflux one hour on water bath. Filter (recrystallize-ethanol) to get 8.5 g indolyl-3-dimethylamino-methyl ketone (III). Add 4.6 g (0.02 M) (III) in 30 ml tetrahydrofuran to 2.3 g lithium aluminum hydride in 50 ml tetrahydrofuran, stir one-half hour at room temperature and reflux two hours. Add a little water dropwise and extract the precipitate with acetone. Dry, evaporate in vacuum the combined organic phases to get an oil which will precipitate with ether-petroleum ether to give DMT. (Ill) should be tested for psychedelic activity.
Dialkyltryptamines BCSJ 11,221 (1936), BSC 2291 (1966)

30 g 5-methoxy-indoIyl-3-acetonitrile is heated with KOH in aqueous methanol until no more ammonia is evolved (about 20 hours). Evaporate the methanol in vacuum and extract the water remaining with ether. Acidify the aqueous layer with HC1 to precipitate 28 g 5-methoxy-tryptophol (1). Alternatively, dissolve 2.3 g indole in 15 ml glacial acetic acid and 5 ml acetic anhydride. Add with stirring 0.025M ethylene oxide, heat to 70° for 25 hours, then hold at 20° for 50 hours in a closed flask. Pour into water and extract with ether. Wash with water, dry, evaporate in vacuum and saponify (e.g., heat with NaOH) the residue to get 1.5 g tryptophol (can purify on alumina; benzene elutes indole, ether elutes tryptophol). 2g (I) or tryptophol in 100 ml ether. Mix with 1 g PBr_3 dissolved in ether and let stand 12 hours at room temperature. Decant the liquid from the precipitate; wash with water and $NaHC0_3$ and dry, evaporate in vacuum the ether to get 1.3 g of the oily bromide (11). 1 g (II), 4 ml methanol, 4 ml 33% aqueous DMA (or DEA etc.) and heat on steam bath in sealed container 15 hours. Acidify with about 50 ml dilute HC1, extract with ether and dry, evaporate in vacuum the ether to get about 0.5 g DMT or analog. *Dialkyltryptamines* BSC 1335(1966)

To 600 ml liquid NH_3 add 23.5 g Na: 40 g Na-amide are thus prepared and the NH_3 evaporated in vacuum. Mix 170 g 5-C1-2-methoxy-phenylacetonitrile (preparation given elsewhere) in 900 ml benzene with the Na-amide and stir and reflux two hours. Cool to 40° and add dropwise 111 g 2-dimethylamingchloroethane (or diethyl etc. analogs) prepared freshly in benzene as described in a previous method, or use the base freshly distilled. Reflux two hours, cool and add a little ethanol and water and extract the amine by evaporating in vacuum or pouring on cool water and filtering to get 157 g (I) (recrystallize-petroleum ether). 105 g (I) in 150 ml methanol containing 15% NH_3. Hydrogenate at 50°, 70 kg pressure, in presence of Raney-Ni. Filter, dry and evaporate in vacuum to get 97 g of the phenethylamine (II). Cyclise (II) with Na and naphthalene as described later for 4-methoxyindole to get the yellow, oily indoline (III) (recrystallize-ethanol). Test this for activity. If desired, the noncyclised material can be eliminated by tosylation. 3.1 g (III), preferably as the HC1 salt, 200 ml water; stir and heat fifteen hours with 10 g Raney-Ni and 1.5 g maleic anhydride. Filter, dry and evaporate in vacuum to get 4-methoxy-DMT.

Dialkyltryptamines

A: CCCC 22,1848 (1957). 5.5 g indole, 15 ml cyclohexan, %g

copper. Reflux and add dropwise 2.9 g diazoacetone. After a time, the reaction goes very rapidly and forms two layers. Filter, evaporate in vacuum or distill (130-145/0.2) to get 2.6 g 3-indolyl-acetone (I).

A (Alternative): JCS 3175(1952). 2 g 3-indolyl-acetic acid (preparation given elsewhere here), 1.55 g freshly fused sodium acetate, 5 ml acetic anhydride. Heat 135-140° on oil bath for eighteen hours; cool, **wash** with water and extract with $CHCl_3$-ether (1:4). Wash organic phase with 3X20 ml saturated $KHCO_3$ and dry, evaporate in vacuum to get the l-acetyl-3-indolyl-acetone, which can be reduced to the alpha-methyl-tryptophol derivative with lithium aluminum hydride, and then converted to the dialkyl-tryptamine as already described (as can (I)), or used in step B, or reduced to (I) as follows: dissolve 1 g in 1 ml 1 N Na-methoxide in methanol and 60 ml methanol, and keep at 40° for 10 minutes: acidify with dilute HC1 and extract with ether. Dry, evaporate in vacuum to get (I) (recrystallize-methanol).

A (Alternative): JCS 2834(1962). 4.8 g Mg turnings, 32 g ethyl iodide in 20 ml dry anisole. Cool to 0° and add dropwise 15.6 g indole in 20 ml anisole. Stir one-half hour at 20°; cool to 0° and treat with 20 ml prop-2-ynyl-bromide in 10 ml anisole over 20 minutes. Continue stirring one hour at 0° and let stand at room temperature twelve hours. Cool to 0°, add 100 ml ether, 200 ml water, 12 ml glacial acetic acid, 100 ml water, and extract with 5X25 ml ether. Wash with $NaHCO_3$ and dry, evaporate in vacuum the extract to get 8 g oily material which precipitates on standing in refrigerator. Add V2g $HgSO_4$ to 100 ml 2N sulfuric acid; stir and heat on steam bath and add 15 g of the precipitate in 100 ml ethanol. Stir and heat two hours and pour into water. Basify with $NaHCO_3$ to get 3 g (I) (recrystallize-benzene).

B: JMC 9,343(1966). 3.3 g (1) in 100 ml ethanol; reduce over palladium-carbon catalyst in presence of 0.04 M DEA (or other amine). After two hours filter and evaporate in vacuum to get the DET or analog.

Methylethyltryptamines HCA 49,1199(1966)

82 ml acetic anhydride, 35 ml formic acid; heat two hours at 50-60° with stirring and then add dropwise a solution of 100 g 4-benzyloxytryptamine (or equimolar amount other tryptamine) in 250 ml tetrahydrofuran. Cool to room temperature and stand twelve hours. Evaporate in vacuum, add 100 ml water and let stand two hours to precipitate the oily N-formyltryptamine (1) (recrystallize-700 ml 50% ethanol). 35 g (1) in 150 ml tetrahydrofuran; add

dropwise to 20 g lithium aluminum hydride in 400 ml tetrahydrofuran and reflux twelve hours. Cool to 15°, slowly add 35 ml ethyl acetate and reflux two hours. Slowly add 10 ml water, 10 ml 15% NaOH, 30 ml water. Filter, wash precipitate with tetrahydrofuran and evaporate in vacuum to get 20 g 4-benzyloxymethylethyltryptamine (II) or analog (can recrystallize by dissolving in 100 ml methanol and precipitating with 10 g oxalic acid (anhydrous)).

Alternatively, dissolve 220 g 4-benzyloxy-3-indoleacetic acid (or equimolar amount other indoleacetic acid) in 2 L absolute methanol and reflux six hours in the presence of 20 g Dowex 50X8 sulfonic acid resin. Filter (decolor with carbon if desired) and concentrate below 35° until precipitation starts; then cool to precipitate and filter to get 200 g of the methyl ester. Add 200 g of the ester to 600 ml 40% aqueous methylamine over twelve hours with vigorous stirring. Filter, wash precipitate with water and dry to get 187 g of the N-methyl-acetamide (reflux two hours in 500 ml benzene to remove unreacted ester). 24 g of the acetamide in 300 ml tetrahydrofuran is added dropwise to 10 g lithium aluminum hydride in 300 ml tetrahydrofuran; reflux ten hours, cool to 15° and add dropwise with stirring 50 ml ethyl acetate. Reflux two hours and proceed as above to get 15 g (II) or analog.

Dialkyltryptamines JACS 84,4917(1962)

Illustrated for the piperidine analog of DMT.

2.5 g methyl or ethyl-indoleacetic acid (see previous method and elsewhere for preparation), 12 ml dry piperidine and reflux twenty-four hours. Evaporate in vacuum, dissolve residue in $CHCl_3$; wash with dilute HCl, $NaHCO_3$, and dry and evaporate in vacuum to get 2.6 g 3-indolyl-aceto-piperidide (I) (test for activity). 2.6 g (I) in 80 ml tetrahydrofuran; add 2.5 g lithium aluminum hydride in 200 ml ether and reflux five hours. Carefully add a little water until bubbling stops. Filter, dry and evaporate in vacuum to get the piperidine analog of DMT.

Tryptamine from Tryptophan JCS 3993(1965)

10 g tryptophan in 500 ml diphenyl ether; reflux one hour under N_2; cool and extract with 3X40 ml 2N HCl. Wash extract with ether, basify with 6N NaOH and extract with 5X50 ml ether. Wash extract with water, NaCl; dry and evaporate in vacuum and recrystallize-benzene to get tryptamine which can be alkylated to dialkyltryptamine as described previously. (Tryptophan, if oxidized

by H_2O_2 and cyclised with HCl, gives a psychedelic compound.) Much interst has been generated by the mention of tryptophan oxidation to a psychedelic compound, but the original reference gives no details of the method.

Dialkyltryptamines CCCC 24,3984(1959)

A: 4 g 3-indoleacetic acid (I) in ether. Treat with PCl_5 as described elsewhere here to get 2.7 g of the chloride (II). Dissolve 2.7 g (II) in 40 ml ethyl acetate and add 2 ml piperidine (or equimolar amount other amine), 3.5 ml N-ethyl-piperidine in 40 ml ethyl acetate. Let stand three hours at room temperature and filter. Wash filtrate with 1N HCl, 10% Na carbonate and evaporate in vacuum to get 1 g of the amide (III) (test for activity). Add 1 g (III) in 25 ml ether to 1.4 g lithium aluminum hydride in 50 ml ether; stir four hours at room temperature and reflux one-half hour. Cool and carefully add water until no more bubbling. Add 3 ml 20% NaOH and dry, evaporate in vacuum to get 1 g piperidine analog of DMT (IV).

A (Alternative): Treat 4 g (I) in pyridine with $SOCl_2$ as described elsewhere here to get (II). Treat (II) with 2.3 g triethylamine and 2 g piperedine (or other amine) in 5 ml ether. Stir fifteen hours at room temperature; extract with 200 ml water, and after precipitation, wash precipitate with 10% Na carbonate, 3N HCl and dry, evaporate in vacuum the ether solution to get (III). Reduce (III) to (IV) as above or with the $NaBH_4$ method or possibly with hydrogenation.

A (Alternative): To 6 g (I) in 250 ml ether add 3.1 g piperidine (or other amine) in 20 ml ether. Let precipitate form and filter. Heat 7 g precipitate three-and-one-half hours at 190-215°; cool and dissolve in 100 ml ether. Wash with 10% K carbonate and 5N HCl and evaporate in vacuum to get (III), which is reduced to (IV) as above.

Dialkyltryptamines JCS 7175,7179(1965)

6.3 g N-Methyltryptamine in 40 ml methylformate; heat in autoclave six hours at 100° and evaporate in vacuum to get 7.4 g precipitate (test for activity). Dissolve precipitate in 50 ml tetrahydrofuran and add to 2.6 g lithium aluminum hydride in 50 ml tetrahydrofuran and reflux three hours. Carefully add a little water or methanol; filter, evaporate in vacuum to get DMT or analog. This paper also gives four ways to prepare hydroxylamine analogs of DMT, but their activity is unknown.

5-Methoxy-DET BSC 1062(1962)

If 3-methoxy-aniline is used, 6-methoxy-DET will probably result, but if 3,5-dimethoxyaniline is used, 4,6-dimethoxy-DET should be obtained.

A: 1M p-methoxy-aniline (p-anisidine), 0.5 M ethyl-gamma-Br-acetoacetate (brominate as described above for 1-methyl-DET synthesis); cool and add 250 ml ether. Filter, evaporate in vacuum and reflux residue fifteen hours with 60 g $ZnCl_2$ in 250 ml ethanol. Evaporate in vacuum, wash precipitate with water and dissolve residue in benzene. Wash with 4N HCl and water and dry, evaporate in vacuum. Reflux prcipitate two hours in ethanol-KOH to get about 70% yield of 5-methoxy-indoleacetic acid (I).

B: Dissolve 4.26 g triethylamine and 8 g (I) in 200 ml $CHCl_3$; cool to -5°, add rapidly 4.58 g ethyl-Cl-carbonate and agitate fifteen minutes. Bubble dry NH_3 through for five minutes (can possibly substitute concentrated NH_4OH) and let stand one hour at room temperature. Add water, wash with $NaHCO_3$ and water and dry, evaporate in vacuum the $CHCl_3$ to get 5-methoxy-diethyl-indolyl-acetoacetamide(II). Test this for activity.

B (Alternative): 0.5 g (I) and 0.28 g triethylamine in 5 ml methylene Cl. Add 0.33 g dicyclohexylcarbodiimide and let stand for sixteen hours at room temperature. Add a little glacial acetic acid, wash with dilute HCl, NaHCO and water and dry, evaporate in vacuum to get (II).

B (Alternative): Do not reflux the precipitate in ethanol-KOH in the last part of step A. Heat 8 g of the precipitate with equimolar amount DEA (or other amine) in 80 ml methanol in a sealed bomb or tube in autoclave for twenty-four hours at 105° and filter, evaporate in vacuum to get (II) (recrystallize-ethanol).

B (Alternative): 20 g of the unrefluxed precipitate (ethyl-ester of (I)) from last part of step A in 100 ml ether. Add dropwise to a solution of 4 g lithium aluminum hydride in 900 ml ether at 0°. Reflux three hours and isolate the resulting tryptophol as described earlier. Dissolve 3 g of the tryptophol in 140 ml ether and stir at 0°. Add dropwise 1.8 g PBr_3 in 30 ml ether and let stand sixteen hours at room temperature. Decant the ether and wash the precipitate with ether. Wash ether with water, $NaHCO_3$ and water, and dry, evaporate in vacuum the ether to get the bromide (recrystallize-ethanol). 2 g of the bromide and 1.5 g piperidine (or equimolar amount DEA, etc.) in 65 ml methanol and heat in sealed tube fifteen

hours at 100° (or let stand room temperature twenty-four hours). Evaporate in vacuum to get the 5-methoxy-dialkyltryptamine.

C: Reduce (II) to 5-methoxy-DET or analog with lithium aluminum hydride or diborane as described previously.

Tryptamine CA 54,13018(1960)

15.4 g indole (or substituted indole) in 40 ml ether under N_2; add to 50 ml methyl MgBr in ether (2.62 M) and reflux fifteen minutes. Cool on ice bath and add 68 ml ethyleneimine in 30 ml dry xylene. Stir 1½ hours at room temperature (add xylene to keep volume constant), reflux one hour and cool to room temperature. Add dropwise 75 ml water and take pH to 1 with HCl. Filter, wash precipitate with ether and dissolve in 150 ml hot water. Cool to 10° for fifteen minutes and decolorize. Filter, neutralize with 80 ml 10 N NaOH and stir at 5°. Filter and dry to get the tryptamine which can be converted to the dialkyltryptamine as described previously. More tryptamine can be had by adjusting pH of solution to 10 with NH_3 (or NH_4OH) and extract with methylene Cl: evaporate in vacuum.

Dialkyltryptamines BSC 1417(1965)

Dissolve 456 g o-vanillin (2-OH-3-methoxy-benzaldehyde) and 150 g NaOH in 1 L water and add dropwise 660 g benzenesulfonyl-Cl. Filter, wash precipitate with water, ethanol and recrystallize-acetic acid to get 805 g of the benzenesulfonate (I). Can probably also protect the OH group by methylating with dimethylsulfate as described elsewhere here. However, OH protection may be unnecessary to yield an active final product. Quickly add 250 g (I) to 2.5 L fuming HNO_3 at 0° and let stand five minutes. Pour onto ice and filter after melting. Wash precipitate with water, ethanol and recrystallize-acetic acid to get 171 g (II). Dissolve 170 g (II) in 2 L methanol and reflux ten minutes. With vigorous stirring add 100 g K_2CO_3 in 200 ml water and 400 ml methanol. Reflux one-half hour, filter and dissolve precipitate in boiling water; acidify to precipitate 6-NO_2-o-vanillin (about 86 g) (III). Dissolve 50 g (III) and 40 g K_2CO_3 in 1.2 L DMF and 60 ml water. Stir 1½ hours and add dropwise benzyl-Cl and continue stirring eighteen hours under N_2 if possible and in the presence of NaI. Precipitate by pouring on ice; filter, dry and recrystallize-benzene-petroleum ether to get about 52 g 2-benzyloxy-3-methoxy-6-NO_2-benzaldehyde (IV). Again, methylation can probably be done instead, and this step may be unnecessary. To 50 g (IV) in 1 L ethanol add 18 ml nitromethane, and then at -15° add 25 g K_2CO_3 (or KOH) in 40 ml water and 400

ml ethanol in small portions over a period of one hour. Keep two hours at -10°, then acidify with 50 ml concentrated HCl (keep temperature below 0°). Add 2 L water, filter (or extract five times with ether and dry, evaporate in vacuum). Heat precipitate five minutes at 140° with 60 g anhydrous sodium acetate and 250 ml acetic anhydride and pour on ice, filter to get 52 g of the nitrostyrene (V) (recrystallize-methanol). 60 g (V) and 300 g iron filings in 1 L 80% acetic acid and heat forty minutes at 95°. Add 1 L saturated Na bisulfite and extract with benzene; dry and evaporate in vacuum (can chromatograph on alumina with benzene) to get 33 g 4-benzyloxy-5-methoxy-indole (VI) (recrystallize-benzene-petroleum ether), which can be converted to the dialkyltryptamine by any of the methods described here or as follows. 320 ml dioxane, 320 ml glacial acetic acid, 24.8 g 40% formaldehyde, 25 g DMA (or other amine) in 40% aqueous solution. To this stirred mixture at 0° add 34 g (VI) in 300 ml dioxane, let stand twelve hours and pour on ice. Basify, filter and extract with HCl; basify and extract with ether (or just dry and evaporate in vacuum after pouring on ice) to get 30 g of the gramine (VII) (recrystallize-ethyl acetate). To 20 g (VII) in 400 ml methanol add a solution of 9 g KCN in 20 ml water and 25 g methyl iodide below 10°. Stir at room temperature for twenty-four hours and evaporate in vacuum. Dissolve residue in ether, wash with dilute HCl, $NaHCO_3$, water and dry, evaporate in vacuum to get the acetonitrile (VIII) (recrystallize-ethanol). Dissolve 14 g (VIII) in 300 ml 33% ethanol solution of DMA (or other amine) and hydrogenate at 40° and 100 atmospheres pressure in presence of 3 g Raney-Ni for about three hours. Filter, evaporate in vacuum (can dissolve residue in ether, dry and evaporate in vacuum) to get 7 g of the dialkyltryptamine.

Indoleacetonitrile BER 58,2043(1925)

To the Grignard reagent prepared from 2.4 g Mg, 10 ml anisole and 16 g ethyl iodide, add 7.8 g indole in 10 ml anisole. Stir and cool to 0°. Slowly add dropwise 5.5 g Cl-acetonitrile in 40 ml anisole. Warm to room temperature and stir; heat to 60-70° on water bath (a reddish precipitate forms over about twenty minutes). Cool and purify and convert to the dialkyltryptamine as described earlier.

Tryptamines JOC 24,894(1959)

Add a 1 M excess of nitroethylene dropwise to liquid 5-benzyloxyindole (or other indole) on a steam bath over two hours. Cool, filter and recrystallize from methylene chloride-petroleum ether. Hydrogenate at two atmospheres over 10% palladium-carbon

catalyst to get 5-OH-tryptamine in 30% yield. Can probably also reduce with lithium aluminum hydride or diborane methods.

4-Nitration of 5-methoxy-DMT JMC 12,321(1969)

Dissolve 35 g 5-methoxy-DMT (or analog) in 100 ml glacial acetic acid, cool to 10°, stir and add dropwise a solution of 30 ml concentrated HNO_3 in 50 ml glacial acetic acid over one-half hour. Let warm to room temperature, stir eight hours and dilute with 1 L ice-water. Filter, wash precipitate with water and dry to get 4.5 g 5-methoxy-4-NO_2-DMT (recrystallize-methanol).

Methylation of OH indoles JOC 23,1977(1958), CA 74,53525 (1971)

The procedure will not work for tryptamines. This and the two following procedures may be used to protect the OH group during subsequent steps, or simply to give the alkyloxy compounds which may be more active than the OH compounds.

Dissolve the OH-indole in ethanol (0.14 M in 50 ml) and add 28 ml dimethylsulfate and 1.2 g Na hydrosulfite. Add slowly with stirring and cooling (under N_2 if possible) 12 g NaOH dissolved in 26 ml water (keep temperature at 20-25°). Heat to 70° for one-half hour, cool and dilute with an equal volume water. Extract the yellow oil into ether-benzene and dry, filter, and evaporate in vacuum to get the methoxy-indole.

Methylation of OH-tryptamines LAC 513,16(1934)

This should work well with OH-dialkyltryptamines.

Dissolve 1 g OH-tryptamine in methanol or ether; add 2.5 g diazomethane in ether and heat twenty hours. Evaporate in vacuum to get the methoxy-tryptamine.

Acetylation of OH-tryptamines

May require modification for OH-indoles, but probably not for OH-dialkyltryptamines.

Dissolve 4.1 g OH-tryptamine in 20 ml 1 N NaOH and evaporate to dryness under N_2. Dry in vacuum at 90° and dissolve in 50 ml dimethoxyethane. Add to 1.9 g acetyl-Cl in 50 ml dimethoxyethane and stir four hours at room temperature. Add to dilute $NaHCO_3$ and $CHCl_3$; shake and dry, evaporate in vacuum the $CHCl_3$ layer to get the acetyltryptamine. This will also work with benzoyl-Cl for benzoylation and with chlorsulfonic acid for sulfonylation. Acetylation can also be done with acetic anhydride in NaOH at 5°.

Demethylation of methoxy-oxyindoles BER 96,253(1963)

The procedure may require modification for tryptamines, and indoles.

Mix 1.63 g 4-methoxy-oxyindole and 1.5 g finely ground $AlCl_3$ and heat ten minutes at 220-230° in oil bath. Cool, powder and dissolve in ice water, evaporate in vacuum to get 4-OH-oxyindole (recrystallize-water).

4-Substituted Indoles from 5-OH-indoles HCA 51,1209(1968); see also: TL 4459(1966), JOC 35,3764(1970), TET 26,3685(1970)

This method, although described for indoles, probably also works with 5-OH-tryptamine (serotonin), and 5-OH-DMT (bufotenin); *with compounds of the latter type, orally active psilocybin analogs will be obtained in one step.* Dissolve 5 g 5-OH-indole (or analog) in 25 ml ethanol. Add 5.5 g 33% aqueous dimethylamine (or other amine, e.g., piperidine) and add slowly dropwise with stirring 3.5 g 38% aqueous formaldehyde. Two minutes after the end of the addition shake with water and $CHCl_3$: dry and evaporate in vacuum the $CHCl_3$ phase to get 5 g oily 4-dimethyl-aminomethyl-5-OH-indole (I) (can chromatograph on 100 g alumina and elute with ethyl acetate). It has been claimed that this method does not work.

Alternatively (CA 72,66732(1970)), add 1.6 g 5-OH-indole, 1 g bis-dimethyl-aminomethane in 5 ml dioxane. Heat 2½ hours on water bath to get 1 g (I) (recrystallize-methanol-dimethylformamide).

For the transformation of the dimethylaminomethyl substituent of (I) into methyl, aminomethyl, formyl or cyanomethyl see BSC 2046(1973).

4-Hydroxydimethyltryptamine (Psilocin) from DMT C.R. Acad. Sci. Paris 275,613(1972)

See also C.R.A.S.P. 269,51(1969) and BSC 1523(1959).

Mix 0.01 M dimethyltryptamine, 0.02 M phosphate buffer pH 7.2 containing 5 mM ascorbic acid, 0.02 M disodium EDTA and 0.01 M ferrous sulfate (CuCl may substitute) and add with stirring at 20-22° 0.02 M H_2O_2 (0.01 M may increase yield). Let reaction proceed to completion (2 hours or less) and extract with ethyl acetate. Dry and evaporate in vacuum to get about 30% yield of psilocin. The product, which contains the other OH-DMT's as well, can be chromatographed on silica thin layer with t-butanol-acetic acid-water (ACS 22,1210 (1968)) or on a 5% alumina-Nickel

column or 10% alumina-Nickel plate with $CHCl_3$-methanol and the psilocin eluted with methanol.

Tryptamine from Tryptophan Synthesis 475(Sept. 1972)

Gently reflux a suspension of 250 mg L-tryptophan in 10 g warm diphenylmethane in a stream of nitrogen (if possible) for 5-20 minutes until there is no more CO_2 evolution. Cool and evaporate in vacuum or treat with 20 ml benzene saturated with dry HCl and filter, wash precipitate with hexane and dry to get about 60% yield of tryptamine.

4-Acetylation of 5-OH-indoles BCSJ 44,550(1971)

To 2 g 5-OH-indole (or analog) in 50 ml nitrobenzene add 4 g $AlCl_3$ in 50 ml nitrobenzene. Add 1.26 g Acetyl-Cl and heat three hours at 50°; evaporate in vacuum or add dilute HCl to get 1 g 4-Acetyl-5-OH-indole (recrystallize-ethyl acetate).

4-Substituted Tryptamines JMC 8,200(1965)

Heat 85.5 g 3-carbethoxy-2-piperidone and 30 g KOH in 1 L water for twelve hours at 30°. Filter, cool to 0°, add 50 ml 6N HCl. Prepare a fresh solution by diazotizing at 0-5° a mixture of 85 g 3-amino-4-Cl-acetophenone, 250 ml concentrated HCl and 750 ml water with a solution of 36 g Na nitrite in 125 ml water. Add the piperidone solution at 0° to the diazonium salt solution and stir five hours at 10°. Filter, wash precipitate with water to get 80% yield of the hydrazone (I) (recrystallize-95% ethanol). Reflux 62 g (I) in 310 ml 88% formic acid to get 40 g of the carboline (II) (recrystallize-absolute ethanol) (test for activity). Reflux 40 g (II), 100 g KOH, 480 ml ethanol and 360 ml water for eighteen hours and evaporate in vacuum. Add 480 ml water to the residue, cool and adjust pH to 6 with glacial acetic acid. Scratch glass to precipitate; filter, wash precipitate with cold water to get 41 g 4-acetyl-2-COOH-7-Cl-tryptamine (recrystallize-50% ethanol) which can be alkylated to the active dialkyltryptamine as described elsewhere here.

Alpha,alpha-DMT from Gramine or Indole-3-aldehyde JCS 7165 (1965), 3493(1958)

81 g (0.465 M) gramine (or analog), 405 ml 2-nitropropane and 20.4 g NaOH are stirred and boiled under nitrogen for 20 hours. Cool and treat with excess 2N acetic acid and ether and wash the ether layer with 2N acetic acid and water and dry, evaporate in vacuum to get ca. 90% 3-(2 methyl-2-nitropropyl)indole(Ia) (recrystallize-benzene-light petroleum). See JCS 3493(1958) for the

use of the indole-3-aldehyde to get the corresponding nitronium salt (Ib). (Ia) is then reduced (e.g., with PtO at 20°/1 Atm. in EtOH or one of the methods given elsehwere here) or (Ib) is reduced (e.g., with lithium aluminum hydride as described many times, e.g., JMC 6,378(1963)) to give the tryptamine, which can be alkylated as described. This paper also gives a route to other alpha and beta mono and disubstituted tryptamines.

Reduction of Indolyglyoxamides with Diborane JOC 38,1504 (1973), TET 1145(1968)

A solution of 7mM of the indolyglyoxamide in 160 ml tetrahydrofuran and 30 ml (30mM) 1.OM borane in THF is refluxed 2 hours and cooled. Carefully add water, then evaporate in vacuum and dissolve residue in ether. Wash twice with saturated saline, dry and evaporate in vacuum. Triturate with ether and filter to get the tryptamine-borane in ca. 30% yield. Diss. 200 mg in 2 ml xylene and 2 ml octene-1 and reflux 4 hours. Cool, dilute with hexane and filter to get ca. 80 mg white tryptamine (or dialkyltryptamine) (recrystallize-acetone-hexane etc.).

Alternatively, 63 g (0.45M) BF_3 etherate in 180 ml diglyme is added dropwise with stirring to 0.15 M of the indolyglyoxamide and 12 g $NaBH_4$ in 300 ml diglyme. Stir 12 hours at room temperature and evaporate in vacuum. Boil residue 2 hours with methanolic NaOH and evaporate in vacuum. Take up residue in ether, wash with water and dry, evaporate in vacuum to get the dialkyltryptamine in ca. 80% yield.

Indole Syntheses

4-7-Dimethoxyindoles Farmaco 25,972(1970)

Heat 1 g Cl-acetone and 7 g 2,5-dimethoxyaniline (or analog) at boiling until complete fusion; then one-half hour at 180° on a metal bath. Cool, dissolve in a little ethanol and pour into 100 ml 7% HCl. Cool, filter and dry (can distill 100/.001) to get 160 mg 4,7-dimethoxy-2-methylindole (recrystallize-benzene:petroleum ether, 1:1).

4-Carboxyindoles CJC 49,2784,2797(1971)

To a stirred solution of 0.05 M 2-methyl-5-nitroisoquino-linium iodide in 250 ml water, add a solution of 11.2 g KOH in 110 ml water and immediately add a solution of 49.4 g K ferricyanide in 300 ml water; stir one hour at room temperature. Add 50 ml methylene chloride and 100 ml benzene and stir until solids dissolve.

Separate organic phase and extract aqueous phase with benzene. Wash combined organic layers with 10% HCl, water and dry and evaporate in vacuum to get about 90% yield of 2-methyl-5-nitroisocarbostyril (I) (recrystallize-cyclohexane). Mix 8.16 g (I), 18 ml acetic anhydride, 5 drops concentrated sulfuric acid and heat on steam bath four hours. Cool to room temperature, add 25 ml water and heat on steam bath until a single phase is produced (about ten minutes). Pour into a large volume of water, extract with methylene chloride, wash methylene chloride five times with water and dry and evaporate in vacuum to get 6.8 g 2-methyl-4-acetyl-5-nitro-isocarbostyril (II) (recrystallize-benzene). 1.64 g (II), 200 mg 10% palladium-carbon in 100 ml ethanol and hydrogenate at room temperature and initial pressure of 60 pounds per square inch for one hour. Transfer to 500 ml round bottom flask under N_2. Evaporate in vacuum and add solution of 8.4 g KOH in 120 ml 50% dimethylsulfoxide to residue. Stir and reflux seventeen hours under N_2 and then add concentrated HCl until the dissolved silica precipitates from the basic solution. Filter, wash precipitate with water and acidify filtrate with concentrated HCl. Extract filtrate with ethyl acetate and then shake ethyl acetate with Na carbonate (100g/L). Acidify solution with concentrated HCl and extract with ethyl acetate. Wash extract with water and dry, evaporate in vacuum to get 400 mg 2-methyl-indole-4-COOH (recrystallize-60% ethanol). Can dissolve in methanol and chromatograph on 5 g silica gel-250 ml ethyl acetate elutes the indole.

4-OH-Indole JCS 1605(1948)

Dissolve 0.7 g KOH in 10 ml ethanol, cool to -10° and add with stirring over twenty minutes to 1 g 2-nitro-6-OH-benzaldehyde and 0.4 g nitromethane in ethanol at -10°. Acidify with cold HCl, add water and extract with ether. Dry and evaporate in vacuum the ether to get a yellow oil. Warm the oil with 2 g Na acetate and 3 ml acetic anhydride for fifteen minutes. Add 20 ml water, separate the precipitate and add water to crystallize about 1.3 g 2,beta-dinitro-6-acetoxy-styrene (I) (recrystallize-ethanol). Warm gently a solution of 0.5 g (I), 2 g iron filings, 4 ml ethanol and 4 ml glacial acetic acid until hydrogen evolution is vigorous and continue to warm gently for ten minutes. Filter, wash precipitate with a little warm ethanol and add water to filtrate. Basify with Na carbonate, extract three times with ether and dry and evaporate in vacuum the ether to get about 0.1 g 4-acetoxyindole (II) (recrystallize-petroleum ether). If 4-OH-

indole is desired, dissolve 0.1 g (II) in 3 ml methanol and saturate at 0° with NH_3 and keep below 5° for sixteen hours. Evaporate in vacuum, add 50 ml water and extract with ether, dry and evaporate in vacuum to get 4-OH-indole (recrystallize-petroleum ether).

4-Substituted Indoles MON 100,1599(1969), 101,161(1970)

To a solution of 1.84 g Na metal in 60 ml ethanol at 5-10° add, over ½ hour with vigorous stirring a mixture of 0.08 M ethyl azidoacetate and 0.02 M 2 (or 2,5; 2,3 etc. but not 6) substituted benzaldehyde and continue stirring at 5-10° until nitrogen evolution ceases (about ½-1 hour); then stop immediately and rapidly evaporate in vacuum ½ the ethanol (keep temperature below 30°). Basify the solution with solid NH_4Cl, dilute with 500 ml water and extract 3 times with ether. Filter, wash with water to neutrality and dry, evaporate in vacuum the ether (or can dissolve the residue in petroleum ether, or 1:1 petroleum ether:benzene for methoxy compounds, and filter through silica gel) to get the ethyl-alpha-azidocinnamates (I) in about 50% yield. Store in freezer until used in next step. Dissolve 1 g (I) in 100 ml p-xylol and reflux 10 minutes. Evaporate in vacuum (or add 5 ml pentane, filter, evaporate in vacuum) to get about 90% yield of the 4 substituted-2-carbethoxyindole which can be decarboxylated as described elsewhere here.

4-Methoxy-indole JCS 3909(1952)

4.5 g 2-methoxy-6-nitro-benzyl-Cl (JOC 6,217(1941)), 4.5 ml ethanol, 1.6 g KCN, 1.5 ml water; reflux six hours, cool and extract with ether. Wash with water, dry and evaporate in vacuum the extract to get 4 g of the cyanide (I). 4.2 g (I), 125 ml concentrated HCl; reflux six hours, cool and filter. Add precipitate to dilute aqueous Na carbonate; stir and warm until dissolved and filter. Acidify and let stand one hour at 0°; filter to get 1.8 g 2-methoxy-6-nitro-phenylacetic acid (II). 5 g (II) in 100 ml glacial acetic acid catalyzed with palladium-carbon at room temperature gives 3.8 g 4-methoxy-indole. Filter, evaporate in vacuum and recrystallize-1:5 ethanol/water.

Indoles CA 74,87819(1971)

To 30 g polyphosphoric acid (prepared by adding 2:1 P_2O_5:85% phosphoric acid) add 3.3 g phenylhydrazine and 4 g phenylacetone (or equimolar amount ethylacetone) and heat twenty minutes at 130-140° in N_2 stream. Pour over 200 ml water and extract with methylene chloride to get about 45% yield 2-benzylindole or 30% 2-

ethyl-indole (recrystallize-ether).

Indole-3-acetic acid CA 72,66815(1970)

To 21.6 g phenylhydrazine dissolved in 300 ml 0.3N sulfuric acid, add 9.8 g concentrated sulfuric acid. Add dropwise with stirring and heating at 100°, 11.6 g methyl-beta-formyl-propionate in 300 ml 0.3 N sulfuric acid and continue heating six hours to get 14 g indole-3-acetic acid. Convert to the dialkyltryptamine as already described.

α,α-Dimethyl-indoleacetic acid ACS 8,122(1954)

117 g indole in 1 L acetone; add 220 g NaOH pellets and stir in three-neck, 3 L flask with thermometer and dropping funnel. Cool in ice bath and add $CHCl_3$ dropwise over about two hours, keeping temperature below 15°. Let warm to room temperature over one hour with stirring and continue stirring four hours. Warm on water bath and evaporate the acetone. Dissolve the residue in 1.5 L water and extract four times with ether (dry and evaporate in vacuum the extract to get about 50 g unreacted indole). Acidify the aqueous phase with dilute sulfuric acid and extract the oil with ether. Wash with water and dry and evaporate in vacuum the extract to get the title compound (recrystallize-aqueous methanol), which can be converted to the dialkyltryptamine as described elsewhere here.

4-Nitroindole JACS 80,4621(1958) -cf. Chem. Het. Cpds. (Russian) 37(1973).

21 g ethyl-pyruvate-meta-nitro-phenylhydrazone (I) in 100 g polyphosphoric acid; warm in oil bath with stirring and cool to keep temperature below 125°. Stir at 105-115° for one-half hour and then add ice water. Filter, extract water with ether to remove unreacted (I), wash precipitate with water and dry to get 9.5 g ethyl-4-nitroindole-2-carboxylate (II) (recrystallize-ethanol or 800 ml benzene). It may be possible to use this directly for diakyltryptamine synthesis, otherwise proceed as follows. Dissolve 9.7 g (II) in 75 ml hot ethanol and add solution of 7.5 g KOH in 18 ml water, let stand six hours at room temperature. Add 350 ml warm water and add the mixture to excess dilute HCl so that the pH is acid. Filter, wash precipitate with water and dry to get 9 g 4-nitroindole-2-COOH (III). 11.3 g (III) and 1.1 g CuO or Cu powder in 90 ml quinoline and reflux 2 hours. Add 100 ml concentrated HCl and 200 g ice; filter and extract both precipitate and filtrate with ether. Evaporate in vacuum or wash with dilute $NaHCO_3$, water and

dry and evaporate in vacuum to get the title compound (recrystallize-dilute ethanol).

Methoxyindoles from Methoxynitrostyrenes JOC 22,331(1957)

Illustrated for 5,6,7-trimethoxyindole (for the trimethyl-indole see JOC 25,1542(1960)). 2-methoxy-beta-nitro-styrene, if nitrated at the 6 position and used in place of (I), should give 4-methoxy-indole.

7.9 g 3,4,5-trimethoxy-beta-nitrostyrene (preparation described in mescaline section) in 40 ml acetic anhydride at -8°: stir well and add dropwise 5 ml fuming HNO_3. Stir twenty minutes and pour on 200 ml ice water. Add some solid Na carbonate, filter, wash with water to get the 2-nitro derivative (I) (recrystallize-aqueous ethanol). 2.5 g (I) in 18 ml ethanol; add 8.8 g iron powder and 18 ml glacial acetic acid and stir and warm (cooling is eventually necessary). Stir about ten minutes until solution thickens and about five minutes more, then add 50 g Na bisulfite in 220 ml water and extract the indole with 5X 200 ml ether. Wash combined extracts with $NaHCO_3$, water, and dry and evaporate in vacuum to get the indole (can purify on alumina, eluting with 1:1 benzene:petroleum ether, discarding the precipitate that won't dissolve in the benzene-petroleum ether).

4-Substituted Indoles from Pyrrolyl Aldehydes J. Prakt. Chem. 315,295(1973)

A mixture of 9.5 g pyrrolyl-2-aldehyde, 29.2 g dimethyl-succinate and NaH (9.6 g of 50% suspension in oil) in 100 ml benzene is stirred at room temperature 6 hours, cooled and carefully acidified with glacial acetic acid. Add water and ether and dry, evaporate in vacuum or work up (JACS 72,501(1950), JCS 1025(1959)) to get ca. 17 g (80%) 3-methoxycarbonyl-4-(2'-pyrrolyl)-3-butenoic acid (I) (recrystallize-acetone-benzene). A mixture of 12 g (I), 7 g sodium acetate and 70 ml acetic anhydride is left overnight at room temperature with occasional shaking. Then gradually raise the temperature to 70-75° over 2 hours, maintain for 4 hours and work up (see JCS 1714(1955), 986(1958)) to get ca. 8 g (60%) methyl-4-acetoxy-indole-6-carboxylate (II) (recrystallize-petroleum ether). If desired, this can be converted to 4-OH-indole-6-COOH and 4-methoxyindole-COOH as described in the ref. or decarboxylated as described elsewhere here. If the 1-methyl cpd. is used, 1-Me-indole results.

Dialkyltryptamines from Indoles BSC 1424(1973)

Dissolve 2.75 g anhydrous sodium carbonate in a mixture of 50 ml acetic acid and 25 ml propionic acid. Add 11.7 g (0.1M) indole

and 8.8 g (0.11M) dimethylamine hydrochloride (or other amine) in 5 ml diglyme. Cool to between zero and minus 5° and add 11 g chloracetaldehyde hydrate (containing 75% chloracetaldehyde-0.1M). Stir 1 hour, keeping temperature below zero and put in refrigerator at ca. 5° for ca. 5 days. Pour on crushed ice and filter out the white, flocculent ppt. Shake the cold acid filtrate with cold ether (vigorous cooling) and separate the ether. Slowly with stirring neutralize by adding NaOH dropwise. Rapidly decant the ether phase, dry rapidly over sodium sulfate and quickly, with stirring, at a low temperature add HCl in ether. Decant the ether and treat the thick oil which formed with a small amount of absolute ethanol to bring about crystallization (add dry ether if necessary). Can recrystallize 3 times from ethanol-ether or acetonitrile to get 8.2 g (32%) alpha-chloromethylgramine (I).

Add 1 g (I) to a suspension of 2.5 g $NaBH_4$ in 75 ml diglyme heated to 55° with stirring. Heat to 85-90° and keep at this temperature for 48 hours (the yellow color disappears). After 24 hours, cool and pour on ice. Extract with ethyl acetate and evaporate to get about 37% yield of the oil DMT (or analog). Can purify on 1:1 silica:celite column; benzene elutes the skatole, methanol the DMT (recrystallize-hexane).

4-Acetylindoles from 5-Hydroxyindoles BCS 2046(1973)

Heat 1.1 g 2-ethoxycarbonyl-5-hydroxyindole(5-OH-indole and perhaps 5-OH-DMT will work) and 0.9 g powdered $AlCl_3$ at 145° in orthodichlorobenzene. Add 2-3 ml acetylchloride and keep the temperature at 145-150° for 2 hours. Cool and hydrolyze with ice cold 2N HCl. Extract with chloroform and dry, evaporate in vacuum to get 4-acetyl-2-ethoxy-carbonyl-5-hydroxyindole in ca. 50% yield. This paper also gives a method for borminating the starting cpd. in the 4 position.

5-Methoxy-indole REC 81,317(1961)

Again, if 3,5-dimethoxyaniline is used, 4,6-dimethoxy-indole should result.

To 123 g p-anisidine (p-methoxy-aniline) in 1 L 15% HCl; add 1 Kg ice and while stirring, quickly add dropwise below the surface, a solution of 75 g $NaNO_2$ in 200 ml water (temperature below 5°). Add 5 g activated carbon, stir and filter and quickly add filtrate with stirring to a mix of 160 g ethyl-alpha-methyl-acetoacetate in 1 L methanol, 1 Kg ice and 820 g Na acetate. Stir two hours and extract with 4X500 ml benzene. Wash extract with water, dry and

evaporate in vacuum and dissolve residue in ½ L ethanol. Cool to 0° and quickly add ½ L cold ethanol saturated with dry HCl gas (violent boiling). Stir one hour, add 100 ml hot water and refrigerate twelve hours. Filter, wash precipitate with 2X100 ml ethanol, 2X200 ml hot water and dry to get 135 g ethyl-5-methoxy-indole-2-COOH (I). (I) might be used directly to synthesize a dialkyltryptamine. 135 g (I) and 56 g KOH in 1 L 90% ethanol; reflux 1½ hours and pour into 6 L water. Acidify with concentrated HCl, filter, wash with water and dry to get 108 g 5-methoxy-indole-2-COOH (II). To a stirred mixture of 45.6 g (II) in 60 ml fresh quinoline, add 2 g Cu chromite and heat to 210-230° in a metal bath until CO_2 evolution stops (or just heat at 210-230° five minutes under N_2). Cool, filter, dry and evaporate in vacuum or add ½ L ether, filter and extract filtrate with 3X200 ml 2N HCl, 3X200 ml water, 2X100 ml 2N NaOH, 2X100 ml water and dry, filter, evaporate in vacuum to get 24 g 5-methoxy-indole.

5-Nitroindole JGC 29,2508(1959); see also JOC 20,1541(1955)

11.9 g indoline dissolved in 150 ml acetic anhydride. Add 8.5 ml concentrated HNO_3 dropwise with stirring (temperature 10-12°). Pour the mixture into water and filter. Add the precipitate (or 1-acetyl-indoline, prepared by boiling indoline in acetic anhydride) to 100 ml concentrated HCl and boil one-half hour. Basify with $NaHCO_3$ (can filter to remove black precipitate formed after adding first portion of $NaHCO_3$) to get 12 g 5-nitro-indoline (I) (recrystallize-heptane). 7.9 g (I) and 11.7 g chloranil in xylene. Reflux ten hours, cool, evaporate in vacuum or wash two times with 20% NaOH, filter, wash xylene with water, 50% HCl, water and dry, evaporate in vacuum to get 5.4 g 5-nitro indole (II). Can reduce (II) to the aminoindole as described for preparation of 4-amino-DMT or as follows. To 5.4 g (II) in 50 ml ethanol add a little Raney-Ni and add dropwise over two hours 100 ml hydrazine hydrate to the boiling solution. Filter, evaporate in vacuum (can distill 190/6) to get 5-NH_2-indole (recrystallize-heptane). Can benzoylate by dissolving in benzene and shaking with 20% NaOH and excess benzoyl-Cl, let stand twelve hours and dry, evaporate in vacuum (recrystallize-benzene). The dialkyltryptamine of the benzoylated compound may be more active than that of the amino compound.

4-CN-indole JACS 71,761(1949) (See BER 89,270 (1956), 90,1980(1957) for a more involved method.)

To 23 g Na in 350 ml ethanol add 146 g ethyl-oxalate and 171 g 2-nitro-6-Cl-toluene and reflux forty minutes. Dilute the red solution with water and steam distill until no more starting material is distilled. The aqueous residue is filtered, acidified with HCl and filtered to get 102 g 2-nitro-6-Cl-phenylpyruvic acid (I) (recrystallize-benzene). Add 81 g (I) in dilute NH_4OH to a solution of 560 g $FeSO^4.7H^2O$ and 230 ml concentrated NH_4OH and 2 L water and boil five minutes. Filter, wash precipitate with dilute NH_4OH, water and acidify filtrate with dilute HCl to get 60 g 4-Cl-2-indole-COOH (II) (recrystallize-aqueous ethanol). 9.78 g (II) and 6.7 g CuCN in 35 g quinoline and reflux (about 237°) for twenty hours. Pour the hot solution into a mixture of 25 ml concentrated HCl and ice. Stir and filter; wash precipitate with water and extract the filtrate and precipitate three times with ether. Wash the ether with HCl, water and dry, evaporate in vacuum to get 3.6 g 4-CN-indole (recrystallize-water). Or, heat (II) alone at 290° until fusion; then heat at 250° for ten minutes until CO_2 evolution ceases to get 4-CN-indole. For conversion to 4-formyl-indole see HCA 51,1616(1968).

4-Alkyloxyindoles TET 24,6093(1968), JMC 13,983(1970) and a longer route in CT 274(1970).

Add solution of 150 g 2-amino-6-nitrotoluene (prepared by reduction of 2,6-dinitrotoluene with H_2S in ammoniacal ethanol and recrystallize-water or ethanol) in 550 g concentrated sulfuric acid slowly to 5 Kg crushed ice and then add dropwise a solution of 75 g Na nitrite in 100 ml water with stirring and cool (0-5°). Continue stirring two hours and add 2 L 10% sulfuric acid containing 0.1% Cu sulfate. Heat at 75-80° twelve hours or until N_2 evolution ceases. Filter, cool to precipitate 135 g 2-OH-6-nitrotoluene (I) (recrystallize-aqueous ethanol) (can also prepare by nitrating o-cresol). Add 20 g (I) in 100 methanol to a solution of 5.8 g Na metal in 60 ml methanol or ethanol. Add dropwise with stirring, 34 g diethyl or dimethylsulfate. After addition reflux one hour, evaporate in vacuum most of the methanol, add 100 ml water and extract with 3X50 ml ether. Wash ether with 50 ml 5% NaOH, 2X50 ml water: dry, filter, evaporate in vacuum (can distill 116/2.2 for ethyl-, 94-6/0.5 for methyl-) to get 20 g 2-alkyloxy-6-nitrotoluene (II). Can also use 1-Br-propane and reflux four hours; evaporate in vacuum the ether extract and distill residue (180/17) to get the 2-n-propoxy-6-nitrotoluene (recrystallize-aqueous methanol). To a suspension prepared from 7.8 g K metal (Na may do) and 25 ml absolute ethanol in 160 ml dry ether, add dropwise a solution of 0.1 M (II)

and 29.2 g diethyloxalate in 50 ml dry xylene. Stir four hours and let stand at room temperature three days. Extract the precipitate with 100 ml ice water and extract the resulting dark red aqueous layer with 3X50 ml ether. Filter and remove the residual ether by blowing air through the aqueous solution. Cool in ice bath and treat alternately with a little 20% NaOH and 30% H_2O_2 (16 ml each total) until the dark red color is gone. Filter and acidify with concentrated HCl to get 9 g of the 2-alkyloxy-6-nitrophenylacetic acid (III). 2 g (III) in 40 ml glacial acetic acid. Add 0.1 g 10% palladium-carbon and hydrogenate at room temperature and atmospheric pressure about one hour. Filter, evaporate in vacuum to get 1.2 g 4-alkyloxyindole (recrystallize-toluene). For the n-propoxy compound, hydrogenate one-half hour in 30 ml 5% NaOH, filter, acidify with concentrated HCl and heat on steam bath for one-half hour. Cool and filter and recrystallize-aqueous ethanol. If desired, these indoles can be dealkylated as described elsewhere here.

Alternatively, dissolve 45 g (III) in 600 ml water with the minimum amount of 2N NaOH (about 80 ml). Add $Na_2S_2O_4$ to the well stirred solution in small amounts until no further increase in temperature occurs. Add 2N NaOH dropwise, at the same time add further Na hydrosulfite, until the red color disappears (about 80 ml NaOH, 70 g Na hydrosulfite). This takes about one hour and final temperature is about 35°. Stir in 200 ml dilute (1:1) HCl to precipitate the alkyloxyindole-COOH (IV) which can be used as is, or decarboxylated with quinoline and Cu powder by heating to 245° and cool, filter and evaporate in vacuum as described elsewhere here.

Methoxyindoles from Methoxyanilines JOC 20,1454(1955), 23,19 (1958)

Illustrated for preparation of 4,5,6-trimethoxyindole (IV). 1.8 g 3,4,5-trimethoxyaniline in 10 ml glacial acetic acid; add 1.9 g ethyl-oxomalonate-dihydrate and heat ten minutes on steam bath. Let stand two hours at room temperature and add 125 ml water and then solid ammonium carbonate till pH is 8 to precipitate 2.7 g 4,5,6-trimethoxy-3-OH-3-carbethoxyindole (I) (recrystallize-benzene-petroleum ether). 4.5 g (I) in 50 ml 5% NaOH and heat on water bath with aeration ten minutes. Take pH to 4 with dropwise addition of formic acid. Filter, wash with water and recrystallize from aqueous ethanol to get 1 g 4,5,6-trimethoxyisatin (II). To a stirred suspension of 7.2 g (II) in 30 ml boiling water, add 7 g Na hydrosulfite and let clear solution stand twelve hours in refrigerator.

Filter, recrystallize the precipitate from boiling water and dry to get the dioxindole (III). To a stirred slurry of 1.9 g lithium aluminum hydride in 100 ml dry ether add 4.3 g (III) in 120 ml dry benzene and reflux four hours. Cool and carefully add a little water. When bubbling stops, filter and dry, evaporate in vacuum the organic layer to get (IV).

4-Methoxyindole BSC 1335(1966)

Methylate p-Cl-phenol to get p-Cl-methoxy-benzene which is then converted (BSC 643(1953)) to 5-Cl-2-methoxy-benzyl-Cl (I). 50 g (I) in 50 ml dimethylformamide is added to a solution of 16 g KCN in 80 ml dimethylformamide and 70 ml water at 70°. Add a pinch of KI and heat at 85-90° 1½ hours. Pour on cold water; filter, dry (can purify by distilling 167/12) to get 38 g 5-Cl-2-methoxy-phenyl-acetonitrile (II). Alternatively, dissolve 29 g (I) in 200 ml acetone, add 8 g NaCN and 1.6 g NaI and reflux twenty-four hours. Cool, filter, and evaporate in vacuum to get 21 g (II). 174 g (II) in 174 g concentrated sulfuric acid, 174 ml water and 174 g glacial acetic acid; reflux and stir three hours. Cool, filter and dissolve the brown crystals in Na carbonate solution (can add decolorizing carbon and filter) and acidify to precipitate 179 g (III) (recrystallize-ethanol) (2-methoxy-5-Cl-phenylacetic acid). Alternatively, dissolve 50 g (II) in 350 ml methanol containing 15% NH_3 and hydrogenate at 70 Kg pressure, 50° in presence of Raney-Ni (or other reducing method) to get 40 g colorless liquid (after filtering, and evaporating in vacuum) 2-methoxy-5-Cl-β-phenethylamine (VIb). 76 g (III) carefully mixed with 60 g $SOCl_2$ and heated until dissolved. Let stand twelve hours and evaporate in vacuum to get 58 g yellow oily 2-methoxy-5-Cl-phenylacetyl-Cl (IV) (can distill 145/10). See preparation of mescaline for alternatives to this and other steps. 6 g (IV) and 14 ml 10% NaOH are added at the same time to 10 ml 33% aqueous methylamine at 0° and stirring is continued for one-half hour. Filter, wash precipitate with water and dry to get 5 g of the N-methyl-phenylacetamide (V). Carefully add 20 g pure and dry (V) to 10 g lithium aluminum hydride in 800 ml dry ether (can first reflux lithium aluminum hydride and ether twelve hours under N_2 and filter), reflux about four days and carefully add a little water until no more bubbles. Filter, extract filtrate with 2N HCl and extract the HCl with ether (evaporate in vacuum the ether to recover 3 g (V)). Basify the HCl extract and extract it with ether. Dry and evaporate in vacuum the ether to get 8 g oily N-methyl-2-methoxy-5-Cl-beta-phenethyl-amine (VIa) (can distill 110/0.5). 12 g (VIa or b) and 4.5 g DEA or

DMA in 500 ml ether; mix rapidly with 270 ml 0.9 M phenyl-Li, boil fifteen hours and extract as for (VI) or as described previously to get 8 g oily 4-methoxy-indoline (or its 1-methyl derivative) (VII). Alternatively, add 36 g naphthalene to 300 ml tetrahydrofuran and add 11 g Na metal cut in small pieces. Reflux and stir three hours and add 18 g (VI) and 8 g DEA in 200 ml tetrahydrofuran rapidly and boil twelve hours. Evaporate in vacuum, dissolve the oily residue in 2N HCl and extract with ether. Proceed as described to get (VII). 4 g (VII) in 200 ml dry pyridine; add to 6 g Cu chloride in 400 ml pyridine and reflux 1½ hours. Pour on water and extract with ether. Wash extract with 4N HCl and then water and dry and evaporate in vacuum the ether to get 2 g of the indole (VIII). Alternatively, dissolve 4 g (VII) and 9.5 g cinnamic acid in 700 ml mesitylene, add 1 g 5% palladium-carbon and reflux five hours. Filter, wash with HCl and $NaHCO_3$ and dry and evaporate in vacuum the mesitylene to get the red, oily (VIII) (can chromatograph on alumina and elute with benzene-petroleum ether).

5-OH-indole JCS 2525(1952)

To a solution of 4.3 g 2,5-dihydroxyphenylalanine and 2 g $NaHCO_3$ in 150 ml water, add with stirring during ten minutes, a solution of 13 g K ferricyanide and 3 g $NaHCO_3$ in 200 ml water (dark solution turns pale yellow). Extract with 3X200 ml ether and dry, evaporate in vacuum to get 2.3 g 5-OH-indole.

4-Indolecarboxylic Acid CPB 20,2123(1972)

Heat 3-nitrophthalic anhydride with ammonium carbonate to get 3-nitrophthalimide (I). Dissolve 4.3 g (I) in 50 ml 90% methanol and add 1.9 g sodium borohydride over 30 minutes while stirring vigorously at room temperature. Stir 2 hours, acidify with 20% HCl, evaporate in vacuum and treat the dry residue with acetone. Evaporate in vacuum to get 3.9 g (88%) 3-OH-4-nitrophthalimidine (II) (recrystallize from acetone). Dissolve 3.9 g (II) in 40 ml 20% HCl and stir for 10 hours on water bath at 80-90°. Distill off HCl and stir residue with acetone. Filter and evaporate in vacuum to get 3.4 g 3-OH-4-nitrophthalide (III) (recrystallize from $CHCl_3$ and can purify on column). Prepare an ether solution of CH_2N_2 and add to 1.93 g (III) in a 100 ml flask until a reaction is no longer evident. Add acetic acid to decompose excess diazomethane and evaporate in vacuum to get about 2 g of 2-methoxycarbonyl-6-nitrostyrene oxide (IV) (can purify on column). Dissolve 560 mg (IV) in 50 ml absolute methanol, add 50 mg PtO_2 and hydrogenate as described elsewhere here (other reducing methods should work). Filter,

evaporate in vacuum and recrystallize from benzene to get 270 mg methyl-4-indolecarboxylate (V). Dissolve 250 mg (V) in 2 ml 0.05M KOH and stir at room temperature 6 hours. Neutralize with 10% HCl carefully to prevent excessive heat and collect the crystals by filtration. Dry to get 126 mg 4-indolecarboxylic acid.

Indole Russian Patent 306,126(29July1971)

To a stirred suspension of 1.9 g orthocarbamoyl cinnamamide in 50 ml methanol add 26 ml 0.77 N NaOCl and heat in a distillation apparatus at 40° for 2 hours, or until no more indole is distilled off (can use the indole tests described earlier). Extract the distillate with $CHCl_3$ and dry, evaporate in vacuum (or steam distill the solvent) to get about 45% indole.

Indole German Patent 2,052,678(6May1971)

A molar ration of 2-(o-nitrophenyl)-ethanol to reducing gas of 1:5 is best (greater than 90% yields). The catalyst is Al_2O_3 or silica gel containing 7-14% by weight of copper (or Ni, Co, Cu chromite, etc.), with some potassium sulfate if necessary. Reducing gas is NH_3 or H_2, which can be mixed with nitrogen. The temperature is 250-300°. The 2-(o-nitrophenyl)-ethanol is vaporized over 30 ml catalyst in a quartz tube 56 cm long with an inner diameter of 15 mm, containing along its whole length a thermoelement tube with an outer diameter of 8 mm. The tube is filled to 28 cm with quartz glass fragments. The gas flow rate is 80-240 ml/minute with a contact time of 7-14 seconds. Compare CA 79,105065-66(1973).

Indole Analogs

Replacement of one or more of the C or N atoms of the indole nucleus by atoms of N, C, O or S will result in dialkyltryptamine analogs some of which are very likely to be psychedelic. Among the indole analogs are isoindole, indene, indazole, diazindoles, benzofuran, benzothiophene and benzimidazole. The syntheses of several such compounds follows.

Benzimidazole Analog of DET JCS 1671(1957)

17.3 g benzimidazole dissolved in 300 ml ethanol containing 3.4 g Na metal. Slowly add 22.4 g alpha-Cl-N, N-diethyl-acetamide (or 18.2 g dimethyl analog) in 100 ml ethanol and reflux four hours. Filter, evaporate in vacuum to get 2-1'-benzimidazolyl-N,N-diethyl-acetamide (I) (recrystallize-acetone). Add 16 g (I) to 6 g lithium aluminum hydride in 300 ml tetrahydrofuran and reflux six hours. Cautiously add a little water and filter, evaporate in vacuum to get the DET analog (recrystallize-water). (I) may be active.

Alternatively, dissolve 10 g N,N-diethyl-N'—o-nitrophenyl-ethyl-enediamine in 100 ml ethanol. Add Raney-Ni and 5 atmospheres hydrogen and hydrogenate one hour. Filter, evaporate in vacuum and reflux the oil forty minutes with 100 ml 4N HCl and 20 ml 87% formic acid. Basify with NH_4OH; extract four times with $CHCl_3$ and evaporate in vacuum to get the DET analog (recrystallize-water).

Indene Analogs of DET JMC 10,856(1967), JOC 30,3231(1965).

Illustrated for 6-methoxy-DET analog.

Prepare 6-methoxy-1-indanone (I) (JCS 1986(1962)) using polyphosphoric acid made by diluting 500 g of the commercial acid with 120 g 85% phosphoric acid. 2.5 g (I) in 176 ml ether and reflux one hour with 0.27 g lithium aluminum hydride. Cool and carefully add water and filter when bubbling stops (can use Celite filter aid). Dry and evaporate in vacuum and store twelve hours at -15° (under N_2 if possible) to precipitate the white 6-methoxy-1-indanol (II) (recrystallize-n-hexane). 2.5 g (II) in 73 ml benzene and reflux one-half hour with 0.2 g p-toluenesulfonic acid. Cool, add water and separate the phases. Extract the aqueous phase with ether and combine with benzene phase and dry, evaporate in vacuum to get 5-methoxy-indene (III) (can distill 110-45/10). 1.53 g (III) and 1.39 g N,N-diethyl-aminoethyl-Cl.HCl in benzene (prepare the free base in benzene as described previously). Reflux four hours with 0.42 g sodamide, cool, wash with water and dry, evaporate in vacuum to get the indene analog of 6-methoxy DET as a dark liquid (can crystallize as oxalate). Alternatively, dissolve 2.51 g (III) in ether and treat (under N if possible) with 12 ml 1.6M buty-Li in hexane at 0-10°. After two hours cool to -30° and add 12 ml more of butyl-Li. Add ether suspension of 2.5 g N,N-diethylaminoethyl-Cl. HCl over one-half hour and warm to room temperature. Filter, evaporate in vacuum to get the 6-methoxy-DET analog.

The following are some other syntheses of indole analogs:

Indene JOC 37,1545(1972); TL 2869(1972); CT 7,205(1972)

Indazole analog of 5-benzyloxy-DMT JACS 79,5246(1957), 80,966(1958)

Benziminazole analog of 5-OH-tryptamine JCS 1671(1957)

5-BR-benzothiophene analog of DMT JMC 10,270(1967)

Tryptamine analogs using pyrrolidine and piperidine JMC 10,1015 (1967)

Benzofuran derivatives LAC 662,147(1963), CA 60,2901(1963)

Benzothiophene preparation JOC 10,381(1945)

4-Azindoles CA 72,66934(1970), 73,56000(1970)

Isoindoles J.Prakt. Chem. 312,440(1970)

Various analogs JMC 9,819(1966), 10,856(1967), 13,1205 (1970); ACS 17,2724(1963); JACS 77,4324(1955); J.Het. Chem. 6,775(1969); JCS (C) 2317(1959), 1612(1969), 498 (1970); JOC 37,51(1972). CT 7,205(1972)

The following are syntheses of indoles and derivatives: For an extensive review of indole syntheses and reactions see CHEMISTRY OF HETEROCYCLIC COMPOUNDS (W.J. Houlihan, Ed.), 25, parts 1, 2 and 3 (1972-3).

5-OH-DMT (which can be substituted in the 4 position as described here) from 2,5-dimethoxybenzaldehyde JCS 1165(1954)

5-Nitro-DMT (in six steps from tetrahydrofurfuryl alcohol) JACS 75,1880(1953)

N-acylation of tryptamines JPS 58,563(1969), cf. JACS 74,101 (1952)

4-Acetylindole-3-acetic acid (in ten steps from m-amino-benzyl alcohol) BER 87,229(1954)

4,5-Benzindole JOC 24,565(1959)

5-methyl-indole JOC 24,2030(1959)

Indolyl-3-acetaldehyde JCS 3172(1952)

DMT derivatives JACS 77,4322(1955)

5-substituted indoles JCS 1424(1965), Israel J. Chem. 5,129 (1967)

5-6-Methylenedioxyindole JCS 78(1949)

Diphenyltryptamine CA 73,109616(1970)

Tryptamines (via ethyleneimine) CA 55,19897(1961)

Indoles (from phenylhydrazones) CA 72,66814(1970)

Indoles (possible route to methylethyltryptamine, using N-ethyl-aziridinium tetraflouroborates) Angew. Chem. 79,188 (1967)

3-(4-pyridyl)indoles (if this is not active, the 4-n-alkyl-pyridyl analog will probably be) J. Het. Chem. 7,1071(1970), ACS 22,1064 (1968)

Indoles (from o-acylanilines and dimethylsulfonium methylide) GCI 100,652(1970), TL 679(1969)

Indoles BSC 643,741(1960), 1051,2263(1962), 861,2175 (1965), 3359(1966)

Indole Grignard Reagents (review) Adv. Het. Chem. 10,43(1969)

Indoles (reviews) Het. Compounds (Elderfield-Ed.) 3,1(1952); Prog. Drug Res. 6,75(1963); THE INDOLE ALKALOIDS, W. Taylor (1966); THE CHEMISTRY OF INDOLES, R. Sundberg (1970)

4-Aminoindole from 5-Br-indole C.R. Acad. Sci. Paris 265,110 (1967)

Indole derivatives JPS 60,304(1971); AP 304,73(1971)

5-OH-indoles from substituted phenylethylamines TL 723(1970)

4-Alkylindoles from 4-Br or iodoindoles BER 104,2027(1971)

Indoles from cyclohexanones and allylamines C.R. Acad. Sci. Paris 272,1509(1971)

For a general, simple high yield indole synthesis from anilines and methylthioacetaldehyde etc. see JACS 95,588,591,2718,6508 (1973). For indoles from N-(β -hydroxy-ethyl aniline esters see BSC 2485(1973). For a 2-acyl-indoles in one step from orthoamino-ketones and alpha-haloketones or 2-carboxyindoles from sulfo-namides of ortho-aminocarbonyls see JOC 38,3622-24(1972). Indole and 5-Br-indole in 4 steps from beta-naphthol see Chem. Het. Cpds. (Russ.) 753(1973). Indole-JOC 37,3622(1972).

4-substituted indoles: from N-methylpyrrole in 5 steps Compt. Rend. 276C,1327(1973); in 20% yield by irradiation of 1-substituted indoles TL 2451(1973); in one step Swiss Patent 536,840(29 June 1973); French Patent 2,154,485(15 June, 1973); from para-benzoquinone etc. German Patent 2,145,573(15 March 1973); from 4-aminobenzofurans CA 78,147795(1973) (Japanese Patent 73 08,777(03 Feb 1973)).

Indoles Review: Int. Rev. Sci. Orgn. Chem. Ser.1 4,29(1973). Sulfur analog of psilocin JCS (P.T.1) 3011(1972); JHC 10,297 (1973); DMT analog CPB 19,603(1972). Benzothiophenes from thiophenes JOC 38,1056(1973).

Dialkyltryptamines from tryptamines: CA 78,147730(1973).

Tryptamines: J. Het. Chem. (Russ.)213(1973).

Indoles from Nitrosoanilines JHC 10,883(1973); from N-(beta-hydroxyethyl)aniline by thermal cracking: BSC 2485(1973); from isonitrile and diazomethane: TL 2133(1973).

CA 79,146321(1973) gives a one step synthesis of tryptamine from phenylhydrazine and 4-chlorobutyraldehyde by refluxing in aqueous ethanol for 6 hours (70% yield). CA 80,3381(1974) gives the preparation of DMT analogs.

JPS 62,490(1973) gives an indoline synthesis which can be carried one step further (dehydrogenation described in this chapter) to give DMT derivatives. See JOC 41,1118(1976) for indoles from betaketosulfoxides.

Indoles JOC 2,235(1937), TET 27,775,1167(1971); CA 75, 35735,63605,88424,98445,118230(1971), 76,14237(1972); ACS 25,1277(1971); JOC 37,43(1972); CA 77,75123(1972); CPB 20,1395(1972); J. Heterocyclic Chem. 8,903(1972); Diss. Abst. Int. 31B,5871(1971); AP 305,159(1972); JCS (Chem. Comm.) 415(1972).

4-Fluorotryptamines Israel J. Chem. 2,25(1964)

Tryptophan 4-acetic acid from tryptophan JACS 88,3941(1966)

Indoles from o-azidobenzaldehydes JOC 37,719(1972)

Indoles from isatins or oxindoles via diborane Synthesis 2,84 (1972)

Indoles from 2-oxindoles TL 1081(1972)

Indole Derivtives JOC 37,2010(1972)

Psilocin Derivatives Diss. Abst. Int. 32B,2606(1971)

Benzothiophene and Benzofuran TET 28,5397(1972)

Isoindoles TL 4295(1972); JCS(C) 1149(1972)

5-OH-indoles Diss. Abst. Int. 33B,107(1972)

Alkoxyindoles from Hydroxyindoles CA 77,151,914(1972)

MESCALINE AND FRIENDS

Mescaline and related alkaloids are found in varying amounts in cacti of the genera *Lophophora, Gymnacalycium, Stensonia, Mammillaria, Ariocarpus, Opuntia, Trichocereus, Pelecyphora,* and probably others. Members of the Native American Church do quite well with the dried cactus, but extraction of mescaline is desirable since the pure compound seems to produce fewer unpleasant side effects (e.g., nausea). For an excellent review on the occurrence and chemistry of the mescaline type compounds, see JPS 59,1699(1970) (cf. JPS 60,655(1971)). Various species of these cacti occur in southwestern U.S. as well as Central and South America and have been used by the Aztecs and others for millennia. For a good review of peyote see Lloydia 36,1-58(1973).

Extraction of Mescaline from Cactus

JACS 88,4218(1966), Lloydia 29,318(1966)

Dry and grind the top of the cactus and add 50 g to 250 ml methanol and let soak one day. Filter and add 100 ml 1N HCl to the wet powder and let stand about two hours. Meanwhile, evaporate in vacuum the methanol. Filter the HCl solution until clear and add to the residue remaining from the methanol. Make pH about 7 with 2N KOH and add 100 ml $CHCl_3$. Shake in separatory funnel and separate the bottom $CHCl_3$ layer. Add 40 ml water to the $CHCl_3$ and shake in separatory funnel. Dry and evaporate in vacuum the $CHCl_3$ layer to get the mescaline (and other compounds).

The most detailed directions for cactus extraction are contained in PSYCHEDELIC GUIDE TO THE PREPARATION OF THE EUCHARIST by R. Brown, obtainable for $5.50 from L.S.I. Co., PO Box 4374, Austin, TX 78765.

Another source pressure cooked the peyote in acidic water 15 minutes at 15 lbs. and poured off the liquid. This process was repeated 5 more times and the combined water extracts evaporated slowly to a tar which is cooled until able to be formed into small pills. The pills are dipped in Salol (phenyl salicylate), which has been liquified by heating, and allowed to dry. This forms an enteric coating which is said to allow ingestion without nausea. Others

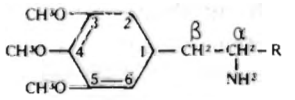
merely put the tar in gelatin capsules. Either way the nausea of whole peyote is greatly diminished. Three or four tabs are supposed to have the impact of 15-20 buttons.

Methoxyphenethylamines and Derivatives

Of the nineteen possible methoxyphenethylamines, only three are known to be psychedelic in man at reasonable doses. These are the 3,4,5-trimethoxy-(mescaline), 2,3,4,5 and 2,3,4,5,6 compounds. There are, however, a vast number of possible psychedelic derivatives with methyl, ethyl, Br, and other groups replacing methoxy groups. In addition, innumerable amphetamine derivatives which closely resemble mescaline in their structure and psychedelic properties have been synthesized. This similarity can be seen in the structures of mescaline (R=H) and 3,4,5-trimethoxyamphetamine ($R=CH_3$).

These amphetamine derivatives have the advantage that they are almost all more active than mescaline, STP being about 80X more active (i.e., requiring only about 5 mg as contrasted with about 400 mg for mescaline), and that they are often easier to synthesize. They do, however, seem to produce somewhat more of the effects of speed (e.g., anxiety, restlessness, sweating) than mescaline. The methylenedioxy compounds, on the other hand, produce some of the mildest trips of any psychedelic.

2-5,dimethoxy-4-Br-amphetamine (prepared by bromination of 2,5-dimethoxy-amphetamine -- see JCS 200(1953)) is about ten times more active than STP but it produces a trip similar to that of MDA and is not truly hallucinogenic. The phenethylamine analogs of this compound and of STP are ten times less potent than the corresponding amphetamines and produce only MDA type effects without the intense sensory alterations. Beta-hydroxy-3,4-methylenedioxyphenylethyl amine is said to be a very fine trip.



Mescaline (R=H) or 3,4,5-trimethoxyamphetamine ($R=CH_3$)

When the amino group of amphetamine is methylated, one gets methamphetamine which is considerably more stimulating. The corresponding hallucinogenic analogs of methamphetamine have not yet been shown to have any special stimulating properties, having on the contrary less potency than the unmethylated forms (see JMC

13,134(1970)), but human tests should be done (preliminary results show these compounds to be very pleasant).

N-methyl-MDA is extremely pleasant, producing more euphoria than cocaine, lasting much longer and having a very easy down. N,N-dimethylation or N-ethylation diminish activity drastically and the latter appears to have sedative effects. The methylenedioxy compounds are generally free of marked visual changes, allow considerable voluntary control of the experience and are more potent than the dimethoxy counterparts.

It is probably best to avoid p-methoxyamphetamine (PMA) and 2,5-dimethoxy-4-methylamphetamine (STP), the former because it seems to have a high toxicity and the latter because it lasts too long (e.g., 24 hours for a minimum dose). Other 4-alkyl amphetamines also seem to be toxic. A number of apparent fatalities due to MDA have been noted, but the reports usually involve very large amounts, often in combination with other drugs (e.g., 7 g MDA plus barbiturates) and screening for other, more toxic drugs (in particular, PMA) has not been done.

These amphetamine analogs can be produced by using the appropriately substituted benzaldehyde in place of 3,4,5-trimethoxy-benzaldehyde, and nitroethane in place of nitro-methane in the aldehyde method for mescaline synthesis (using nitropropane, etc., to give a longer chain results in less activity). However, easier synthetic routes from the naturally occurring (therefore cheap and commercially available) ring substituted propenylbenzenes are given here.

The following table lists common names, position of ring substitution, and approximate activity of the amphetamine derivatives for some readily available allyl and propenyl benzenes (see J. Chromatography 30,54(1967) for further information on these compounds). Activity is relative to mescaline which equals 1 (an activity of 12 means a dose of about 25 mg). Parentheses indicate a methylenedioxy bridge; other substituents are methoxy groups.

Allyl	*Propenyl*	*Substituents*	*Activity*
Safrole	Isosafrole	(3,4)	2
Croweacin	——	2(3,4)	2
Myristicin	Isomyristicin	3(4,5)	2
Dillapiole	Isodillapiole	2,3(4,5)	6
Estragole	Anethole	4	6
——	Asarone	2,4,5	12
——	——	2(4,5)	12
Apiole	Isoapiole	2(3,4)5	12

Amphetamines from Allylbenzenes JACS 91,5648(1969)

To a cooled and stirred solution of 100 ml acetonitrile and 64.8 g mercuric nitrate, add slowly 0.2M of the allylbenzene (keep temperature below 30°). Stir one hour at room temperature, cool and add 200 ml 3N NaOH, then 200 ml 0.5M $NaBH_4$ in 3N NaOH. After one hour saturate the water layer with NaCl and extract with ether. Dry and evaporate in vacuum the extract to get the N-acetyl-amphetamines. This procedure may not work with the propenylbenzenes.

If it is desired to remove the N-acetyl group see CJC 51,1407 (1973).

Amphetamines from Propenylbenzenes CA 52,11965(1958)

Use of N-methyl-formamide in place of formamide will give the corresponding N-methyl-amphetamine which is nicer.

Exemplified for 3,4-methylenedioxyamphetamine (MDA).

To a cooled mixture of 34 g 30% H_2O_2 and 150 g formic acid, add dropwise a solution of 32.4 g (0.2M) isosafrole in 120 ml acetone (keep temperature below 40°). Let stand about twelve hours and evaporate in vacuum. Add 60 ml methanol and 360 g 15% sulfuric acid to the residue and heat on water bath three hours. Cool, extract with ether or benzene and evaporate in vacuum the extract to give 20 g 3,4-methlenedioxybenzyl-methyl ketone (I) (can distill 115/2). Add 23 g (I) to 65 g formamide and heat at 190° for five hours. Cool, add 100 ml H_2O_2, extract with benzene and evaporate in vacuum the extract. Add 8 ml methanol and 57 ml 15% HCl to residue, heat on water bath two hours and evaporate in vacuum (or basify with KOH and extract the oil with benzene and dry, evaporate in vacuum) to get about 11 g MDA. In this, as in the other syntheses, either the cis or trans (alpha or beta) propenylbenzenes (or a mixture) may be used.

Amphetamines from Propenylbenzenes JMC 9,445(1966)

If the allyl isomer is at hand, it must first be converted to the propenyl as follows (CJC 43,3437(1965)). Add equal weights of the allyl compound and KOH flakes, and absolute ethanol and heat on steam bath or reflux for twenty-four hours; dry and evaporate in vacuum or add two times the volume of water and extract with ether or methylene chloride and dry, evaporate in vacuum (recrystallize-hexane).

0.034M propenylbenzene in a mixture of 3.3 g pyridine and 41 g dry acetone is cooled to 0° and 6.9 g tetranitro-methane added over

one minute with vigorous stirring, and stirring continued for two minutes. Add 2.2 g KOH in 40 ml water, add more water and extract the nitropropene with methylene chloride and dry, evaporate in vacuum (recrystallize-methanol). The nitropropenes (which seem to have little activity themselves) can be reduced to the active amphetamines with lithium aluminum hydride or Zn-Hg as described later, or reduced by another method (hydroboration, hydrogenation, Na-ethanol, electrolytic, etc.).

Mescaline and Amphetamines from Styrenes and Propenylbenzenes JACS 86,3565(1964)

The yield of mescaline should be about 50%; that for amphetamines will vary.

0.1M of ring substituted styrene or propenylbenzene in 30 ml tetrahydrofuran in ½L flask. Flush with N_2 and add 33 ml 1 M borane in tetrahydrofuran (see procedure below for preparation). Stir one hour, add 3 ml water and 50 ml 3N NaOH, and then 215 ml 0.31 M fresh chloramine solution (prepared by treating dilute aqueous NH_4OH with Na hypochlorite at 0°; see BER 40,4586 (1907)). Keep at room temperature one hour, acidify with HCl, extract with ether, basify with NaOH and extract with ether and dry, evaporate in vacuum (or just basify and extract with ether and dry, evaporate in vacuum) to get the amine.

To prepare the diborane in tetrahydrofuran, add 0.3 M $NaBH_4$ (or $LiBH_4$) and 0.4 M BF_3 in total 200 ml tetrahydrofuran and keep dry in refrigerator, or generate the diborane in the reaction flask as follows: To a well-stirred suspension of 3.4 g $NaBH_4$ in 150 ml tetrahydrofuran and 0.3M of the styrene or propenylbenzene, add over one hour at room temperature, 15.1 ml BF_3 in ether in 20 ml tetrahydrofuran (keep temperature at room temperature); let stand one hour at room temperature and decompose the excess hydride with water; then add the NaOH and chloramine (or hydroxyl-amino-O-sulfonic acid) and proceed as above to get the amine.

Other references on organoboranes: JACS 82,4710(1960), 88,5853(1966), Org. Reactions 13,28(1963).

Amines from Alkenylbenzenes by Aminoboration BSC 2668 (1973)

Styrenes will give phenethylamines, 1-propenylbenzenes will give amphetamines. The tetrahydrofuran should be dried over KOH pellets and, if desired, distilled from sodium then from lithium aluminum hydride. The diglyme can be vacuum distilled from

calcium hydride and stored with calcium hydride. Hydroxylamine-O-sulfonic acid can be purchased or prepared (LAC 702,131(1967); Inorg. Synth. 5,122(1957)). To a 3-necked flask flushed with a nitrogen stream add 0.096M styrene or 1-propenylbenzene in 200 ml diglyme, and then a solution of 1.52 g (0.04M) $NaBH_4$ in 70 ml diglyme. Keep the temperature at 25° and add with stirring over ½ hour 7.3 g (0.052M) 48% BF_3 etherate. Let temperature rise over 3 hours and then reflux 3 hours. Cool and carefully add 11.86 g (0.105M) hydroxylamine-O—sulfonic acid dissolved in 50 ml diglyme. Reflux 3 hours, cool and take up in 10% HCl. Extract with ether, basify the cold acid phase with excess NaOH, extract with chloroform, and dry, evaporate in vacuum to get about 40% yield of the amine.

Amphetamines from Phenylacetates CA 35,5868(1941)

Add 0.44 moles ring substituted phenylacetate, 100 g acetic anhydride and 30 g sodium acetate and heat at 145-150° for 18 hours to get ca. 0.4 moles of the methyl-phenylacetate (I). Add (I) and formamide (or N-methyl-formamide for the N-methyl cpd.), heat 4-5 hours at 180-195°, cool and extract with $CHCl_3$. Evaporate in vacuum, dissolve residue in 40% sulfuric acid and heat at 90-125° for 5-6 hours. Neutralize and add solid NaOH to precipitate about 50% amphetamine. Treat with 10% sulfuric acid to get the sulfate.

Amphetamines from Phenylacetones CA 61,6953(1964)

Exemplified for 2,4,5-trimethoxyamphetamine (I) preparation.

Mix 25 g 2,4,5-trimethoxyphenylacetone, 9.3 g hydroxyl-amine-HCl, 15.6 g K acetate and 400 ml 70% ethanol and reflux 3½ hours. Evaporate in vacuum and extract the residue with 4X150 ml benzene. Wash combined extracts with 2X75 ml water; dry and evaporate in vacuum the benzene (can purify the oil by dissolving in benzene and precipitate by adding petroleum ether) to get aout 20 g precipitate (test for activity). Dissolve 18.1 g precipitate in 200 ml methanol and hydrogenate. Acidify to get about 15 g (I).

Amphetamines from Propenylbenzenes J. Prakt. Chem. 137,345, 138,271(1933), JACS 54,273(1932)

Illustrated for 2,4,5-trimethoxyamphetamine (I) preparation.

Add a saturated solution of 40 g Na nitrite to 10 g asarone in 90 ml ether. Add dropwise over four hours 75 ml 20% sulfuric acid with stirring. Let stand eight hours; filter and wash precipitate with water, ether, ethanol, and dry. Dissolve 10 g precipitate in 60 ml 8% K

carbonate in ethanol with stirring and gentle (below 30°) heating. Add 150 g ice, acidify with 100 ml dilute HCl and let stand one-half hour at 0°. Filter, wash with water and dry to get about 7 g yellow crystals (recrystallize-methanol) (2-nitropropenylbenzene). Add 4 g crystals to 100 ml ethanol and 50 ml glacial acetic acid; then add 10 ml concentrated HCl or 50 ml concentrated sulfuric acid for the catholyte in a 40 cm^2 Hg-cathode in a porous cell surrounded by 3N sulfuric acid anolyte with a water cooled lead anode and reduce at 4 amps (about 0.07 amps/cm^2 cathode surface) at 30-40° for twenty hours or until solution is colorless. Evaporate in vacuum to about 20 ml; cool with ice, basify with NaOH and extract with ether. Wash, dry and dilute the ether (or dry, evaporate in vacuum) to get (I).

Note that this provides an alternative to tetranitromethane for nitration of propenylbenzenes, and an alternative to lithium aluminum hydride or Zn-Hg for reduction of nitropropenes.

Amphetamines from Bromobenzenes JACS 63,602(1941)

0.2 M p-methoxy (or other group)-Br-benzene (see this paper for prepartion) and 4.6 g Mg. Rapidly add 18.5 g chloroacetone in 50 ml ether. Evaporate the ether by heating in oil bath and then at about 135° for one hour. Cool and add ice and dilute HCl; extract the oil with ether and dry, evaporate in vacuum to get about 11 g product (can distill 106/18). 0.057 M of the ketone product in 16 g formamide in 100 ml round bottom flask, with an air condenser. Heat twelve hours at boiling and then reflux with 35 ml 30% NaOH eleven hours and separate the amine layer and dry, evaporate in vacuum to get the amphetamine.

The following papers often employ a glass apparatus called a Soxhlet extractor to get maximum yields in a reduction with lithium aluminum hydride; it is, however, unnecessary.

Phenylisopropylamines and Phenethylamines JMC 13,134(1970)

Mix 5.5 g 3,4,5-trimethoxybenzaldehyde (or analog), 2.5 g NH_4 Acetate, 25 ml nitroethane (or equimolar amount nitromethane for the analog), 25 ml benzene and reflux about twenty hours; water being removed with a Dean-Stark tube. Cool and wash with 2X25 ml water, 2X25 ml saturated $NaHSO_3$ and 2X25 ml water and dry and evaporate in vacuum the benzene to get (I). Reduce the nitropropene (or nitrostyrene) by any method such as follows: To a stirred suspension of 3 g lithium aluminum hydride in 50 ml tetrahydrofuran, add 4.4 g (I) in 50 ml tetrahydrofuran and reflux one hour. Cool in ice bath and treat slowly with wet tetrahydrofuran

until bubbling stops. Filter and evaporate in vacuum (or filter and extract precipitate with 3X25 ml hot tetrahydrofuran and evaporate in vacuum combined tetrahydrofuran) to get the amine.

For a catalytic reduction of (I) see AP 270,340,410(1932) or proceed as follows (AP 273,481(1935)): Dissolve 0.02 M (I) in 250 ml glacial acetic acid and add 10 ml concentrated sulfuric acid and 1 g palladium-carbon (or other catalyst). Reduce at 2 atmospheres H_2 and 15° (about fifteen minutes); filter, add 36 ml 5N NaOH and evaporate in vacuum to get the amine. For Zn-Hg reduction of (I) see below. See also JOC 37,1861(1972) for another catalytic reduction of (I).

Substituted Amphetamines from Substituted Benzenes JACS 68,1009(1946)

4 M of the substituted benzene and 32.4 g dry $FeCl_3$. Cool to -21° in an ice-salt bath and add dropwise with stirring over two hours, 76.5 g allyl-Cl and continue stirring three hours. Add about 2 lbs. crushed ice and 100 ml concentrated HCl. Agitate and separate the organic layer and wash with dilute HCl, then water and filter, dry and evaporate in vacuum (or distill 100-115/10 with Claisen flask, etc.) to get the substituted-1-phenyl-2-Cl-propane (I). Dissolve 0.16 M (about 27 g) (I) in 450 ml ethanol saturated with NH_3 (125 g/L, seal in an iron pipe in autoclave and agitate and heat about nine hours at 160°. Cool and filter and evaporate in vacuum to get the amphetamine in about 20% yield.

Amphetamines from Benzylmethyl ketones JACS 70,1315 (1948)

10 ml water and 0.2 g Pt oxide (or other catalyst) in 300 ml Parr hydrogenation bottle. Shake in H_2 atmosphere ten minutes and add 0.3 M p-methoxy-benzyl-methyl ketone (1-p-methoxy-phenyl-2-propanone) (or analog), 20 g NH_4Cl, 225 ml methanol saturated with NH_3, 25 ml NH_4OH and shake with 1-3 atmospheres H_2 until uptake ceases. Filter, wash precipitate with methanol or acidify with HCl and dry, evaporate in vacuum to get p-methoxy-amphetamine or analog.

For the preparation of phenylacetones from nitropropenes see JOC 15,8(1950).

Mescaline J. Chem. U.A.R. 11,401(1968) and many others.

Obtain 3,4,5-trimethoxybenzoic acid or synthesize as follows (Org. Synth. Coll. Vol 1,537(1946)): To a cold solution of 80 g NaOH in 500 ml water in 1 L flask, add 50 g gallic acid; tightly

stopper to exclude O and shake occasionally until all acid dissolves. Add 89g (67 ml) dimethyl sulfate, shake twenty minutes, releasing pressure occasionally, and cool to keep temperature below 30°. Again add 89 g dimethyl sulfate and shake ten minutes. Reflux two hours, add 20 g NaOH in 30 ml water and reflux two hours more. Cool, acidify with HCl; filter and wash with water to get 50 g 3,4,5-trimethoxybenzoic acid (recrystallize-2 L hot water) (can recover more by concentrating the filtrate).

A. Do a Fisher esterification by refluxing 100 g 3,4,5-trimethoxybenzoic acid in ethanol with concentrated sulfuric acid for several hours. Cool, filter, to get the ester (I) (recrystallize-ethanol).

A. (Alternative) 100 g 3,4,5-trimethoxybenzoic acid, 20 g NaOH, 55 g $NaHCO_3$ and 300 ml water and add with stirring 94 ml methyl or ethyl sulfate over twenty minutes and reflux one-half hour. Cool, filter, dissolve the precipitate in a small amount hot methanol or ethanol and cool to precipitate (I) (acidify the filtrate to recover unreacted trimethoxybenzoic acid).

B. 1 M (I), 10 M $NaBH_4$; dissolve in methanol, reflux four hours and filter, dry and evaporate in vacuum to get 3,4,5-trimethoxybenzyl alcohol (II).

B. (Alternative) To 4.6 g lithium aluminum hydride in 200 ml ether, add over one-half hour a solution of 23 g (I) in 300 ml ether. Slowly add 50 ml ice water; decant the ether and add 250 ml ice cold 10% sulfuric acid. Extract with 3X50 ml ether and dry, evaporate in vacuum (can distill 135-137/0.25) to get (II).

C. To a stirred solution of 39.6 g (II) in 150 ml $CHCl_3$ (or CCl_4 or benzene), at 0-5°, add 35 g $SOCl_2$ in $CHCl_3$ over one-half hour; let warm to room temperature and stir for one hour. Evaporate in vacuum and pour residue on ice cold water. Filter and wash precipitate 3X with water to get the trimethoxybenzyl-Cl (III) (recrystallize-benzene-hexane).

C. (Alternative) 25 g (II) and 125 ml ice cold concentrated HCl is shaken vigorously until a homogeneous solution is obtained. Let stand four hours until gummy precipitate forms and dilute with 100 ml ice water. Decant the water and extract with 3X50 ml benzene. Dissolve precipitate in this benzene, wash benzene with water and dry, evaporate in vacuum. Suspend the residue in a small amount ice cold ether, filter through cold funnel and wash with cold ether. Let filtrate stand in refrigerator to get more precipitate of (III) (recrystallize-benzene).

D. 43.2 g (III), 40 g KCN, 300 ml 85% formic acid (or DMSO, acetonitrile, 70% methanol, but lower yield for these). Add 150 ml water and reflux two hours. Cool, filter, and extract filtrate with 3X50 ml $CHCl_3$. Wash $CHCl_3$ with 3X50 ml water and dry, evaporate in vacuum to get the phenylacetonitrile (IV) (recrystallize-benxene-hexane, yield about 34 g).

E. HCA 53,50(1970) (see JMC 14,375(1971) or the following for other methods of reducing (IV)). 40 g (IV) in 90 ml methanol and 10 g aqueous 50% Raney-Ni (or substitute catalyst described in chemical hints section). Add dropwise over ten minutes with vigorous stirring a solution of 7.6 g $NaBH_4$ in 25 ml 8N NaOH and cool to keep temperature at 50°. H_2 evolution stops in about five minutes. Filter, wash with methanol and evaporate in vacuum to get mescaline (V).

E. (Alternative) Dissolve 10 g lithium aluminum hydride in 300 ml tetrahydrofuran or ether. Stir and add 20.4 g (IV) in 60 ml tetrahydrofuran or ether over one-half hour. Reflux three hours and cool. Slowly (dropwise at first) add 10 ml concentrated sulfuric acid in 40 ml water; separate the aqueous layer and basify with concentrated NaOH. Filter off any precipitate and extract brown oil with 3X30 ml ether. Wash ether with water, dry and add 1 ml concentrated sulfuric acid and 25 ml ether. Filter and wash the white precipitate with ether to get (V) (recrystallize-ethanol). (Alternatively, add 1.5N sulfuric acid dropwise until bubbling stops, filter (wash precipitate with solvent and add washings to filtrate), and dry, evaporate in vacuum (or bubble HCl gas through, or add a little concentrated HCl and evaporate in vacuum) to get (V)).

Mescaline and Amphetamines via Aldehydes J. Chem. U.A.R. 11,401(1968) and many others.

Illustrated for mescaline.

A. To 39.6 g trimethoxybenzyl alcohol (see preceding method for preparation) (or other analog) in 250 ml methanol, stirred and cooled to 0°, carefully add 54 ml Br_2 over one hour at 0°. Let temperature rise to room temperature, stir for two hours and add 30 ml saturated Na thiosulfate. Filter off the aldehyde (I) (recrystallize-benzene).

A. (Alternative) To 11 g hexamethlenetetramine in 70 ml $CHCl_3$, add 18 g trimethoxybenzyl-Cl (or other analog) and reflux four hours. Evaporate in vacuum and add 35 ml acetone to cause precipitation. Filter and heat precipitate with 100 ml water for twenty

minutes. Add 17.5 ml concentrated HCl and reflux five minutes. Evaporate in vacuum the acetone, cool and filter to get (I).

B. To 40.4 g (I) and 16 g nitromethane (or equimolar amount nitroethane for amphetamines) in 100 ml methanol, add 14 ml 3% methylamine in methanol (under N_2 if possible) and let stand at room temperature one day. Cool to -10°, filter, wash precipitate with cold methanol and dry in vacuum or warm oven to get the nitrostyrene (or nitropropene) (II), which can be reduced as described previously, or as in step C.

B. (Alternative) 40.4 g (I) and 16 g nitromethane (or equimolar amount nitroethane) in 150 ml glacial acetic acid and 15 g NH_4 acetate. Reflux 1½ hours; cool, filter, and recrystallize from acetic acid or methanol to get (II).

C. CPB 16,217(1968). Suspend 0.2 M (II) and Zn-Hg from 200 g Zn and 20 g $HgCl_2$ in 2 L ethanol and add with vigorous stirring portions of concentrated HCl until the yellow color disappears. Continue stirring one-half hour, filter, evaporate in vacuum to get about 0.14 M of the amine.

Phenethylamines from Acetophenones JOC 22,331(1957)

Acetophenones can be obtained by various routes such as by reacting acetic anhydride with the substituted benzene (Shirley-PREPARATION OF ORGANIC INTERMEDIATES, 1951, pg. 190) and may then be isomerized, if necessary, with aluminum chloride (JCS 232(1944)).

A mixture of 0.33M of the acetophenone, 39 g of redistilled morpholine and 14.4 g sulfur is refluxed for 12 hours and the wrm solution poured into 175 ml hot ethanol. Cool to precipitate about 80% yield of the substituted phenylacetothiomorpholide (I). Mix about 50 g (I), 110 ml acetic acid, 16 ml sulfuric acid and 25 ml water and reflux 5 hours. Decant from the small amount of tar formed with stirring into 850 ml water. Filter, wash the precipitate with water and heat the precipitate with 225 ml 5% aqueous NaOH. Filter and acidify the filtrate with dilute HCl to give about 80% yield of the substituted phenylacetic acid (II). Mix about 21 g (II) and 25 g phosphorus pentachloride (caution), and after the initial reaction subsides, warm on the steam bath 10 minutes. Distill under reduced pressure to remove the POCl and gradually add the residue to ice cold concentrated NH_4OH. Filter, wash precipitate with water and air dry (can recrystallize from benzene with a little ethanol added) to get about 18 g (85%) of the substituted phenyl-acetamide (III). (III)

may be reduced by various means such as the following. To a stirred suspension of 8.6 g lithium aluminum hydride in 500 ml dry ether, add a solution of 10 g (III) in 600 ml boiling reagent benzene, adding additional hot benzene to redissolve any precipitate. Stir and reflux for 22 hours and then hydrolyze by adding water cautiously and 10% sulfuric acid. Filter, heat the precipitate with concentrated HC1 to dissolve and cool to preicipitate the substituted phenethylamine.

Phenylethylamines from Benzaldehydes Indian J. Chem. 5,471 (1967), JMC 11,534(1968)

A. 0.02 M substituted benzaldehyde, 27 g acetic anhydride, 12 g fused K acetate in 250 ml round bottom flask with air condenser and $CaCl_2$ tube. Heat on oil bath at 160° one hour and then at 175° for four hours. Pour into water (neutralize with Na carbonate and steam distill to recover unreacted aldehyde), cool, acidify and filter to get about 60% yield substituted cinnamic acid (I).

B. Dissolve 10 g (I) in 100 ml water containing 10% NaOH and add with stirring, 300 g 3% Na-Hg portionwise at intervals of one hour and stir for ten hours. Filter, concentrate to one-half volume and acidify to precipitate the hydrocinnamic acid (II) in about 50% yield.

C. 10 g (II) and 15 g $SOCl_2$ are refluxed on water bath two hours and evaporated in vacuum on water bath. Pour residue into cold liquid NH_3 or NH_4OH with stirring. Filter, wash precipitate with water to get about 80% yield substituted hydrocinnamamide (III) (recrystallize-benzene or dilute ethanol).

C. (Alternative) To 0.1M ethyl-chloroformate in 100 ml $CHCl_3$ at -30° add a cold solution of 0.1 M (II) and 0.1 M triethylamine in 100 ml $CHCl_3$ over forty minutes. Stir 1½ hours at -20° to 5° and bubble NH_3 through the cold mixture for twenty minutes. Stir one-half hour at room temperature, filter and extract the solid with $CHCl_3$. Combine $CHCl_3$ extracts and filtrate and wash two times with cold NaOH solution and two times with water. Dry and evaporate in vacuum to get (III).

D. Pass the chlorine from 3 g $KMnO_4$ and excess HCl into 120 ml 10% NaOH to make a solution of hypochlorite (Clorox may do). Add 10 g finely powdered (III) and stir to dissolve amide, while warming to 50°. Heat one hour at 85°, add 30 g KOH and heat two hours. Separate the oil and extract the aqueous layer with ether. Add ether to oil and dry, evaporate in vacuum to get the substituted phenylethylamine (IV).

D. (Alternative) To a stirred and cooled solution of 0.1 M NaOH in 100 ml water at -5° add 0.04 M bromine over five minutes and stir one-half hour at 0°. Add 0.02 M (III) and stir 1½ hours at 0-5°. Stir sixteen hours at room temperature and 70° for one hour. Cool and extract with ether, dry and evaporate in vacuum to get (IV).

Phenylethylamines from Substituted Benzenes CA 57,6721(1963)

0.1 M m-methoxy-toluene (or analog), 30 ml HCl, 30 ml benzene; cool to 0° and with cooling and stirring saturate with HCl. Add 0.15 M formaldehyde and then more HCl for fifteen minutes. Stir at room temperature for two hours and dry, evaporate in vacuum the benzene layer to get about 30% 2-methyl-4-methoxy-benzyl-Cl (or analog). 0.5 M (I), 0.8 M NaCn, 5 g NaI or KI in 250 ml dry acetone; stir and boil twenty hours. Filter, wash precipitate with 100 ml acetone and dissolve precipitate with 75 ml benzene. Wash with 100 ml water and dry, evaporate in vacuum to get about 80% yield 2-methyl-4-methoxy-benzyl-CN (II). 0.1 M (II) in 60 ml 10 N NH_3 in methanol; 4 g Ni-Cr_2O_3 and shake in autoclave at 70-100 atmospheres H_2 and 120° to get about 80% yield of the phenethylamine.

Phenylethylamines from Phenols CA 68,86944(1968)

To 5.1 g omega-phthalimidoethyl-Br and 3.1 g 2,6-dimethoxy-phenol (or analog) in 500 ml ether add 2.66 g dry $AlCl_3$ portionwise and let stand twenty-four hours at room temperature. Heat two hours at 60°, filter, wash to recover starting material and dry, evaporate in vacuum to get 25% yield of (I). To an ether solution of diazomethane from 8 g H_2N-CON(NO)CH_3 add 4 g (I) portionwise and filter, evaporate in vacuum to get about 100% yield of (II). Heat 2 g (II) in 20 ml aqueous HCl for four hours and cool, precipitate, filter, evaporate in vacuum the filtrate to get about 30% yield mescaline.

Phenethylamines JMC 15,214(1972)

This is a rapid, convenient procedure. If trimethoxybenzyl alcohol is used in place of p-anisyl alcohol, mescaline will result. Shake 100 g p-anisyl alcohol (or 0.72 moles analog) with 500 ml concentrated HCl for 2 minutes. Wash the organic phase with water, 5% $NaHCO_3$ and water, and then add over 40 minutes to a stirred slurry of 49 g NaCN in 400 ml dimethylsulfoxide with ice water cooling to keep temperature at 35-40°. After completing addition, remove cooling bath, stir for 90 minutes and then add to 300 ml water. Separate the small upper layer and extract the aqueous-DMSO layer

with 2X100 ml ether. Add the ether extracts to the small upper layer, wash once with water and dry ($MgSO_4$). Add 600 ml ether to a dry flask and chill in ice as 80 g of anhydrous $AlCl_3$ is added portionwise, followed by 23 g of lithium aluminum hydride. Add the washed and dried ether extracts at such a rate as to give gentle reflux without external heat (ca. 1 hour). Stir for 2 hours, ice chill and treat dropwise with 25 ml water then 250 ml 20% aqueous NaOH, with periodic addition of ether through the condenser to replenish losses and facilitate stirring. Filter and wash precipitate with ether; add ether to filtrate and mix with one third its volume of absolute ethanol. Slowly and with continuous swirling and ice cooling add 60 ml concentrated HCl. Cool to 0° and filter to get the amine hydrochloride in ca. 75% overall yield (or can obtain the crude amine by filtering and drying, evaporating in vacuum the final ether solution). Note the use of concentrated HCl to obtain the crystalline end product in contrast to many other papers which employ HCl gas.

N-Methylation of Amines JMC 13,134(1970), 15,214(1972)

Either phenethylamine or phenylisopropylamine will work. If the hydrochloride salt is available, this should first be changed to the free amine by stirring with concentrated aqueous NaOH.

Treat 0.54 moles of the amine with 100 ml of benzene and 70 g of benzaldehyde in a flask fitted with a Dean-Stark trap and reflux until no more water is present in the condensate (ca. 1 hour) (alternatively, reflux ½ hour and then distill until the temperature reaches 100°): remove the trap and add a solution of 82 g dimethylsulfate in 200 ml benzene through the condenser at a rate sufficient to maintain reflux (ca. 15 minutes). Reflux 30 minutes (or heat 90 minutes on a steam bath), add 200 ml water and reflux (or heat on steam bath) for ½ hour more. Separate the aqueous layer, extract it twice with ether or benzene, basify with 50% NaOH and extract twice more. Add the extracts to the organic layer and dry, evaporate in vacuum to get ca. 70% yield of the N-methyl-amine. Can crystallize by dissolving in 500 ml 20% absolute ethanol-ether and treating with 50 ml concentrated HCl while swirling and cooling. The crystals can be further purified by washing with ice cold 20% ethanol-ether and recrystallizing from ethanol.

N-methylation of hallucinogenic amphetamines seems to produce a very smooth, mellow, euphoric trip, and the same is probably true for phenylethylamines.

For N-methylation via the imides see JOC 38,1348(1973). N-

methylation appears to decrease the potency. Larger N-alkyl groups seem to have a sedative action.

N,N-Dimethylamines JMC 13,134(1970)

To 14 g formic acid, cooled in an ice water bath, add dropwise 0.016 mole of the amine and then 3.6 g of formaldehyde (ca. 10 ml of formalin) and reflux for 5 hours. Cool to room temperature, add 7 ml concentrated HCl and evaporate in vacuum. The resulting oily dimethylamine can be purified by dissolving in 25 ml water, extracting with 2X25 ml $CHCl_3$. Basify the aqueous layer with 2N NaOH and extract with 3X25 ml ether, and proceed as described above for the N-methylamines. This procedure should work for both phenethylamines and phenylisopropylamines, and should affect the trip similarly to N-monomethylation.

See the following method for another easy route to N-alkylation which will probably work for dialkylation.

Although N,N dialkyl compounds have very little activity, they are probably worth further investigation.

Amphetamines via phenylacetones CT 3,313(1968) CF. JACS 58,1808(1936) and JCS 18(1930)

Note that the following procedure leads from the aldehyde to the amine or N-substituted amine without involving a troublesome catalytic hydrogenation for reducing the intermediate nitropropene.

Mix 0.25M substituted benzaldehyde, 0.3M nitroethane, 50 ml dry toluene and 5 ml n-butylamine (or other amine), and reflux 3 hours with a Dean-Stark trap (or prepare the nitro-propene as described elsewhere here). Add 50 g iron powder and 1 g $FeCl_3$ (optional) and reflux while adding 90 ml concentrated HCl over 3 hours. Reflux 1 hour more, add 2 liters of water and extract 3 times with ether, then dry and evaporate in vacuum (or steam distill until about 3.5 liters of distillate is obtained; extract the distillate 3 times with toluene; wash the toluene layers with 7 g $NaHSO_3$ in 225 ml of water, then 3 times with water and dry, evaporate in vacuum) to get the ketone. Mix 0.13M ketone, 28 g formamide (or dimethylformamide if the N,N-dimethylamine is desired) and 3 ml formic acid and heat at 160°. Add 3 more ml formic acid and heat 16 hours at 170-180° adding formic acid from time to time to keep the pH acid. Distill off the water formed (about 16 ml), cool and extract with 3X70 ml benzene. Distill off the benzene and reflux the residue 7 hours with 30 ml concentrated HCl. Chill, basify with 10% NaOH and extract with 3X70 ml ether. Dry and evaporate the ether in

vacuum to get the amine. Since some amines are unstable to heating, it is perhaps best just to dry and evaporate the benzene extract.

To obtain an N-substituted amine reflux 0.1M ketone, 17 g aluminum filings or foil, 50 ml ethanol, 40 ml 30% aqueous n-butylamine (or other amine), and 0.5 g of mercuric chloride for 3 hours. Cool and pour on 500 g crushed ice and 200 ml 10% KOH. Extract 3 times with ether and dry, evaporate in vacuum (or wash combined ether layers 2 times with 10% HCl, basify acid extract with 15% NaOH and extract 3 times with ether and dry, evaporate in vacuum) to get the n-butyl-amine (or other amine).

Alkoxybenzaldehydes

2,4,6-Trimethoxybenzaldehyde JCS 4964(1952)

This method should also work for 3,4,5-trimethoxybenzene and other symmetrically substituted benzenes.

To 42 g 1,3,5-trimethoxybenzene, 30 g formanilide and 200 ml ether add 19 g $POCl_3$ and let stand twelve hours. Evaporate in vacuum, add 900 ml 5% NaOH and steam distill residue to get the aldehyde (recrystallized benzene-ligroin).

For a different synthesis see Org. Synth. 2,11(1940).

Methylenedioxybenzaldehydes

Substituting methyl sulfate for methylene sulfate will probably give the dimethoxybenzaldehydes.

Dissolve 4 g 3,4-dihydroxybenzaldehyde (or any other benzaldehyde having adjacent OH groups) and 7.6 g KOH in 50 ml water. Heat to 50° (under N_2 if possible) with stirring and add 5 g methylene sulfate; stir and heat two hours. Add 500 ml water and sufficient K sulfate to dissolve the precipitate. Extract with ether, acidify the aqueous phase with HCl to precipitate unreacted aldehyde, and dry, evaporate in vacuum the ether to get the title compounds (recrystallize-methanol).

2,4,5-Trimethoxybenzaldehyde JACS 57,1126,2739(1935)

To 13 g 3,4-dimethoxyphenol in 20 ml methanol add a solution of 5.3 g KOH in 100 ml methanol and then 12 g methyl iodide. Reflux two hours, add 300 ml water and make pH 10 with 5% NaOH. Extract with ether and dry, evaporate in vacuum the pooled extracts to get a clear oil. Mix 17.3 g N-methyl-formanilide and 19.6 g $POCl_3$ and let stand at room temperature for one-half hour. Add 8.5 g of the oil, heat two hours on steam bath (or boiling water) and pour

black viscous product on 800 g cracked ice and let stand three hours, or until no more precipitation to get title compound. Filter (recrystallize-methanol).

Simple methods of preparing phenylacetonitrile from diazoacetonitrile and triphenylboron are given in JACS 90,6891(1968) and from the borophenyl-9-borabicyclo (3.3.1) nonane (BBN) and Cl-acetonitrile in JACS 91,6854(1969). These methods should work with substituted phenyl compounds to give mescaline and analogs. Likewise (JACS 90,5936(1968)), a preparation of phenylketones from triphenylboron or BBN and diazoacetone, or bromo-acetone (JACS 91,6852(1969)) may be used to prepare the phenylacetones which can be reduced to the amphetamines in one step as already described. For synthesis of BBN see JACS 91,4304(1969) and for borabicyclononane see JACS 90,5280(1968).

The amphetamine and mescaline analogs which can be obtained by replacing carbon atoms with O, N, or S atoms may also be active, but little work has been done on this. For the synthesis of thienyl analogs see JACS 64,477(1942).

Other Syntheses

N-Methyl Mescaline HCA 35,1577(1952)

p-Methylephedrine Pharmazie 24,735(1969)

4-*Nitropropenylbenzene* GCI 100,846(1970)

Amphetamines and Phenylethylamines JMC 11,186(1968), 13, 26,134(1970); JOC 19,11(1954), 20,102,1292(1955), 22,331 (1957), 23,1979,2034(1958), 25,2066(1960); Alab. J. Med. Sci. 1,417(1964); JCS 18(1930); BSC 835(1962); BER 63,3029 (1930), 65,424(1932), 67,696(1934); CA 6953(1964); Arznei. Forsch. 9,157(1959); JACS 51,2262(1929), 63,602(1941), 76,5555(1954); Pharmazie 22,19(1967); CT 3,313(1968).

Bromoamphetamines JMC 15,413(1972)

N-substituted mescaline derivatives and methamphetamine analogs Diss. Abst. Int. 32B,5704,5706(1972).

Methamphetamine analogs JMC 16,14(1973), MMDA CJC 46,75 (1968).

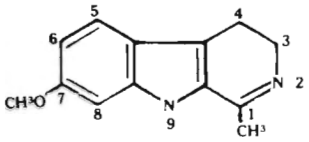
See CT 8,308(1973) for a route from phenethyl or phenylpropylchlorides to the amines. For older MDA syntheses see JACS 62,425(1940); JCS 15(1943), 1527(1951).

For other compounds related to STP see CJC 51,1402(1973), and

Psychopharmacology Communications 1,93(1973)
MDA Japanese Patent 8573 (5 Oct 1956)

HARMALINE AND OTHER BETA-CARBOLINES

Although some of the compounds of this group occur in plants used as hallucinogens for millenia by the aborigines of South America and elsewhere, very little scientific work has been done on them. The *Homa* of Asia Minor appears to be syrian rue *(Peganum harmala)* from which harmaline was first isolated. Harmaline (1-methyl-7-methoxy-3,4-dihydro-beta-carboline) is about three times less potent than the 6-methoxy isomer, and very probably the 5-methoxy isomer will be even more active. The 6-methoxy isomer is also called 10-methoxy-harmalan. Activity appears to be greater when the methoxy group is replaced by a longer chain alkoxy group. If a double bond is also placed in the 3-4 position of harmaline, one obtains harmine. These compounds are active at about 200 mg orally. Most of these compounds are probably legal.



Harmaline

Harmaline and Isomers CJC 37,1856(1959)

Dissolve 3.3 g 4,5, or 6 methoxy (or ethoxy, methyl, etc.)-tryptamine or its HCl salt in 350 ml 0.1 N HCl: heat on steam bath two hours with 1.1 g glycoaldehyde (reaction over when aliquot no longer gives a precipitate with dinitrophenylhydrazine). Filter, concentrate by heating on water bath or evaporate in vacuum; basify with 20% NaOH and extract with ether (best to do in an extractor for eighteen hours). Dry and evaporate in vacuum the extract to get about 5 g residue or oil which may precipitate on standing. Add 250 ml 90% phosphoric acid and heat on steam bath two hours. Evaporate in vacuum (or dilute with water, basify with 20% NaOH; extract with ether in extractor and dry, evaporate in vacuum the

extract) to get about 2.5 g harmaline (or analog).

Norharmaline and Isomers JACS 72,2962(1950)

To 24 ml acetic anhydride in 80 ml formic acid add 22 g 4,5 or 6 methoxy (or analog) tryptophan and reflux ½ hour. Concentrate to thick syrup on steam bath with vacuum and add slowly with stirring 180 ml water and let stand twelve hours at 0°. Filter, wash with 2% HCl and water to get about 18 g N-formyl-methoxy-tryptophan (I) (recrystallize-benzene-ethanol). 10 g (I), 119 g polyphosphoric acid, 10 ml $POCl_3$ mixed in 500 ml flask with vigorous stirring. Heat on oil bath at 125° for eighty minutes (HCl and CO_2 evolution). Add ice, cool, filter and neutralize filtrate with concentrated NH_4OH to get about 5 g norharmaline or isomer. To get harmaline isomers, use 1.4 g N-acetyl-methoxy-tryptophan, 14 g polyphosphoric acid and 3 ml $POCl_3$ and proceed as above.

Harmaline and Isomers JACS 70,223(1948)

Dissolve 27 g 4,5, or 6 methoxy (or ethoxy, methyl, etc.) tryptophan in 50 ml freshly distilled acetaldehyde and 1 L water and heat at 50° in loosely stoppered flask three hours. Heat on steam bath five hours to remove acetaldehyde, then add 5 L water and heat to boiling. Add 1.2 L 10% K dichromate and 240 ml glacial acetic acid and continue heating three minutes. Cool and add excess Na sulfite; take pH to 8 with Na carbonate Extract with 5 L ether and dry, evaporate in vacuum (or simply evaporate in vacuum after cooling) to get the harmaline isomer.

1,2-Dihydroharmaline JPS 57,269(1968)

Dissolve 4 g glyoxylic acid monohydrate in 220 ml water and add with stirring to a solution of 10 g 4,5, or 6 methoxy-tryptamine-HCl in 80 ml water. Adjust pH to 4 with 10% KOH and stir five hours at room temperature. Filter and wash with water to get about 4.5 g precipitate. Melt to decarboxylate or to 4 g precipitate add 30 ml concentrated HCl and 100 ml water and heat at 65° one hour. Add water to dissolve the solid and add excess 10% KOH. Filter to get the title compound or analog.

Harmaline analogs BSC 2262(1962)

Brominate cyclohexanone-2-COOH (JACS 72,2127(1950)) and cover to the ethyl ester. Add 1M ethyl-3-Br-cyclohexanone-2-carboxylate to 2M p-methoxy-aniline in cold benzene. Recrystallize the product from ether-petroleum ether and reflux sixteen hours in presence of $ZnCl_2$ in dry ethanol. Filter, evaporate in vacuum and recrystallize-petroleum ether. Dehydrogenate with 5% palladium-

carbon and then treat with NaOH (JCS 530(1945)). Heat at 180° to get the analog of 6-methoxy-norharmine.

Sulfur Analogs of Harman and Other beta-Carbolines JACS 72,4999(1950)

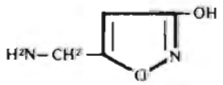
To synthesize 6-methoxy-3,4-dihydro-beta-carboline (10-methoxy-harmalan), add 5-methoxy-tryptamine to acetic anhydride and let stand twelve hours at 10°. Dilute with water, basify and extract with methylene Cl and dry, evaporate in vacuum to get melatonin (I). Reflux (I) in xylene in the presence of P_2O_5 to get the title compounds. *Other References:* JMC 7,136(1964); JPS 57,1364 (1968), 59,1446(1970); JACS 70,219(1948); JCS 1602(1921), 1203(1951), 4589,4593(1956); Organic Synthesis 51, 136 (1971). For the preparation of tryptophan-4-acetic acid from tryptophan see JACS 88,3941(1966).

Sulfur isosteres of harmine, harmaline, etc. J.Het. Chem. 9,1265 (1972). *Harmaline and analogs* BSC 2058(1973). *Beta-carbolines from sugars and tryptamines in 1 step* BER 106,2943(1973).

MUSCIMOLE AND OTHER ISOXAZOLES

It appears likely that mushrooms were the source of man's first psychedelic experiences. The "soma" praised in the Rig Veda of ancient India (about 2,000 BC) is now thought to be a mushroom (the fly agaric, *Amanita muscaria*, and possibly other *Amanita* species). Much of the Eurasian religion and mythology may have had its origin in the psychedelic properties of these mushrooms. Probably all members of the genus *Amanita* are psychedelic, but ingesting them is unwise since there is probably not a great difference between the psychedelic and lethal dose of mushroom for some species. *Amanita muscaria* itself is seldom lethal but be very careful if you eat it. It is said to be active if dried, powdered, and smoked. In the USA it fruits in early summer and again in late summer (in fall and winter on the Pacific coast). Since muscimole is very water soluble, it can be extracted from the dried, powdered mushroom (or perhaps even fresh ones) by soaking in water (hot or even boiling water may be OK) and straining -- but drink cautiously. Most of the muscimole is contained in the red "skin" and the underlying yellow tissue. Some Russian peoples regarded thorough drying of *Amanita* as a necessary preliminary to ingestion. It has recently been suggested that there are significant chemical differences between New and Old World *A. muscaria*.

The main psychedelic component of these mushrooms appears to be muscimole (5-aminomethyl-3-OH-isoxazole), which is active in an oral dose of about 10 mg. See HCA 48,920(1965) for extraction of muscimole from the fungus.



Muscimole

The value of muscimole as a psychedelic is diminished by the dizziness and muscle twitching which seem to occur (at least in some people), but a small dose in conjunction with another psychedelic should be very interesting. Ibotenic acid also occurs in Amanita, and though not itself a desirable psychedelic, it can be converted to muscimole by dissolving in dimethylsulfoxide or refluxing in water.

Its synthesis is generally more difficult than that of muscimole (see CA 65,2266(1966) and CPB 15,1025(1967), 19,46(1971)). Several routes for the synthesis of muscimole (also called agarin or pantherine) follow. For a good review of this subject see Prog. Chem. Org. Nat. Prod. 27,262(1969). Muscimole is probably legal everywhere.

Muscimole Synthesis

Method 1 Rend. Ist. Lomb. 93A,150(1959), 94A,735(1960), JCS 172(1968)

Dissolve 100 g 1-Cl-3-Butanone (JACS 75,5438(1953)) in 300 ml dimethylformamide; stir and add 77.5 g $NaNO_2$ with cooling. Stir five hours and let stand twelve hours. Add 300 ml water; extract with ether and dry, evaporate in vacuum the extract (can distill residue 86/2) to get 50 g 1-NO_2-3-butanone (I). Dissolve 18 g (I) in 90 ml 48% HBr and reflux ten minutes. Add 100 ml water and steam distill. Dry, extract with ether and dry, evaporate in vacuum the extract (can distill 67-8/18) to get 4.8 g 3-Br-5-methyl-isoxazole (II). 32.4 g (II) and 85.5 g KOH in 220 ml methanol and reflux twenty four hours (under N_2 if possible). Add 1 L water, extract with 4X250 ml ether and dry and evaporate the combined ether extracts to get 13 g liquid 3-methoxy-5-methyl-isoxazole (III). Add 100 ml n-butyllithium in hexane (2 moles) with stirring over twenty minutes below -65° to 22.6 g (III) in 100 ml dry tetrahydrofuran. Stir at -75° one hour and pour onto a stirred mixture of 1 kg dry ice(solid CO_2) and 1 L ether. Let stand twelve hours or until CO_2 evaporates and extract with 3X200 ml 2N NaOH. Acidify with dilute HCl and extract with 3X100 ml ether. Dry and evaporate in vacuum the extract to get 25 g 3-methoxy-isoxazole-5-acetic acid (IV) (recrystallize-petroleum ether-ethyl acetate). Dissolve 5.2 g (IV) in 100 ml 3% HCl in methanol and reflux three hours. Evaporate in vacuum and recrystallize-petroleum ether (or dissolve residual oil in ether, wash with $NaHCO_3$ and dry, evaporate in vacuum) to get 4.5 g of the methyl ester (V) (can distill 80/0.1). Add 6.5 g (V) in 20 ml methanol to 3 g hydrazine hydrate in 20 ml methanol and reflux four hours. Evaporate in vacuum and dry in exsiccator over concentrated sulfuric acid for twelve hours to get 6 g 3-methoxy-isoxazole-5-acetohydrazide (VI) (recrystallize-ethyl acetate). Dissolve 5.13 g (VI) in 50 ml dry tetrahydrofuran and treat with 50 ml 1.75 N HCl in tetrahydrofuran. Cool to -40° and add over ten minutes with stirring 5 ml tertiary butyl nitrite in 20 ml tetrahydrofuran (temperature rises to about 10°). Evaporate in vacuum and dissolve

the yellow oil in 100 ml ethyl acetate. Wash with 50 ml NaCl containing 1% $NaHCO_3$ and dry, evaporate in vacuum to get the azide. Dissolve the azide in 50 ml toluene and heat at 100° until N_2 evolution stops (about thirty minutes). Add 10 ml ethanol and reflux two hours. Evaporate (room temperature/15) to get 4 g 5-(ethoxy-carbonylamino)-methyl-3-methoxy-isoxazole (VII) (can distill 129/0.2). Test for psychedelic activity. Dissolve 4 g (VII) and 2.5 g KOH in 12 ml ethanol and reflux eight hours. Dissolve in 20 ml water, acidify with dilute HCl and evaporate to dryness. Dissolve residue in hot ethanol and evaporate to get 3 g 5-aminomethyl-3-methoxy-isoxazole (VIII). Test for activity. 1 g (VIII) in 10 ml glacial acetic acid and 4.5 g HBr and reflux one hour. Evaporate in vacuum to get muscimole.

Method 2 JACS 62,1147(1940), TL 2077(1963), CA 65,2267 (1966)

Pass chlorine gas into an ice cold, well-stirred solution of 5 ml acetylketene in 30 ml CCl_4 until there is a 4.5 g increase in weight (solution is slightly yellow). Pour slowly into excess methanol or ethanol at 0° and distill at 118/17 to get 6 ml methyl (or ethyl)-4-Cl-acetoacetate (I). To 2.7 ml methanol saturated with dry HCl at 0°, add a mixture of 10 g (I), 20 g methyl orthoformate (trimethoxy-methane) and 13 g methanol and reflux four hours. Pour hot into 200 ml ice water and adjust pH to 8 with 30% NaOH. Extract four times with ether and evaporate and distill to get methyl (or ethyl)-4-Cl-3,3-dimethoxy-butyrate (II). Dissolve 40 g (II) in 20 ml methanol and add hydroxylamine.HCl in methanol. After ninety-six hours at room temperature (under N_2 if possible), evaporate in vacuum. Can purify the residue by dissolving in water and put on anionic column; wash column to neutrality and elute with 2N acetic acid; just before the acid elutes, the alkaline fraction giving a positive $FeCl_3$ test appears; evaporate in vacuum this fraction below 40° and dry at 40/0.5 for twelve hours. Dissolve 5 g product in 130 ml glacial acetic acid and saturate at room temperature, then at 0° with dry HCl. Let stand sixteen hours at room temperature and evaporate in vacuum at 40°. Dilute with water and evaporate three times. Extract with 2X130 ml hot ether and filter, evaporate in vacuum to get 3-Cl-methyl-5-OH-isoxazole (III) (recrystallize-acetone). Heat (III) six-teen hours at 90° in concentrated NH_4OH in autoclave and evaporate to get muscimole.

Method 3 GCI 91,61(1961), JCS 172(1968)

To 1 g 3-Cl-5-methyl-isoxazole in 14 ml 1.4 N NaOH add with

stirring 1.1 g $KMnO_4$ in 20 ml water. Filter, decolorize with $NaHSO_3$ and acidify with dilute sulfuric acid. Extract with ether and dry, evaporate in vacuum to get 0.8 g 3-Cl-isoxazole-5-COOH (I). To 2.5 g (I) in 7.5 ml water add 15 g KOH in 43 ml methanol and reflux four hours (under N_2 if possible). Cool, acidify with concentrated HCl and extract with ether five times. Dry and evaporate in vacuum to get 2 g oil which precipitates to give 3-methoxy-isoxazole-5-COOH (II). Dissolve 5.2 g (II) in 100 ml 3% HCl in methanol and reflux three hours. Evaporate in vacuum and recrystallize-petroleum ether (or dissolve residual oil in ether, wash with $NaHCO_3$ and dry, evaporate in vacuum) to get the methyl ester (III). Add with stirring 0.8 g (III) to 40 ml aqueous NH_3 (density about 0.88) and stir thirty minutes at room temperature. Filter, wash with cold water and dry to get 0.5 g 3-methoxy-isoxazole-5-carboxamide (IV). Dissolve 37.8 g $NaBH_4$ in 100 ml diglyme (dimethyl ester of diethylene glycol) and 23 ml BF_3 etherate in diglyme; add to 4.6 g (IV) in 100 ml tetrahydrofuran and reflux forty-eight hours. Add HCl, evaporate in vacuum and dissolve residue in water. Basify with 50% KOH and extract with ether. Dry, filter, evaporate in vacuum or treat with HCl to give (VIII) of method 1 which converts to muscimole as described.

Method 4 CA 65,2266(1966)

Dissolve 626 g 2-(2-nitrovinyl) furan in 3.13 L 48% HBr and 6.26 L glacial acetic acid and heat on steam bath nine hours. Evaporate in vacuum to 3 L; add 3 L water; boil; decolorize; cool and filter. Extract filtrate with 2L $CHCl_3$ and evaporate in vacuum the extract. Add residue to precipitate. Filter out to get 3-Br-isoxazole-5-proprionic acid (I) (recrystallize-benzene-cyclohexane). Dissolve 44 g (I) in 440 ml concentrated sulfuric acid and add 80 g CrO_3 in 80 ml water dropwise over three hours at 15-20°. Pour onto 800 g ice and extract the aqueous solution with 3X500 ml ether. Evaporate in vacuum to get 3-Br-isoxazole-5-COOH (II) (recrystallize-benzene-toluene). Dissolve 30.7 g (II) and 27 g KOH in 500 ml methanol and stir two hours at 140°. Cool, add 1.5 L water and extract with 3X1.5 L ether. Can decolorize aqueous solution by boiling briefly with carbon, then filtering and acidifying with concentrated HCl. Filter and recrystallize-benzene to get 3-methoxy-isoxazole-5-COOH, which is the analog of (IV) in method 1 and is identical to (II) in method 3 and can be converted to muscimole by either method.

Method 5 Rend. Ist. Lomb. 94A,737(1960)

This method gives a somewhat lower yield than method 1. Dissolve 14.1 g 1-nitro-3-butanone in 30 ml glacial acetic acid and heat to 35°; add slowly with stirring to a solution of 5.3 g bromine in 10 ml glacial acetic acid. Evaporate in vacuum, dissolve residue in ether and wash with water, $NaHCO_3$ and water. Dry and evaporate in vacuum the ether (can distill 84/2) to get 6 g 1-nitro-4-Br-3-butanone (I). Add 4.4 g (I) to 25 ml 48% HBr and reflux three hours. Add 50 ml water and steam distill. Neutralize the distillate with K carbonate and extract with ether. Dry and evaporate the extract (can distill 128/20) to get 5.6 g 2-Br-5-Br-methyl-isoxazole (II). To a warm solution of 5.2 g urotropine (hexamethylenetetramine) in 45 ml $CHCl_3$, add 8 g (II) in 10 ml $CHCl_3$ and let stand four hours at room temperature. Filter, wash with $CHCl_3$ and dry. Dissolve 2.3 g precipitate in 10 ml concentrated HCl and let stand two hours at room temperature. Add 30 ml water, basify with NaOH and extract with ether. Precipitate with dry HCl gas to get 3-Br-5-aminomethyl-isoxazole (III). Test for activity. Dissolve 8.8 g (III) and 5.6 g KOH in 60 ml methanol and reflux thirty hours. Dissolve in 100 ml water, acidify with dilute HCl; evaporate in vacuum and dissolve residue in hot methanol to get 3-methoxy-5-aminomethyl-isoxazole (IV). Test for activity. Convert (IV) to muscimole as described in method 1 or as follows: reflux in concentrated HCl four hours and evaporate in vacuum (recrystallize-methanol:tetrahydrofuran 1:1). Can add tetraethylamine to precipitate.

Method 6 (best yield) CPB 19,46(1971), JCS 121,1638(1922)

To prepare diethylacetone dicarboxylate (I) proceed as in method 3 for cocaine synthesis, substituting 720 ml ethanol for methanol. To 197 g (I), add rapidly with stirring and cooling 208 g PCl_5, keeping temperature below 50°. When HCl evolution stops, pour into water and add ice as necessary to cool. Extract the red oil with ether and dry, evaporate in vacuum. Boil residue 2½ hours with 20% HCl, evaporate the water and dissolve the residue in ether. Dry and evaporate in vacuum to get 100 g 3-Cl-glutaconate (II). 100 g (II), 300 g ethanol, 50 ml sulfuric acid and reflux while passing in ethanol vapor until 1.5 L collects. Add water, extract with ether, wash with aqueous Na carbonate and dry, evaporate in vacuum to get 113 g diethyl-3-Cl-glutaconate (III). Mix 28 g NaOH, 140 ml water, 10.4 g hydroxylamine.HCl, 280 ml ethanol and cool to -35° in acetone-dry ice bath. Stir and add 30.3 g (III) in 50 ml ethanol over two minutes; stir one hour (can let stand twelve hours). Neutralize with

60 ml concentrated HCl while cooling in ice bath. Evaporate in vacuum and then add 62 ml dry ethanol, 130 ml benzene and ½ml concentrated sulfuric acid to residue and reflux twenty-four hours to remove 80 ml of the azeotrope. Cool, pour into 60 ml ice water and separate the organic layer. Extract the aqueous layer with 30 ml benzene and add to organic layer. Wash organic layer with 2X15 ml $NaHCO_3$ (2%), 2X30 ml water and dry, evaporate in vacuum to get 14 g ethyl-3-OH-5-isoxazoleacetate (IV) (recrystallize-ether). Add 3.36 g (IV) portionwise to 1.35 g hydrazine hydrate which has been heated at 94° on water bath and heat 3 hours. Cool, filter and recrystallize-methanol to get 2.6 g of the hydrazide (V) (concentrate filtrate to get more). Dissolve 3.41 g (V) in 30 ml tetrahydrofuran and mix with 6.55 ml of a solution of dry HCl in tetrahydrofuran (9.94M). Cool to -50° in dry ice-acetone bath and add dropwise 2.81 g isoamyl nitrite in 10 ml tetrahydrofuran over five minutes. Remove cooling bath, let stand fifteen minutes and stir fifteen minutes and filter. Evaporate in vacuum the liquid, dissolve the residue in 80 ml ethyl acetate; wash with 2X20 ml 1:9 mixture of saturated aqueous $NaHCO_3$ and saturated aqueous NaCl and dry, evaporate in vacuum. Dissolve oily residue in 40 ml dry ethanol and reflux on oil bath forty-five minutes. Cool, evaporate in vacuum, filter and wash with benzene to get 1.2 g 3-OH-5-(carbethoxyamino) methyl-isoxazole (VI) (recrystallize-benzene). 3.83 g (VI) in 80 ml 20% $Ba(OH)_2$. Reflux fifteen hours and evaporate in vacuum (or cool and acidify with 10% sulfuric acid, filter, and evaporate in vacuum) to get muscimole (recrystallize-methanol).

Other References

The following papers describe the preparation of various muscimole analogs which may have activity:

CJC 48,3753(1970); TL 2101(1970); JOC 35,1806(1970); JMC 13,738(1970); BSC 2685(1970). For a simple two-step synthesis of 3-OH-5-methyl-isoxazole (which may substitute for (III) in method 1) see CA 74,76407(1971) (cf. CA 74,125521(1971)). The antibiotic Oxamycin (cycloserine) is often psychedelic (see Merck Index for synthesis).

LSD

Since Hofmann's first trip in 1943, great deal of interest has been generated in the occurrence and properties of various lysergic acid derivatives. Fungi of the genus *Claviceps,* which grow on rye wheat, rice and other grasses, were the first natural source of these alkaloids to be discovered. In recent years related compounds have been found in the genera *Penicillium* (the blue-green mold that also produces penicillin), *Aspergillus*, and *Rhizopus* (the black bread mold). These compounds are now produced commercially by culturing certain strains of *Claviceps* which produce as much as 4 g of ergotamine per Liter of culture medium. Growing pure cultures of fungi is not for amateurs, but those interested will find these references useful: JPS 58,143(1969); App. Microbiol. 18,464 (1969); HCA 47,1052(1964); Lloydia 32,327,401(1969); Can. J. Microbiol. 16,923(1970); CA 61,15314c-f, 67,84858e, 69, 36323w; Biotech. Bioeng. 13,331(1971); CA 76,57736(1972); U.S. Patent 3,483,086; Planta Med. 23,330(1973); J. Pharm. Educ. 36,598(1972); CA 78,41492(1973); French Patent 1,531, 205; German Patents 1,806,984 and 1,909,216; British Patent 1,158,380.

For a description of a wild American Claviceps species see Mycologia 66,978(1974).

The occurrence of hallucinogens in the seeds (and to a lesser degree in the leaves and stems) of various members of the family Convolvulaceae (morning glories, etc.) was known to the Aztecs. Seeds of the genera *Rivea, Impomoea,* and *Argyria* (Hawaiian baby woodrose) contain lysergic acid derivatives; the woodrose being champion with about one hundred times as much as the other genera (about 7 mg alkaloids/g seeds). In view of the low yield (maximum 10 mg alkaloids/100 g seeds) even the famed pearly gates variety of morning glory is not worthwhile extracting, and the trip is commonly a bummer, resembling that produced by scopolamine or ibogaline and unlike that of LSD. However, the lysergic acid amide, etc., can be extracted, hydrolyzed to lysergic acid (as described below for ergot alkaloid hydrolysis), and converted to LSD by any of the

methods described. For species variation of alkaloid content see Lloydia 29,35(1966). Crude ergot or woodrose seeds should yield ca. 1 g LSD/kg after conversion of the isolated alkaloids.

Alkaloid Extraction (short method)

Finely grind seeds (preferably woodrose) and add $NaHCO_3$. Extract with ethyl acetate by soaking about one day. Filter and extract the ethyl acetate with tartaric acid solution. Basify the extract with $NaHCO_3$ and extract it with ethyl acetate. Dry and evaporate in vacuum the ethyl acetate to get the alkaloids. Repeat this procedure on the seeds until no more residue is obtained.

Alternatively, add 100 ml petroleum ether to 100 g finely ground seeds and let soak about two days. Filter, discard petroleum ether and let seeds dry. Add 100 ml methanol to the seeds and let soak about two days. Filter, repeat extraction with another 100 ml methanol and evaporate in vacuum the combined methanol extracts. The residual yellow oil contains the alkaloids.

For chromatographic purification of ergot alkaloids from seed extracts see Phytochem. 11,1479(1972).

For ergot extraction and separation see also Fr. Patent 2,089,081 (11 Feb 1972) and CA 79,105,457(1973).

For a recent review of the ergot alkaloids see R. Manske (Ed.) The Alkaloids, vol. 15:1-40(1975).

Extraction of Lysergic Acid Amides from Woodrose Seeds or Powdered Ergot

Reduce the seed material to a fine powder in a blender, and spread it out to dry. Grind it again if it is not fine enough after the first time due to dampness.

Saturate the powdered seed material with lighter fluid, naphtha or ligroine. When completely saturated, it should have the consistency of soup.

Pour it in a chromatography column and let it sit overnight.

Remove the fatty oils from the material by dripping the lighter fluid or other solvent through the column slowly and keep testing the liquid that comes through for fats by evaporating a drop on clean glass until it leaves no greasy film. It will take several ounces of solvent for each ounce of seeds.

Mix 9 volumes of chloroform with 1 volume of concentrated ammonium hydroxide and shake it in a separatory funnel.

When it settles the chloroform layer will be on the bottom. Drain

off the chloroform layer. Discard the top layer.

Drip the chloroform wash through the column and save the extract. Test continuously by evaporating a drop on clean glass until it ceases to flouresce under a black light.

Evaporate the chloroform extracts and dissolve the residue in the minimum amount of a 3% tartaric acid solution. If all the residue doesn't dissolve, place it into suspension by shaking vigorously.

Transfer the solution to a separatory funnel and wash the other vessel with acid in order to get all the alkaloid out. Pour the washings in the funnel also.

Basify by adding sodium bicarbonate solution, and add an equal volume of chloroform.

Shake this thoroughly, let it settle, remove the bottom layer and set it aside.

Once again, add an equal portion of chloroform, shake, let it settle and remove the bottom layer.

Combine the chloroform extracts (bottom layers) and evaporate to get the amides.

The Culture and Extraction of Ergot Alkaloids

Make up a culture medium by combining the following ingredients in about 500 milliliters of distilled water in a 2 liter, small-neck flask:

Sucrose	100 grams
Chick pea meal	50 grams
Calcium nitrate	1 gram
Monopotassium phosphate	0.25 grams
Magnesium sulphate	0.25 grams
Potassium chloride	0.125 grams
Ferrous sulphate heptahydrate	8.34 milligrams
Zinc sulphate heptahydrate	3.44 milligrams

Add water to make up one liter, adjust to pH 4 with ammonia solution and citric acid. Sterilize by autoclaving.

Inoculate the sterilized medium with *Claviceps purpurea* under sterile conditions, stopper with sterilized cotton and incubate for two weeks periodically testing and maintaining pH 4. After two weeks a surface culture will be seen on the medium. Large-scale production of the fungus can now begin.

Obtain several ordinary 1 gallon jugs. Place a two-hole stopper in the necks of the jugs. Fit a short (6 inch) glass tube in one hole,

leaving 2 inches above the stopper. Fit a short rubber tube to this. Fill a small (500 milliliter) Erlenmeyer flask with a dilute solution of sodium hypochlorite, and extend a glass tube from the rubber tube so the end is immersed in the hypochlorite. Fit a long, glass tube in the other stopper hole. It must reach near the bottom of the jug and have about two inches showing above the stopper. Attach a rubber tube to the glass tube as short or as long as desired, and fit a short glass tube to the end of the rubber tube. Fill a large, glass tube (1 inch x 6 inches) with sterile cotton and fit 1-hole stoppers in the ends. Fit the small, glass tube in end of the rubber tube into 1 stopper of the large tube. Fit another small glass tube in the other stopper. A rubber tube is connected to this and attached to a small air pump obtained from a tropical fish supply store. You now have a set-up for pumping air from the pump, through the cotton filter, down the long glass tube in the jug, through the solution to the air space in the top of the jug, through the short glass tube, down to the bottom of the Erlenmeyer flask and up through the sodium hypochlorite solution into the atmosphere. With this aeration equipment you can assure a supply of clean air to the *Claviceps purpurea* fungus while maintaining a sterile atmosphere inside the solution.

Dismantle the aerators. Place all the glass tubes, rubber tubes, stoppers and cotton in a paper bag, seal tight with wire staples and sterilize in an autoclave.

Fill the 1-gallon jugs 2/3 to 3/4 full with the culture medium and autoclave.

While these things are being sterilized, homogenize in a blender the culture already obtained and use it to inoculate the media in the gallon jugs. The blender must be sterile. Everything must be sterile.

Assemble the aerators. Start the pumps. A slow bubbling in each jug will provide enough oxygen to the cultures. A single pump can, of course, be connected to several filters.

Let everything sit at room temperature (25° C.) in a fairly dark place (never expose ergot alkaloids to bright light -- they decompose) for a period of ten days.

After ten days adjust the cultures to 1% ethanol using 95% ethanol under sterile conditions. Maintain growth for another two weeks.

After a total of 24 days growth period the culture should be considered mature. Make the culture acidic with tartaric acid and homogenize in a blender for one hour.

Adjust to pH 9 with ammonium hydroxide and extract with benzene or chloroform/iso-butanol mixture.

Extract again with alcoholic tartaric acid and evaporate in a vacuum to dryness. The dry material is the salt (i.e., the tartaric acid salt, the tartrate) of the ergot alkaloids, and is stored in this form because the free basic material is too unstable and decomposes readily in the presence of light, heat, moisture and air.

To recover the free base for extraction of the amide or synthesis to LSD, make the tartrate basic with ammonia to pH 9, extract with chloroform and evaporate in vacuo.

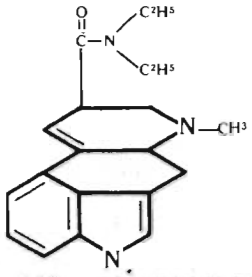
If no source of pure *Claviceps purpurea* fungus can be found, it may be necessary to make a field trip to obtain the ergot growths from rye or other cereal grasses. Rye grass is by far the best choice. The ergot will appear as a blackish growth on the tops of the rye where the seeds are. They are approximately the same shape as the seeds and are referred to as "heads of ergot." From these heads of ergot sprout the *Claviceps purpurea* fungi. They have long stems with bulbous heads when seen under a strong glass or microscope. It is these that must be removed from the ergot, free from contamination, and used to inoculate the culture media. The need for absolute sterility cannot be overstressed. Consult any elementary text on bacteriology for the correct equipment and procedures. Avoid prolonged contact with ergot compounds, as they are poisonous and can be fatal.

LSD Identification

Since LSD is an indole derivative, it gives a positive reaction (violet color) to the tests given in the indole section. LSD also fluoresces under an ultraviolet light (black light), but so do many other compounds. For infrared spectra of LSD and related compounds, see JACS 78,3087(1956) and J. Forensic Sci. 12,538 (1967). For other information on identification see JPS 56,1526 (1967) and JAOAC 50,1362(1967), 51,1318(1968). For a microcrystalloscopic test see J. Pharm. Pharmacol. 22,839(1970).

In order to make LSD, lysergic acid is needed. This can sometimes be obtained, but generally one of the lysergic acid containing ergot alkaloids such as ergotamine is more readily available. Ergot is the dried sclerotium of various species of fungi which infect rye (and other grasses), leading to the formation of large purple growths in place of the rye grains. These growths are collected, dried, powdered and the alkaloids extracted. For the

LSD



extraction procedure see HCA 28,1283(1945), J. Pharm. Pharmacol. 7,1(1955), JPS 50,201(1961), CA 75,137422(1971). Proc. Indian Acad. Sci. 71B,28,33(1970) gives production from artificially infected rye. Ergot is produced mainly in Europe (especially Switzerland) but some has been grown in the USA (e.g., in Minnesota). This production occurs primarily because of the use of ergotamine and related compounds in medicine (contracting the post-partum uterus, terminating migraine headaches, etc.). Many of the ergot alkaloids are derivatives (amides) of lysergic acid. Unfortunately, these compounds have little hallucinogenic activity and it is necessary to hydrolyze (split with water) off the amide, producing lysergic acid, and to synthesize a different amide with greater psychedelic activity. This hydrolysis can be done with any of the following compounds or a mixture of them: ergometrine, ergine, ergotamine, ergosine, ergocristine, ergokryptine, ergonovine (ergometrine) and methysergide (Sansert). When -ine is added to the name (e.g., ergotaminine) this indicates the isomers which will lead to the production of the inactive iso-LSD. The papers cited here give simple techniques for converting these to the active forms (or see the technique for converting iso-LSD to LSD in method 1 following): HCA 37,820,2039(1954); CA 69,36322(1968); CCCC 34,694 (1969). For a review of the ergot alkaloids see THE ALKALOIDS, Manske and Holmes (Eds.), 8,725(1965), and F. Bove, THE STORY OF ERGOT (1970).

Ergot Alkaloid Hydrolysis

JBC 104,549(1934); HCA 47,1929(1964). Perhaps the best method is Hofmann's modern hydrazine hydrolysis given later, since this disposes of the necessity for isolating the lysergic acid (I); otherwise the following alkaline hydrolysis can be used:

Dissolve 20 g of the alkaloid (e.g., ergotamine) in 200 ml 1M KOH in methanol (i.e., dissolve 56 g KOH pellets in 1L 100% methanol) in a 1 L heavy walled vacuum flask and evaporate in vacuum the methanol at room temperature. To prevent the solution

from cooling, and thus greatly prolonging the evaporation time, put the flask in a pan of water kept at room temperature by gentle heating or by running warm water through it. Add 400 ml 8% KOH in water to the residue and boil for one hour (under N_2 if possible -- this can be done by filling the flask with a N_2 stream and loosely stoppering or by allowing a gentle stream of N_2 to flow through during heating). Cool, acidify with dilute sulfuric acid and shake in separatory funnel with 1 L ether. Discard the upper ether layer and filter with vacuum the aqueous suspension of lysergic acid (I). Wash precipitate with 20 ml dilute sulfuric acid. To recover the small amount of (I) remaining in solution, basify with Na carbonate and bubble CO_2 through it. Filter and add precipitate to first batch. Some isolysergic acid will remain in solution and can be precipitated by adding 10% HNO_3. It can be converted to (I) by adding 3 ml 10% KOH for each 0.1 g acid, boiling on steam bath for one hour under N_2 (if possible) and precipitating by acidifying with glacial acetic acid. Maximum yield is about 9 g (I) for 20 g ergotamine.

A shorter method of hydrolysis which may work as well follows: dissolve 20 g alkaloid in 300 ml methanol and 300 ml 40% KOH and reflux two hours under N_2 (if possible). Cool, saturate with CO_2 and evaporate in vacuum. Extract the residue with hot ethanol three times and dry, evaporate in vacuum the combined ethanol extracts to get (I).

Under ordinary conditions, about 20% of (I) will be converted by the action of hot water, etc., to the inactive isolysergic acid. Most of this remains in solution and can be isomerized to (I) as described above, or it can be converted to iso-LSD by any of the methods described later and isomerized to LSD (see method 1).

It is unnecessary to purify (I), but this can be done as follows: dissolve 9 g (I) in 20 ml NH_4OH, filter and concentrate in vacuum at room temperature to precipitate (I). After filtering, the grey crystals can be further purified by dissolving in boiling water and cooling in ice bath to precipitate (I). Melting point should be about 240° (decomposes). Alternatively, the dark-colored (I) resulting from hydrolysis can be shaken with 2X400 ml 2 M NH_4OH in ethanol, and the combined extracts evaporated in vacuum to give (I). Dissolve the remaining residue in 500 ml hot methanol, cool to 0° and filter out the (I) (recrystallize-water). Can remove colored impurities by shaking solution with decolorizing carbon and filtering.

Recently a method for increasing the yield of (I) about 10% using 2.5% hydrazine hydrate was described (CA 69,36323w(1968)).

Dissolve 7 g alkaloid in 200 ml 6 N KOH in methanol and 200 ml ethanol, add 10 ml hydrazine hydrate and boil four hours under N_2 (if possible) and proceed as above.

Finally, the (I) must be thoroughly dried by heating at about 110°/1 mm for two hours or 150° if ordinary lab vacuum of 15 mm is used. A forced water vacuum (about 25 mm) can be used here as elsewhere. An oil bath (e.g., mineral oil) will allow temperature regulation.

LSD Synthesis

Dangers

There are certain aspects of LSD production which are common to all synthetic methods. The first is a certain degree of danger; each uses dangerous reagents and solvents.

Hydrazine and hydrazine hydrate are both violent poisons, and each can cause severe skin burns and eye damage. The vapor of each is irritating, and can cause severe eye irritation as well as liver and blood damage, but the symptoms don't always manifest right away, sometimes appearing three or four days after exposure, so it is easy for exposure to be much more dangerous than is immediately realized. In addition, anhydrous hydrazine is a sensitive and violent explosive, the explosion of which can be set off by certain types of stainless steel and such common things as wood and rust.

Both triflouroacetic acid and sulfur trioxide will cause very severe skin burns, and their vapors are extremely irritating. Sulfur trioxide is such a strong dehydrating agent that it chars organic material, and its heat of dehydration is so high that it will start a fire if spilled on wood, which could prove fatal were flammable solvents in use at the time or stored nearby.

Phosgene is very poisonous; so insidious that it was used as a war gas in World War I. One deep breath can cause immediate collapse and death, and as it is not irritating there is no gag reflex to prevent one from taking that deep breath. Doses which are not high enough to be immediately lethal may not be noticed at all at the time of exposure, yet lead to death within 24 hours. Sub-lethal doses cause pulmonary edema and serious respiratory disability; again, the symptoms can appear well after an exposure which was hardly noticed.

Diethylamine, used in every LSD synthesis, has a very low flash point, and its vapor is irritating. The vapor of DMF is also irritating,

and prolonged exposure can cause liver damage. In fact, most of the solvents used in LSD production are either flammable or toxic or both.

In addition to all the above, the starting material, the ergot alkaloids, is as a class quite toxic, and clean working conditions are necessary when working with it. Ergot alkaloid poisoning, known in the Middle Ages as Saint Antony's fire, can actually cause one's limbs to blacken, shrivel, and fall off! Any woman working with these compounds should also be aware that many of them are oxytoxics, that is, they cause uterine contractions, and are so used to induce labor, etc.

Working Conditions

There are certain procedures common to all syntheses of LSD which are based upon the sensitive nature of ergot compounds in general. Natural ergot alkaloids, lysergic acid, LSD, and the intermediate products associated with the various syntheses are all to a varying degree unstable. Even the most stable of these compounds will readily decompose under any but moderate conditions. Thus precautions must be taken against light, moisture, oxygen, and heat.

Light of the ultraviolet region promotes addition of water at the A9-10 double bond to form the lumi-compounds. Thus reactions are best carried out in the light of red or yellow photographic darkroom bulbs, and storage should be in opaque or amber bottles.

Most of the reactions involved in LSD synthesis require anhydrous conditions for good yield, and so protection must be made against moisture during the actual production. Furthermore, the final product must be thoroughly dried to prevent possible formation during storage of the lumi-compounds as mentioned above.

Oxidizing agents, including atmospheric oxygen, will decompose ergot compounds. For this reason, all reactions are carried out in an atmosphere of an inert gas such as nitrogen. The danger of oxidation increases with temperature, so this precaution is of course most important with those reactions proceeding at elevated temperature.

Various methods have been devised to prevent oxidation during storage. The most obvious is to store the LSD in nitrogen filled containers, but the excellent protection thus afforded is of course lost when the bottle or ampule is opened. Another method is to use an antioxidant; Brown and Smith recommend ascorbic acid. A more sophisticated method, recommended on the highest authority, is to

make LSD maleate rather than the tartrate. Both maleic and tartaric acids are dicarboxylic, but the pK^2 of maleic acid is too low to form a salt with LSD. Thus there is a free carboxyl group in LSD maleate, which group will serve to prevent oxidative decomposition.

Excessive heat will cause decomposition of LSD and its precursors, and will also increase the possibility of racemization. Thus reactions at elevated temperature are not unnecessarily prolonged, nor are temperatures unnecessarily raised. All drying is done in vacuo in an inert atmosphere, and long term storage should be under refrigeration.

Legal Acid

I want to emphasize that "legal acid" can be obtained if other amines are substituted for diethylamine in LSD synthesis. These other lysergamides should give identical trips, but most of them are less potent than LSD. Precise potency data do not exist, so it remains for an enterprising chemist to gain immortality by adding each of the following amines (and any others that come to mind) to separate aliquots of the final step of LSD synthesis (they could easily be done simultaneously), isolating the tartrates and assaying them for potency: piperidine, diisopropylamine, ethylisopropylamine, ethylpropylamine, methylethylamine, methylisopropylamine, tetrahydrooxythiazine, tetrahydroisoxazine, dioxazole, 2-methylmorpholine, 2,5-dimethyl (or dimethoxy) pyrrolidine, cyclo-butyl-amine, cyclopentylamine, etc. Published potency data expressed as a fraction of LSD activity follow: pyrrolidide (1/20), dimethylamide (1/20), morpholide (1/10 or 1/3), ethylpropyl (1/3), dipropyl (1/10), methylethyl (less than 1/10), methylpropyl (less than 1/10).

Methods

LSD via the Hydrazide HCA 38,429(1955), HCA 26,953(1943) CA 57,12568(1962), U.S. Patent 3,239,530(1966).

Perhaps the simplest method is the following devised by Hofmann, which proceeds directly from the ergot alkaloid via hydrazine, and is not to be confused with his earlier use of hydrazine under more violent conditions which led to a racemized product and reduction of the yield by one-half.

Add 1.16 g ergotamine.HCl to 4 ml anhydrous hydrazine and heat one hour at 90°. Add 20 ml water and evaporate in vacuum. Can proceed to the next step or can purify by adding ether and aqueous tartaric acid, basify the aqueous phase and extract aqueous phase with $CHCl_3$ to get mainly d-iso-lysergic hydrazide (I). Can

chromatograph on alumina and elute with 0.5% ethanol in $CHCl_3$ to purify. To 1 g (I), finely ground, in 40 ml 0.1 N ice cold HCl, add with good stirring at 0° 4 ml 1N Na nitrite. Quickly over two-three minutes, add 40 ml 0.1 N HCl so pH is about 5. Let stand five minutes, basify with 1N $NaHCO_3$ and extract with 100 ml ether, then 50 ml ether. Wash ether with water and dry and evaporate in vacuum at 10°. Dissolve the resulting yellow azide in about 5 ml diethylamine (DEA) at 0° and heat one hour at 60° in a bomb (sealed metal pipe), or heat 3 to 4 hours at 45° C in a vented flask. Let stand several hours and evaporate in vacuum to get about 0.7 g d-LSD and 0.15 g d-isoLSD (which can be converted to d-LSD as described in method 1 following). Alternatively, the DEA can be added to the cooled ether solution of the azide and let stand several hours or overnight at room temperature in the dark in a vented flask.

An alternate method of proceeding from the hydrazide follows (U.S. Patent 3,085,092). To a solution of 1.4 g (I) in 5.5 ml 1 N HCl, 5 ml water, 5 ml EtOH, add 1 g acetylacetone (2,4 pentanedione), let stand 1 hour at room temperature and neutralize with 5.5 ml 1 N NaOH. Filter off the lysergyl pyrazole (II) and wash with water. Can purify by drying in vacuum at 60° C and recrystallizing from chloroform by the addition of ether. Heat 0.4 g (II) and 2.5 ml DEA at 100° C for 2 hours (or let stand 15 hours at room temperature, evaporate to dryness and heat a few minutes at 100° C in vacuum). Can recrystallize from $CHCl_3$, petroleum ether or as described elsewhere here.

Technical Scale Details For This Method

Hydrazide Production

In dim yellow light, (preferably) three tared and fully dried 250 ml round-bottom flasks containing stirring bars are each charged with 30 g dry ergotamine tartrate and 120 ml anhydrous hydrazine. The flasks are fitted with gas inlet tubes adjusted to just above the liquid level and streams of nitrogen passed through, the exhaust gas being led through wash bottles equipped with traps and containing dilute acid to remove hydrazine vapors. The flasks are lowered into oil baths preheated to 90°, and heated with slow stirring for one hour. The contents of the three reaction flasks are then emptied into a 2000 ml beaker containing 900 ml distilled water, and this solution transferred to a 3000 ml two-neck round bottom flask. An additional 900 ml water is used to rinse the residue in the flasks, beaker, etc. into the 3000 ml flask. This large flask is fitted with siphon tube, gas inlet tube, and gas outlet connected to wash bottle and trap.

The aqueous hydrazide solution is evaporated from a tared 2000 ml flask on an efficient rotary evaporator, using a bath temperature of 40° and an ice-cooled condenser; the 3000 ml siphon flask assembly is used as storage for the vacuum feed. The weight of the crude hydrazide so obtained is determined, it is dissolved in about 170 ml 1 N tartaric acid, the aqueous solution washed with three 30 ml portions ether, made alkaline with 190 ml 1 N ammonium hydroxide, and exhaustively extracted with successive portions of chloroform, the first two portions being 100 ml each, the following 50 ml.

Completeness is ensured by testing with UV light, extraction ceasing only when the chloroform extract exhibits no blue fluorescence. The chloroform solution is washed with three 30 ml portions distilled water, dried over chloroform moistened magnesium sulfate, and the hydrazide recovered by vacuum evaporation in tared 500 ml flasks, one such flask being used for each two 90 g batches. These flasks are flushed with nitrogen, stoppered, and stored in a dark and dry refrigerator. As the hydrazide is stable, all the ergotamine tartrate will be converted to it prior to the next step. Theoretical yield from 1000 g ergotamine tartrate is 429.65 g; 80% yield is 343 g.

Pyrazole Production

In dim red light, the weighed hydrazide contained in one of the 500 ml flasks (ca. 67 g; 95% of theory) is washed into a 1000 ml beaker with 263 ml 1N hydrochloric acid. 239 ml distilled water, 239 ml ethanol (95%), and 37 ml 2,4-pentanedione are added, and the well-mixed solution left to stand in the dark at room temperature until the reaction is complete, i.e., about 30 minutes. The reaction mixture is neutralized with the addition of 263 ml 1 N sodium hydroxide, and the beaker covered with parafilm and refrigerated to ensure complete precipitation. The pyrazole is filtered at the pump, the mother liquor being returned to the beaker and used to wash out the last few crystals, washed with cold water, and sucked dry under a stream of dry nitrogen. The product is dried in vacuo over barium oxide or phosphorus pentoxide for at least twelve hours before proceeding to the next step, wherein anhydrous conditions will increase yield. Hofmann calls for drying the pyrazole in vacuo at 60°, which indicated the product to be fairly stable. So all the hydrazide is converted prior to aminization.

Amide Production

In dim red light, 50 g of the well-dried pyrazole and 700 ml freshly

dried diethylamine are placed in a tared and well-dried 1500 ml flask equipped with gas inlet tube and stirring bar. The flask is lowered into a bath preheated to 45°, and the contents stirred under a stream of nitrogen for four hours. On a rotary evaporator, using a bath temperature of 40° and an ice-cooled condenser, the diethylamine is removed in vacuo and set aside for purification and re-use. Briefly and in high vacuum the flask is heated to 100°, the split-off pyrazole being thereby driven off.

The residue so obtained is immediately placed in solution with methanolic potassium hydroxide to effect interconversion of the stereoisomers. Amination and Transposition will proceed simultaneously, the first batch being transposed while the second is aminated.

Production Scale Isomerization of iso-LSD to LSD

In dim red light, the amide residue from the last step is dissolved in the least possible amount of dry methanol and washed into a 1500 ml round-bottom flask. A two-fold volume of 4 N methanolic potassium hydroxide is added, and the well-mixed solution left to stand at room temperature, in the dark and under a slow stream of nitrogen, for four hours. At the end of this period, the solution is neutralized with methanolic hydrogen chloride (ca. 5 N), washed into a 4000 ml Erlenmeyer flask, and dried over methanol-moistened anhydrous magnesium sulfate (0.10 g $MgSO_4$ per ml KOH solution). The methanolic acid should be added slowly and with good stirring to prevent possible hydration of the 9-10 double bond to give lumi-LSD. Together with 100 ml dry isopropanol (to remove the last trace of water azeotropicly) the dried solution is transfered to a 3000 ml siphon flask assembly, and the solvent removed in vacuo in a tared 500 ml two-part freeze-dry flask. The weighed gummy residue is scraped into the thimble of a Soxhlet extractor, the adhering residue being washed into the thimble with portions of warm chloroform, the total volume of which is 12.5 ml per gram amide (total weight minus weight KCl). A 3000 ml flask is used with the extracter, and it is previously charged with 37.5 ml dry benzene per gram amide. Under a stream of dry nitrogen, the solvent is in vacuo at 40° refluxed through the thimble, thus extracting the amide from the inorganic salt and at the same time preparing the solution for use in the chromatographic separation of the stereoisomers. The above solution is stored over a small amount of benzene-moistened calcium sulfate in a nitrogen flushed flask which is placed in a dark refrigerator. All the pyrazole is converted to

this benzene-chloroform solution prior to separation of the isomers.

The following methods all proceed from lysergic acid (I). Methods 1, 2, 4, and 6 give less than 20% iso-LSD in the product but methods 2, 5, and 9 seem to have the highest total yield (about 80%) of LSD plus iso-LSD. Since unreacted lysergic acid can be recovered and run through the synthesis again, and iso-LSD isomerized to LSD as described here, it is probably best to use the simplest methods. These comparative yields come mostly from the reference to method 9.

From Lysergic Acid — Method 1 CA 50,10803d(1956) (Pioch)

Dissolve 5.3 g dry (I) in 125 ml acetonitrile (or dimethylformamide or proprionitrile) and cool to -20° (freezer or dry ice-acetone or ethanol mixture). Add 8.82 g trifluoroacetic anhydride in 75 ml acetonitrile cooled to -20° carefully. Let stand at -20° 1½ hours or until all the (I) dissolves. Then add 7.6 g DEA in 150 ml aceatonitrile and let stand at room temperature in dark two hours. Evaporate in vacuum to get LSD. If purification is desired, dissolve the residue in 150 ml $CHCl_3$ and add 20 ml ice water. Pour into ½ L separatory funnel and drain out the lower $CHCl_3$ layer into a beaker (after shaking). Add 50 ml $CHCl_3$ to funnel, shake and drain bottom layer into same beaker. Repeat with 3X50 ml $CHCl_3$ and discard the water. Extract the combined $CHCl_3$ extracts with 4X50 ml ice cold water and dry, evaporate in vacuum the $CHCl_3$ to get 3.5 g d-LSD. This is composed partly of the inactive d-iso-LSD, which, while it will not effect the trip, can be recovered and converted to d-LSD as follows: dissolve the residue in 120 ml benzene and 40 ml $CHCl_3$ (or 200 ml methanol), add tartaric or maleic acid and shake to precipitate mainly d-LSD (add a little ether and cool in refrigerator several days if necessary to ensure complete precipitation; evaporate in vacuum the solvent to get d-iso-LSD. Add 50 ml ethanol and 5 ml 4N KOH per g iso-LSD and let stand at room temperature two hours; evaporate in vacuum (or extract with $CHCl_3$ as above) to get LSD. 4 hours in 2.66 N methanolic KOH is said to be optimal for isomerization.

From Lysergic Acid — Method 2 JOC 24,368(1959) (Galbrecht)

This method is supposed to give little iso-LSD but it gives some of the monomethylamide.

Add 1 L dimethylformamide (freshly distilled, if possible) to dry flask fitted with stirrer, ice bath, dropping funnel and condenser, both protected from water by Ca chloride drying tubes. Add dropwise

with stirring over four-five hours at 0° 0.21 lbs (90.7 g) SO_3 (sulfuric anhydride, available as Sulfan from Allied Chem. Co.). If precipitate forms, stir until it dissolves. Sulfan may be made in larger amounts and is good for several months if kept dry and cool. Molarity of fresh SO_3-DMF reagent should be about 1M, but for precise determination, add a little water to an aliquot and titrate with standard NaOH to phenolphthalein end point. Add 6.45 g dry (I) (or 7.15 g (I) monohydrate) and 1.06 g LiOH hydrate (or NaOH or KOH but these absorb water so they must be dissolved in absolute methanol, titrated and added in equimolar amounts) to 200 ml methanol in a 1 L vacuum flask and evaporate in vacuum. Dissolve residue in 400 ml anhydrous dimethylformamide and distill off 200 ml DMF at about 15 mm Hg through a twelve inch column packed with glass helices or other material. Cool to 0° and rapidly add 50 ml SO_3-DMF solution (1 M). Stir at 0° for ten minutes and add 91.5 g (12.9 ml) DEA and stir ten minutes. Add 400 ml of water, stir and add 200 ml saturated NaCl. Extract the LSD by shaking with several 500 ml portions ethylene dichloride (can use indole test given in indole section to show completeness of extraction). Combine extracts (lower layer in separatory funnel) and dry, evaporate in vacuum to get LSD (can purify as above).

From Lysergic Acid — Method 3 JOC 24,368(1959) (Garbrecht)

This route is said to give a lower yield than method 2. Dissolve 13.4 g dry (I) in 250 ml dry dimethylformamide and cool to 0°. Add cooled solution of 3.4 ml 0.35 M methane-sulfonic acid anhydride in dry dimethylformamide. After thirty minutes at 0° add 14.6 g (20.4 ml) DEA and keep at 0° one hour. Evaporate in vacuum to get LSD and proceed as above.

From Lysergic Acid — Method 4 CA 57,5979(1962) (Hofmann)

Dissolve 0.536 g (I) in 10 ml freshly distilled $POCl_3$; stir and add 416 mg powdered, freshly sublimed PCl_5. Hold two minutes at room temperature, two minutes at 90°, and evaporate in vacuum. Extract the residue with hexane to give the lysergic acid chloride-HCl (can also extract the reaction mixture with hexane instead of evaporating in vacuum). Alternatively, use 6 ml $POCl_3$ and 240 mg $SOCl_2$ and heat three minutes at 90° to get the acid chloride. To 5 g of the acid chloride add 1.4 ml DEA in 50 ml methylene chloride and cool to 0°. Stir and add 27.5 ml pyridine and stir one-half hour at 0°. Warm to room temperature and stir 1½ hours; evaporate in vacuum to get LSD.

From Lysergic Acid — Method 5 CCCC 27,1590(1962) (Cerny

and Semonsky) cf. CA 75,77110(1971)

To a suspension of 13.4 g dry (I) in 800 ml dry dimethylformamide (DMF) in a 2 L vacuum flask at 20°, add a solution of 8.9 g N,N'-carbonyldiimidazole in 250 ml DMF and stir at 20° in dark for one-half hour. Add a solution of 4 g DEA in 50 ml DMF and let stand two hours at 20°; then twenty hours at 5°. Evaporate in vacuum to get LSD. Can purify as above or dissolve residue in 2½ L 2% tartaric acid; extract with ether and discard ether. Filter, basify with NH_4OH and extract with a 9:1 solution of ether:ethanol. Dry and evaporate in vacuum to get LSD in 81% yield.

From Lysergic Acid — Method 6 JMC 16,532(1973) (Johnson et al.)

This method gives very little iso-LSD.

To a refluxing slurry of 3.15 g dry (I) or monohydrate) in 150 ml $CHCl_3$ add 0.1 mole of the amine in 25 ml $CHCl_3$ and 2 ml $POCl_3$ simultaneously from separate dropping funnels over 2 to 3 minutes. Reflux 3 to 5 minutes more til a clear amber solution results. Cool to room temperature and wash with 200 ml 1M NH_4OH. Dry and evaporate in vacuum (below 40°). Can dissolve in the minimum amount of methanol and acidify with a fresh solution of 20% maleic acid in methanol. Filter and wash crystals with cold methanol to get the LSD or other amide. This method works with a wide variety of amines. For LSD itself, the $POCl_3$ can be added first. The yield is about 50%.

From Lysergic Acid — Method 7 German Patent 1.965,896 (1970) (Julia et al.)

See end of total synthesis of LSD given below.

From Lysergic Acid — Method 8 U.S. Patent 3,141,887 (Patelli and Bernardi)

Note: Phosgene is *very hazardous* and only professional chemists working with a fume hood should even think about using this method. It can be dissolved in a weighed container of DMF (dimethylformamide) and a second weighing will give the phosgene concentration.

0.5 g anhydrous lysergic acid suspended in 10 ml DMF or acetonitrile at -10° C are reacted with 2 ml of DMF containing 0.34 g of the phosgene-DMF complex for 20 minutes. Add 0.7 g diethylamine in 10 ml DMF (or acetonitrile), keep at -10° C for ten minutes and then at room temperature for 10 minutes. Dilute with

chloroform, wash with NaOH (1 normal), then water and distill off the solvent in a vacuum. Dissolve the oily residue in methanol, acidify with tartaric or maleic acid; add ether to start crystallization. Keep overnight at 0° C, filter and wash with ether. Dissolve the product in methanol, decolorize with charcoal and precipitate with ether to obtain the tartrate or maleate (tartrate melts 192-198° C). D^{20} = + 25° (C = 1 in water).

From Lysergic Acid — Method 9 CT 13,373(1978) (Losse and Mahlberg)

This method gives about 2/3 iso-LSD, and about 80% total yield.

Add 134 mg (0.5 mM) dry (I), 103 mg (0.5mM) N,N-dicyclohexylcarbodimide, 90 mg (0.67mM) 1-hydroxybenzotriazol (N-hydroxybenzotriazol) and 0.5mM diethylamine to 2.5 ml CH_2Cl_2 and 2.5 ml tetrahydrofuran and stir in the dark at 20° C for 24 hours. filter, wash precipitate with CH_2Cl_2 and evaporate the filtrate at 15 mm Hg, 30° C to get LSD.

LSD Via SO_3 METHOD 1

This and the following method are expanded versions of Garbrecht's method. My own prejudice is that it makes much more sense to use one of the other, simpler methods since the unreacted lysergic acid can be recycled, and the initial yield is consequently of little import. However, the details as presented here derive from the practical experience of underground chemists and contain many points of interest for any technique.

Notes on Processes

1. Chemicals to process one kilogram of ergotamine tartrate:

Alumina, Activity II, 100-200 mesh	8 Lbs.
Benzene, Reagent	20 Liters
Charcoal, activated powder, Norit A	100 Grams
Congo red papers	1 Vial
Dichloromethane (methylene chloride), Purified	60 Liters
Diethylamine, Reagent	500 Grams or 725 ml.
Dimethylformamide, Reagent	12 Liters
Ergotamine tartrate	1 Kilogram
Ether, Absolute	5 Lbs.
Ethyl alcohol, Anhydrous, Denatured	10Liters
Lithium hydroxide hydrate, Reagent	200 Grams
Methanol, Reagent	24 Pints
Molecular sieve, Linde 4 A	1 Lb.
Petroleum ether, B.P. 40°-70° C	2.5 Liters

Phenolpthalein, White ..... 1 Gram
Phosphorus pentoxide, Reagent ..... 100 Grams
Potassium hydroxide, Reagent ..... 2 Lbs.
Sodium Chloride, Reagent ..... 5 Lbs.
Sulfuric acid, Fuming 33% ..... 3 Lbs.
Sulfuric acid, Reagent ..... 4 Lbs.
Tartaric acid, natural, powder, Reagent ..... 200 Grams

2. Cylinder gasses:

Ammonia, anhydrous ..... 1 Lb.
Nitrogen, Dry .....1 small welding cylinder

3. Notes on preparing reagents:

Ammoniacal ethanol is prepared by chilling ten liters of anhydrous denatured ethyl alcohol as commercially purchased in a freezer to well below 0° C. Next, 600 to 750 ml of liquid ammonia is drawn from a pressure cylinder into a 1000 ml graduate in a well ventilated area. The contents of the graduate are carefully poured into the chilled alcohol. The solution is then stirred to mix and warmed to room temperature. The solution should be at least two molar as determined by titration against standard acid solution to a methyl red endpoint. If titration is to be attempted, a little methyl red should be added to the chemical list.

Dilute sulfuric acid is prepared by pouring 750 ml of sulfuric acid into about 11.25 liters of ice cold water in a large acid resistant container such as a polyethylene jug or 5 gallon gasoline container, etc. Anhydrous dimethylformamide for making up sulfur trioxide-dimethylformamide reagent is prepared by shaking three liters of reagent dimethylformamide with 100 to 200 grams of Linde molecular sieve, and allowing the mixture to stand overnight with occasional shaking. Next, the dimethylformamide is decanted off and poured into a five liter boiling flask. The flask is fitted with a helices packed fractionating column and distilled at 25 millimeters pressure. 800 ml is distilled off as a forerun and discarded or re-dried over molecular sieve. The next fraction of about two liters is collected and kept so as to protect from atmospheric moisture (drying tube, etc.). A little dimethylformamide is left in the boiling flask. Dimethylformamide when prepared in this manner is excellent for preparing the sulfur trioxide reagent. Commercially available spectro-quality or pesticide quality dimethylformamide may also be used if the water content is specified to be less than .05%, but the reagent obtained from these products has always appeared darker in

color than that made by the above method. Commercial reagent quality dimethylformamide is suitable for the main reaction.

4. Preparation of the sulfur trioxide-dimethylformamide reagent (SO_3-DMF).

Sulfur trioxide is distilled from fuming sulfuric acid. About 200 grams are necessary and can be obtained from varying amounts of fuming sulfuric acid depending upon the concentration of sulfur trioxide in the commercially available product. Occasionally it is possible to purchase fuming sulfuric acid which contains as much as 70% sulfur trioxide (SO_3). Fuming sulfuric acid containing 30-33% is usually easily available and 200 grams of SO_3 can be obtained by distilling about one kilogram of it. The distillation is done at atmospheric pressure in a simple distillation apparatus which utilizes a large bore condenser of the West or similar type. The receiving flask should be connected to the condenser in a closed fashion as in a vacuum distillation and vented to the atmosphere through a drying tube or similar device. Corks, rubber stoppers and any kind of joint grease cannot be used in contact with sulfur trioxide or fuming sulfuric acid as they will char. Tapered glass fittings should be used throughout without grease. All fittings should be cleaned in benzene to remove grease before distilling. Sulfur trioxide fumes are *very* irritating and good ventilation is a must. Glass stoppers and small empty flasks with tapered fittings should be used to close openings in the distilling apparatus when changing receiving or boiling flasks. This will help considerably to keep fumes out of the atmosphere.

Experimental procedure:

200 grams of sulfur trioxide are distilled from the appropriate amount of fuming sulfuric acid. The boiling range should be 5° or less. The 200 grams are collected in a small round bottom flask previously weighed with a glass stopper in place. Next, a small unweighed portion of phosphorus pentoxide is added to the sulfur trioxide in the flask (1 teaspoonful). The flask is swirled and then placed on the distilling apparatus as the boiling flask. A forerun of 5 ml is distilled into a small receiving flask. This is returned to the boiling flask and the apparatus is fitted with a receiving flask (3 liter boiling flask) already containing 1500 ml anhydrous dimethylformamide and a magnetic stirring bar teflon coated. The flask is surrounded by an ice water bath in a nonmagnetic container and a magnetic stirring motor is placed underneath to rotate the stirring bar in the flask. The remaining sulfur trioxide is distilled into the

receiving flask containing the dimethylformamide. The receiving flask should be absolutely dry before filling it with the dimethylformamide. The sulfur trioxide should distill off over a 2° boiling range the second time. A hot water bath or an oil bath is convenient when heating the boiling flask and prevents overheating. When the distillation is complete, the receiving flask is removed carefully and stoppered. The flask is warmed and swirled to dissolve any crystalline material and then cooled to around 5° C. and left several hours. If any material precipitates, a little anhydrous dimethylformamide is added to dissolve the residue. The flask is swirled and the contents decanted into a storage bottle. The temperature in the storage bottle is recorded and a ten milliliter aliquot withdrawn with a pipette. The aliquot is run into a 250 ml Erlenmeyer flask and diluted with 10 ml water to decompose the complex. The mixture is then titrated to a phenolpthalein endpoint with a standard base solution. A convenient standard base solution can be made by dissolving 1 mole of lithium hydroxide hydrate (41.96 gr) in distilled water to make one liter in a volumetric flask. Three consecutive titrations should be done and an average taken. One mole of sulfur trioxide reacts with two moles of lithium hydroxide. The reagent bottle should be labeled as to sulfur trioxide concentration (about 1.5 molar) and the temperature at which the concentration was determined since the reagent has a rather high coefficient of expansion.

If at any time during the distillation of the sulfur trioxide, crystals of solid sulfur trioxide form in the condenser or receiving flask, they may be melted by careful local heating with a propane torch flame or by running hot water through the condenser jacket. The water in the condenser should be above 23° C during distillation of sulfur trioxide to prevent crystallization of sulfur trioxide polymers.

5. Notes on changing the scale of reactions:

The ergotamine to lysergic acid reaction may be scaled up or down by multiplying the quantities involved by a proportionality constant: all quantities should be multiplied by the same constant. It has been found that the quantities of water and potassium hydroxide used in the hydrolysis of ergotamine are not particularly critical and their relative concentrations may be varied somewhat to meet other considerations. As a rule, ergotamine should be hydrolysed with about a 1.5 to 2.5 molar potassium hydroxide solution.

The lysergic acid to lysergic acid amide reaction has been designed to utilize minimal quantities of solvents in order to squeeze as much material as possible into ordinary laboratory glassware.

Some workers have suggested that the quantity of dichloromethane (or chloroform) can be further reduced and still effectively extract the amide, but this may prove difficult, especially if emulsions are encountered. When scaling down the reaction, if desired, the quantities of methanol, dimethylformamide, saline solution, and dichloromethane may be in greater quantity than calculated by direct proportion to the other reagents. The proportional relationship between lysergic acid, lithium hydroxide and sulfur trioxide must be strictly adhered to. The molar proportions are: lysergic acid, 1 mole; lithium hydroxide, 1 mole; sulfur trioxide, 2 moles. Diethylamine should be added in at least five molar equivalents. 6.5 equivalents are used in the example given. In general, two thirds of the dimethylformamide should be distilled off from the lithiumlysergate solution. It is convenient to do the reaction in a small quantity of dimethylformamide if doing large quantities of lysergic acid since the product is contained in smaller volume and extraction may be done with less solvent.

6. Notes on purification of amide

The chromatography detailed in the example has been used and works fairly well, however, the removal of all colored impurities is not achieved and there is room for improvement. It is suggested that further experimentation be done to improve the process. An ultraviolet light is indispensable when doing experimentation with these compounds. The lysergic acid amide displays a blue fluorescence. Benzene has been used successfully as an eluant on activity 4 alumina, but the results were no better than the example given. Chloroform and chloroform-benzene mixtures also have been used on varying grades of alumina but no useful data is available.

7. Notes on crystallization of tartrate

Methanol and methanol-ether mixtures have both been used to crystallize the amide tartrate. Crystallization proceeds more readily if ether is present. Usually, the quantity of solvent from which the tartrate is crystallized should be around 4.0 to 6.0 times the weight of the free base amide (in grams) expressed in milliliters. For example, if the free base lysergamide weighs 20 grams, then the crystallization should be done in 80 to 120 milliliters of solvent. The purer the free base amide, the less solvent that may be effectively used and the higher the yield. The solvent is reagent grade methanol containing 10.0% to 25% ethyl ether. It is usually preferable to dissolve the amide in the methanol and then to add the ether. Ether should not be added after the tartaric acid is added since it

precipitates the impurities at the site of addition. Crystallization occurs more slowly with impure preparations. Considerable time should be allowed in the cold before filtering. Overnight is excellent.

Lysergic Acid Monohydrate

350 grams of potassium hydroxide are dissolved in 3500 ml of water in a five liter three-neck boiling flask equipped with a reflux condenser and a small tube introducing a slow stream of nitrogen gas. The mixture is then heated to about 80° C, when 500 grams of ergotamine tartrate is added to the flask. The temperature is maintained at 80° for about 2½ hours while continuously bubbling nitrogen gently through the mixture.

The reaction mixture is next poured into a ten liter polyethylene bucket and diluted by addition of ice to an approximate volume of six liters. The bucket is then placed in an ice water bath and the mixture cooled below 10° C, after which the mixture is slowly neutralized by the careful addition of cold *dilute* sulfuric acid (15 parts water: 1 part acid) to a congo red endpoint (pH 4.0 - 4.4). Lysergic acid and considerable potassium sulfate precipitates at this time. The bucket is allowed to stand in the ice water bath several hours when the precipitate is filtered off on a large buchner funnel (15 cm or larger) and sucked as dry as possible on the funnel. The slightly moist filter cake is broken up and placed in a four liter beaker containing 2½ liters of two molar ammoniacal ethanol (about 300 ml liquid ammonia poured into 5.0 liters of *chilled anhydrous* denatured ethanol). The contents of the beaker are stirred for one hour and then filtered. The filtrate is kept and the filter cake is broken up and extracted in the previous manner with a second portion of two liters ammoniacal ethanol. This extract is filtered using 500 ml of ammoniacal ethanol to wash down the filter cake and the combined filtered extracts are taken to total dryness in a rotary vacuum evaporator over a boiling water bath. The tan colored residue is easily scraped from the sides of the evaporator flask by means of two bent wire rods, one bent less than 90° and one bent greater than 90°. The residue is scraped into a large mortar as well as possible with the bent rods and then 225 ml of methanol mixed with 75 ml of water is used in divided portions to wash the remaining residue in the flask into the mortar. The last portion of the methanol-water mixture (about 100 ml) is left in the evaporator flask to be used to wash the mortar clean later. The slurry in the mortar is ground with a pestle to an even consistency free of lumps when it is then poured and scraped into a large Buchner funnel (15 cm or larger) and filtered. The

remaining portion of the methanol-water mixture is used to wash down the mortar and the filter cake. Next the filter cake is washed with at least 250 ml of water and sucked dry for an hour. The filter cake is broken up and dried to a constant weight under high vacuum at 90° C in a dessicator.

Yield: 125 to 150 grams of lysergic acid monohydrate, MW.286.35. A slightly off-white powder.

N,N-Diethyllysergamide (LSD)

143.20 grams of lysergic acid monohydrate (0.5 mole) and 21.0 grams of lithium hydroxide hydrate (0.5 mole) are dissolved in 2500 ml of methanol with stirring and warming in a four liter beaker. When the lysergic acid is completely dissolved, the contents of the beaker are admitted to a rotary vacuum evaporator and taken to total dryness over a boiling water bath. A little methanol is used to rinse any lysergate residue that may remain in the beaker into the evaporator. The crumbly, tan colored dry residue is dissolved and rinsed into a five liter boiling flask with three liters of anhydrous dimethylformamide. Considerable care should be exercised when transferring solutions from one vessel to another to avoid loss of lysergate since small deviations from the calculated quantities of reagents result in considerable reduction in overall yield. The five liter flask is next fitted with a 600 mm helices packed fractionating column and about 2050 ml of dimethylformamide is carefully distilled off at 10.0 millimeters pressure to remove water from the lysergate solution. The boiling flask containing lithium lysergate in the remaining dimethylformamide is tightly stoppered and chilled in an ice water bath to below 5° C. 1.0 mole of sulfur trioxide is now added to the flask by addition of the appropriate amount of sulfur trioxide-dimethylformamide reagent (previously prepared by double distilling sulfur trioxide from fuming sulfuric acid and slowly adding it to anhydrous dimethylformamide to make a solution of approximately 1.5 molar strength as determined by titration against standard base solution). Cooling and swirling are continued for 15 minutes when 335 ml of diethylamine is added. Cooling and swirling are continued 15 minutes longer when the reaction mixture is poured into 3800 ml of a 20% saline (sodium chloride) solution to break the reaction complex. The reaction mixture is now extracted with 10.0 to 12.0 liters of methylene chloride (dichloromethane) or chloroform in divided portions in a separatory funnel. A scheme for division of the extraction solvent is as follows:

Extract	*Quantity*	*Total Solvent Used*
First	2000 ml	2000 ml
Second	1800	3800
third	1500	5300
Fourth	1200	6500
Fifth	1000	7500
Sixth	1000	8500
Seventh	800	9300
Eighth	700	10,000
etc.	etc.	etc.

Continue until clear lower layer appears.

The extracts from the reaction are combined and shaken up with a little anhydrous magnesium sulfate (120 grams) and filtered. The filtrate is evaporated to dryness in the rotary vacuum evaporator, care being taken not to heat the extracts or the residual syrup above 55° C. A good mechanical vacuum pump and effective cold traps in the line are necessary to remove the residual dimethylformamide from the residue. A brown to black bubbly residue should remain when evaporation is complete. This residue contains the amide product and considerable impurities. A general method of purifying the amide follows.

Method A

The material to be purified (the above residue or other material containing N,N-diethyl lysergamide) is taken up in 1200 ml of methylene chloride containing 20% benzene and applied to a chromatographic column containing two pounds of basic alumina 100-200 mesh Brockmann activity *two* or *three*. The column is eluted with nine liters of methylene chloride containing 20% benzene. At this point, the column when viewed with visible light should display three distinct color bands. The uppermost band will be a dark brown or greyish color, the next band will be a reddish brown color, and the lowest band will be a light brown or tan color. The eluant should be amber colored. The column may now be eluted with about one liter methylene chloride containing 0.5% methanol. This will bring the reddish band nearly to the bottom of the column. At no time should any portion of the reddish band be eluted from the column. If any of the reddish band reaches the bottom of the column, elution should be stopped. Next, the total eluant is shaken up with 30 grams of activated charcoal (Norit A) mixed with 30 grams of alumina and filtered. The filter is washed with 600 ml of methylene chloride and the total filtrate taken to dryness on the rotary vacuum

evaporator. Care is taken not to heat the residue or solution above 55° C. The residue is taken up in one liter of benzene and immediately taken to near dryness when another liter of benzene is added to dissolve the residue and the solution is again taken to near dryness. This procedure is repeated until four to five liters of benzene have been added and evaporated. The residue is finally taken to *complete* dryness at about 45° C. If sufficient benzene has been added and evaporated, a light tan bubbly, crystalline material will fill the interior of the evaporator flask. It is important that this residue be completely dry before proceeding. The evaporation of benzene from the residue aids removal of solvents and other volatile materials (as aseotropes) which promotes formation of the bubbly crystalline structure in the residue. 700 ml of petroleum ether is next added to the evaporator flask which is then removed from the evaporator and tightly stoppered. The flask is shaken vigorously to loosen the residue from the sides of the flask. Usually all the material comes loose from the flask and forms a slurry in the petroleum ether. If necessary, a bent wire rod may be used to scrape material from the flask. The slurry is now decanted into a buchner funnel and filtered. The filtrate is used to further wash material from the flask into the filter funnel. The filter cake is sucked as dry as possible and then dried to a constant weight under high vacuum at 45° C in a dessicator.

Yield: approximately 130 grams N,N-diethyllysergamide MW 323.42.

The material remaining on the column may be removed with methanol, evaporated in a vacuum and recycled through the isomerization and subsequent procedures by itself or combined with fresh material. Also, all leftover solutions and residues may be neutralized with sodium bicarbonate, evaporated in vacuo, extracted with ammoniacal chloroform, the extract evaporated to dryness, and the residue re-used.

N,N-Diethyllysergamide Tartrate

130 grams of N,N-diethyllysergamide is dissolved in 400 ml methanol and filtered. The filter is washed with 30 ml methanol and the filtrate and washing is poured into a one liter beaker. 30 ml more methanol is used to further wash the filter and filter flask and the wash is also poured into the beaker. 130 ml of diethyl ether is now added to the contents of the beaker. The beaker is gently warmed on a hot plate and 32.0 grams of tartaric acid are then added with constant stirring and warming until they are completely dissolved.

The beaker is then allowed to cool. Crystallization of the tartrate usually begins as soon as the tartaric acid dissolves completely. The beaker and contents are refrigerated for at least four hours. Occasional stirring of the crystallizing solution will produce smaller crystals, whereas if the solution is left unstirred during the crystallization, larger crystals will grow. Either is satisfactory. After the beaker has been allowed to stand in the cold four hours or more, the contents are filtered off on a 110 mm buchner funnel with suction. The crystals are washed on the funnel with first 200 ml of a two part methanol:one part ether mixture, and then with 250 ml of a two part ether:one part methanol mixture. Next the crystals are washed with 600 ml of ether and sucked dry. The filter cake is broken up and allowed to air dry in a warm, dark place.

First crop yield: Approximately 80 grams pale yellow to white needles.

The mother liquors and the two washes containing methanol are collected and combined. A one normal solution of potassium hydroxide in methanol is added in approximately equal volume to the combined washes and mother liquors. The solution is then filtered and the filter washed with a few ml of methanol. The filtrates are allowed to stand at room temperature for two to three hours to re-equilibrate the iso-lysergic acid amides from the mother liquors. About 500 ml of water is then added and the mixture extracted with 2.5 liters of methylene chloride in divided portions in a separatory funnel. The combined extracts are shaken with 25 grams of anhydrous magnesium sulfate and filtered. The filtrate is taken to dryness on the rotary vacuum evaporator, care taken not to heat above 55° C. The material is purified in the same manner as that from the original reaction mixture using approximately one fourth the quantities of solvents and alumina as for the original.

Second crop yield: Approximately 20 grams white needles.

The mother liquors may again be worked up as before, or alternatively, they may be saved and included in subsequent batches.

Third crop yield: Approximately 5 grams white needles.

Total yield: Approximately 105 grams N,N-diethyllysergamide tartrate MW = 430.51 (includes one mole methanol per mole of amide).

Method B

The residue from the previous step is taken up in two liters of

chloroform and filtered with suction through a column 50 millimeters in diameter packed with 400 grams of basic alumina, Brockman activity 1. The filtrate is then refiltered through the same column in the same manner four or five times until the filtrate appears light amber and further repetition of this process fails to remove significant color from the filtrate. The column is now eluted by adding several liters of fresh chloroform to the top and sucking it through into the previous filtrate. Sufficient chloroform should be added to remove all blue fluorescent material from the column but not greenish or yellow (use a blacklight in a darkened room). A band of greenish yellow material should remain in the upper 2/3 of the column when viewed in ultraviolet light (blacklight). The total filtrate is taken to dryness in vacuo in a three liter round bottom flask on a rotary evaporator over a 60^0 hot water bath. The residue is taken up in 500 ml of benzene and again taken to dryness in the same manner. 500 .nl of benzene is again added and taken to dryness. The flask is left on the evaporator under full vacuum for a considerable length of time after the residue appears dry to remove any traces of dimethylformamide that may still remain. A bubbly, crystalline residue should fill the interior of the flask at the end of this step. If any tarry, gummy appearing material appears to remain on the sides of the flask, repeat the addition of 500 ml of benzene and evaporate to dryness again to get a glassy, crystalline appearance. When the material in the flask is totally dry, remove the flask from the evaporator and add sufficient petroleum ether (a commercial mixture of hexanes is excellent for this purpose) to the flask to be able to swirl the crystalline material around and loosen it from the sides of the flask. Filter this slurry on the buchner funnel with a fritted glass disk and use the filtrate to further wash the remaining material from the evaporator flask into the buchner funnel. Suck the material dry on the funnel and then place in a vacuum dessicator and dry to a constant weight. Record the dry weight of this material *N*. Calculate the weight of one equivalent of tartaric acid as follows:

$$\text{Weight of tartaric acid} = .232N$$

Add methanol to a small beaker in a quantity equal to four times N in milliliters. Dissolve the dried material of weight N in this. Dissolve one equivalent of tartaric acid in the same solution, warming the solution gently and stirring. Slowly with stirring, add ether to the solution in the quantity of no greater than .5 N ml. Addition of ether causes a precipitate which dissolves quickly. Ether should be added dropwise with stirring between drops to dissolve any

precipitate before addition of the next drop. Crystallization of LSD tartrate should begin shortly after or during addition of the ether. This precipitate does not dissolve and should not be confused with the precipitate caused by the addition of ether. The mixture should be stirred until the solution becomes thickened by formation of crystals. Once crystallization of LSD tartrate is begun it is unnecessary to continue addition of ether. The beaker should be refrigerated several hours and the contents then filtered on a buchner funnel with a fritted glass disk. The crystals are sucked dry and washed with 2.0 N milliliters of methanol previously chilled below -5° and then with 4 N milliliters of a 1:1 mixture of cold ether and methanol. The crystals are sucked completely dry, washed with 8 N ml of ether, sucked dry, and placed in a vacuum dessicator to remove last traces of solvent.

The total filtrates from the crystals (mother liquors plus washings) are made basic by addition of 2 molar ammoniacal ethanol in approximately equal volume and allowed to stand several days at room temperature when the mixture is filtered and taken to dryness and treated in the same manner as the residue from step 2 for a second crop of crystals.

LSD Via SO_3 Method 2

Lysergic Acid

Ergotamine tartrate (10g) is added to a stirred de-aerated (nitrogen stream) solution of 38 g potassium hydroxide in 100 ml of methanol and 200 ml of water. The solution turns pink to red. The solution is heated to reflux and the methanol is slowly removed using a partial takeoff. Methanol is allowed to distill until the pot temperature reaches 90-95° C. The mixture is then maintained at total reflux until the evolution of ammonia ceases (hold pH paper in outlet of reflux condenser to test for ammonia). Nitrogen should be bubbled through the mixture to entrain the ammonia.

The hot dark solution is then allowed to cool somewhat and then cautiously acidified with a mixture of 60 ml acetic acid and 60 ml water. The resulting hot solution is quickly treated with Norite "A" decolorizing carbon and filtered hot.

The clear purple-hued filtrate is allowed to cool to room temperature (crystallization begins) and then in an ice bath or refrigerator. The crystalline precipitate of lysergic acid (grey to purplish white) is collected, washed with a small amount of cold water (5 ml), followed by cold methanol (5 ml) and ether. Yield 3.2

to 3.8 g.

Digestion of the crude acid with about 50 ml of methanol (to remove some of the colored impurities) gave after cooling to 0-10° C and filtering an almost quantitative recovery of lighter colored acid. This material is suitable for conversion into LSD.

Lysergic Acid Diethylamide

1. *Sulfur Trioxide-Dimethylformamide Complex*

Into a carefully dried two liter three necked round bottomed flask fitted with a mechanical stirrer, thermometer and a pressure equalizing dropping funnel protected from the atmosphere with a $CaCl_2$ drying tube, was placed approximately one (1) liter of freshly distilled dimethylformamide (DMF) (a one to three degree fraction BP *ca.* 62-63° C/20 mm). The DMF was cooled to 0-5° C by means of an external ice-salt-water bath. Sulfur trioxide (Sulfan B) (*ca.* 100 g) was then placed in the dropping funnel and added dropwise over a period of 30 to 40 minutes to the stirred DMF. The temperature is carefully maintained between 0 and 5° C throughout the course of the addition. Stirring is continued thereafter until all of the crystalline material is brought into solution.

The resulting reagent solution is then transferred into a suitable reservoir fitted with an automatic burette (protected from the atmosphere with a Drierite tube) and refrigerated. If kept dry, the reagent will be good for a month or two even though it will turn yellow and then orange in color.

The molarity of the reagent is then determined by titration against standard base. An aliquot (1 or 5 ml) is first diluted with water (20 or 100 ml) to convert the sulfur trioxide-DMF complex into sulfuric acid. The resulting solution is titrated to phenolphtalein end-point with standard 0.1 or 0.01 *N* aqueous alkali (NaOH or KOH) to determine the *molarity* (½ of the Normality). It should be in the range of 0.9 to 1.2 depending on the amounts of SO_3 and DMF used.

2. *Lysergic Acid Diethylamide (LSD)*

For best results all lysergic acid and LSD solutions should be protected from direct light (yellow light is non-damaging) and the working temperatures should never exceed 25° C.

Lysergic acid monohydrate (7.15 g, 25.0 mmol on a 100% basis) and lithium hydroxide monohydrate (1.06 g, 25.0 mmol) were added to 200 ml of anhydrous methanol and stirred until complete solution occurs. Use magnetic stirrer and keep solution

under dry nitrogen in the dark. The solvent methanol is then removed by evaporation under reduced pressure to leave a frothy glass-like residue of lithium lysergate.

A solution of the calculated amount of tartaric acid is prepared in methanol (*ca.* 8 ml/g). Approximately ½ of the methanol to be used and 20% of the tartaric acid solution is added to the flask containing the LSD base. The flask is swirled and/or shaken until the solid material has dissolved (5-10 minutes) and the solution is then transferred into an Erlenmeyer flask. The balance of the methanol, in two portions, is used to complete the transfer. At this point the rest of the tartaric acid solution is added. It may be helpful to titrate the solution to an end-point pH of 5.3, since adding excess tartaric acid solution inhibits crystallization somewhat. However this is optional. If seed crystals are available, they should be added at this point. Crystallization should begin within a ½ hour. The flask should then be refrigerated for 12-24 hours at 5-10° C and then for another 12 hours at -10 to -20° C. For 5 g of LSD base 1 g of tartaric acid in 7-8 ml methanol and an additional 17-18 ml of methanol are used.

The crystalline mass of needles is broken up and the cold solution filtered (suction). The filter cake is sucked dry and then washed with anhydrous ether. If necessary the product may be recrystallized from methanol using 5 ml for each gram. The snow white product melts at 198-200° C.

3. *Recrystallization Procedure*

The crude tartrate (10 g) is placed in a 125 ml Erlenmeyer flask and boiling methanol (50 ml) is added and the mixture stirred and heated for a minute or two (*no longer*) until solution is complete. The hot solution is quickly filtered through a previously warmed buchner funnel and the filtrate cooled *immediately* by swirling in a cold water bath until the temperature drops to 25° C. Crystallization should be well on the way by this time. The mixture is further cooled to 5 to 10° C and then to -10 to -20° C as previously described, to complete the crystallization. Recovery is between 50 and 70%.

4. *Additional Crops of Crystals*

The mother liquors from initial crystallizations and from re-crystallizations of LSD can be concentrated by evaporation under reduced pressure to produce additional crops of crystals. The second and third crops of crystals are usually dirty enough to require re-crystallization. After three crops, the mother liquors usually become very syrup-like. They then contain mostly iso-LSD (as the tartrate

salt).

The iso-LSD salt can be converted back into the base by the addition of methanolic KOH or potassium methoxide to the mother liquor. The resulting mixture should be added to a separatory funnel containing salt solution and ethylene dichloride. The LSD base is extracted into the ethylene dichloride layer (the lower layer). The lower layer is removed and fresh ethylene dichloride used to extract the last traces of LSD base from the salt water-base mixture. The ethylene dichloride extracts are combined, dried with $MgSO_4$, decolorized and filtered through diatomaceous earth as earlier. The resulting ethylene dichloride solution may be combined with the chloroform solutions of iso-LSD which eluted from the chromatographic column. The combined solution may be evaporated to dryness under reduced pressure.

5. *Isomerization*

The dry iso-LSD base can then be dissolved in methanol and potassium methoxide added. The resulting mixture is stirred for about 30 minutes. During this time isomerization takes place; about 70% of the iso-LSD is converted into the desired "normal" form of LSD.

The methanolic solution is poured into a separatory funnel containing salt water solution and ethylene dichloride. The salt water layer is repeatedly extracted with ethylene dichloride to separate the LSD base from the water-base mixture. The ethylene dichloride extracts are combined, dried with $MgSO_4$, decolorized and filtered. The ethylene dichloride solution is then evaporated to dryness under reduced pressure.

The resulting dry LSD base is chromatographed on basic alumina (activity grade 1) as previously described. The blue band is collected as before, evaporated and converted into the tartrate salt. The iso-LSD band may be collected and saved for further re-cycling.

NOTE: If you only have mother liquors to isomerize, the second mixing with potassium methoxide is unnecessary. Simply prolong the initial mixing to about ½ hour.

Total Synthesis of Lysergic Acid

Of the many attempts at the total synthesis of lysergic acid from simple starting materials, only two have been successful (JACS 78,3087(1956), which is *very* complicated, and CA 74,3762 (1970), which follows). However, it is very likely that some of the intermediates in each attempt are psychedelic. In fact, this is one of

the most promising and least investigated areas of psychedelic chemistry. Following are some references to the synthesis of intermediates: CCCC 33,1576(1968); HCA 33,67,375,1796, 2254,2257(1950), 34,382(1951), 35,1249,2095(1952), 36,839 1125,1137(1953), 37,1826(1954), 38,463,468(1955), 44,1531 (1961); JCS 3399,3403(1954); BSC 861(1965); JOC 10,76 (1945), 26,4441(1961), 29,843(1964); Chem. and Ind. 1151 (1953); CJC 41,2585(1963); CPB 12,1405,1493(1964), 13,420 (1965), 14,1227(1966); JACS 61,2891(1939), 67,76(1945), 71,761(1949), 73,2402(1951), 78,3087(1956), 79,102(1957), 82,1200(1960), 88,3941(1966); BER 86,25,404(1953), 87,882 (1954), 88,370,550(1955), 89,270,2783(1956), 90,1980,1984 (1957), 93,2024,2029(1960), 96,1618(1963), 100,2427(1967), 101,2605(1968); JMC 8,200(1965); C.R. Acad. Sci. Paris 264 (C), 118(1967), 265 (C), 110(1967); BSC 1071(1968); CJC 41,2585(1963); CPB 12,1405,1493(1964), 13,420(1965), 14, 1227(1966); JCS (P.T.I.) 1121(1972), 760(1973), 438(1973); CA 78,71830,72200(1973).

Various analogs containing part of the LSD structure have been synthesized, but few have any activity. See JPS 60,809(1971) for a review of these compounds.

For other LSD analogs see JMC 16,804,1015(1973); BSC 2046(1973); CA 48,4489(1954); JPS 62,1881(1973).

Some other useful references on LSD chemistry: U.S. Patents 3,856,821 and 3,856,822; Swiss Patent 517,680(1970); Belgian Patent 738,926; French Patent 1,368,420 and addition 91,948 (1968).

Total Synthesis of LSD German Patent 1,965,896 (1 Oct 1970). German Patent 1,947,063 is the same as 1,965,896.

For synthesis of 5-Br-isatin from isatin see CA 33,2516(1939) or BER 40,2492(1907).

For the use of cycloaliphatic or aromatic esters in place of methyl-6-methylnicotinate or of isatin or 4 or 5 chloroisatin or 4-bromoisatin in place of 5-bromoisatin see French Patent Addition #2,052,237 (14 May 1971).

Total yield of LSD from starting materials is probably about 1%.

Mix 32.8 g (0.217M) methyl-6-methylnicotinate (other alkyl groups can replace either methyl group) with 45.2 g (0.2M) 5-bromoisatin (apparently 4-Br or 4 or 5 Cl isatin will also work) in a 250 ml flask at 100° in an oil bath and raise the temperature of the

bath to 180° over 15 minutes. Lower temperature to 170° and let react for 70 minutes. Cool and then grind the solid as fine as possible in a mortar. Recrystallize from 150 ml dimethylformamide and wash with ether to get 40 g (57%) methyl- α (5-bromo-3-isatylidene)-6-methylnicotinate (I). Suspend 10 g (I) in 250 ml glacial acetic acid and heat to boiling. Add in small portions over 30 minutes excess powdered zinc. Reflux 1 hour, filter and evaporate in vacuum and recrystallize the residue from dioxane to get 9.7 g (95%) methyl- α -(5-bromo-2-oxindol-3-yl)-6-methylnicotinate (II). To a suspension of 18 g dry $NaBH_4$ in 300 ml dry tetrahydrofuran add with stirring at 0° over 30 minutes about 75 g BF_3 etherate. Stir 3 hours at 0°, add 18 g (II) and heat exactly 20 minutes at precisely 22-24°. Add carefully 150 ml concentrated HCl while cooling in an ice bath. Add 200 ml water and stir 12 hours. Basify, extract the product with ethyl acetate and dry, evaporate in vacuum to get 11 g of residue which recrystallizes from methanol to give methyl- α -(2,3-dihydro-5-bromo-3-indolyl)-6-methylnictotinate (III).

The following step may be unnecessary but it gives stability to (III). The acetyl group can be split off at the end of synthesis, but this is unnecessary since the 1-acetyl-LSD is as active as LSD.

Treat 12 g (III) at room temperature for 24 hours with acetic anhydride then hydrolyze and extract to get 11.5 g residue which is ground in petroleum ether and recrystallized from cyclohexane (can chromatograph on alumina and elute with petroleum ether to wash out an oil, then with benzene containing 5% ethyl acetate to elute the produce) to give methyl- α (1-acetyl-5-bromo-2,3-dihydro-3-indolyl)-6-methylnicotinate (IV). Heat 5 g (IV), 12.5 ml acetone, 12.5 ml methanol and 1.8 ml methyl iodide for 18 hours in a Carius tube at 70-80°. Cool, filter, wash with acetone and recrystallize from methanol to get methyl- α (1-acetyl-2,3-dihydro-5-bromo-3-indolyl)-1,6-dimethylnicotinate iodide (V). To 9.4 g (V) in 250 ml water and 250 ml methanol at 35° add over 5 minutes 2.9 g KBH_4 and stir 10 minutes. Add 2.9 g more KBH_4 and stir 30 minutes. Evaporate in vacuum and extract the residue with methylene chloride to get 6.2 g oily mixture containing about 2 g of the d isomer (can separate by chromatography if desired) of methyl- α (1-acetyl-2,3-dihydro-5-bromo-3-indolyl)-6-methyl-1,2,5,6-tetrahydronicotinate (VI).

To a suspension of finely powdered $NaNH_2$ (6.1 g) in 2 liters dry ammonia, add with stirring 8 g (VI) in 50 ml dry tetrahydrofuran. Stir 1 hour, add NH_4Cl and evaporate the ammonia as fast as

possible in a nitrogen stream. Extract at pH 8 with methylene chloride to get 6 g (can chromatograph on 300 g silica gel and 250 g Celite and elute with 98% benzene-2% absolute ethanol and evaporate in vacuum) of methyl-1-acetyl-2,3-dihydro-lysergate (VII). (VII) can be converted to 2,3-dihydro-LSD (not to be confused with 9,10-dihydro-LSD, which is inactive), which is about ten times less active than LSD. (VII) can be converted to lysergic acid prior to conversion to LSD, which will triple the yield in terms of LSD activity (considering 30% yield). The process (which follows) is somewhat complicated and an easier dehydrogenation process may work. 2,3-dihydro-LSD can be converted directly to 12-hydroxy-LSD, which has about the same activity as LSD and this process is also given below.

Lysergic Acid from 2,3-Dihydrolysergic Acid JACS 78,3114 (1956)

Dissolve 4 g (VII) in 78 ml 1.5% KOH and reflux five minutes (under N_2 if possible). Add 8.5 g Na arsenate hydrate and 16 g Raney-Ni (wet) (deactivated by boiling in xylene suspension — see JOC 13,455(1948)) and reflux twenty hours (under N_2 if possible). Filter, precipitate lysergic acid by taking pH to 5.6 with HCl; filter and wash precipitate with water to get 1 g lysergic acid. Evaporate in vacuum the filtrate to get more product.

12-Hydroxylysergamides from 2,3-dihydrolysergamides HCA 47, 756(1964)

Warm to dissolve 1.5 g 2,3-dihydro-LSD in 5 ml acetone, 40 ml water and 40 ml saturated $NaHCO_3$. Cool to 20° and add all at once with vigorous stirring 2.46 g potassium nitro-sodisulfonate dissolved in 90 ml water and 10 ml saturated $NaHCO_3$. After 1 minute, extract 7 times with ethylacetate, wash the combined extracts with water, dry and carefully remove solvent to get a mixture of 12-OH-LSD, LSD and starting material which can be chromatographed to give about 0.2 g 12-OH-LSD.

The following method of converting (IV) to the diethylamide (which can probably be used in place of (IV) to give the diethylamide of (V), (VI), and (VII)) will probably also work admirably for (VII) or lysergic acid.

Reflux 0.5 g (IV) with 0.5 g KOH in 30 ml methanol for 4 hours. Evaporate in vacuum and add water to the residue. Adjust the pH to between 5 and 6 and filter or centrifuge to get 0.3 g of the free acid. Suspend 1.8 g of the acid in 125 ml chloroform, cool to -5° and add

0.5 g triethylamine, then 0.6 g ethylchloroformate and stir 45 minutes. Add 2 ml diethylamine and stir 3 hours at room temperature to get, after the usual workup, 1 g of the diethylamide (recrystallize from benzene).

Summary of Procedures and Materials For 1 Kilogram Ergotamine

★ *Starred chemicals are carefully watched.*

★★★★diethylamine 500 g(725 ml)
methylethylamine 50 g(75 ml)
ethylisopropylamine 50 g(75 ml)
diethyl ether 5 lbs
potassium hydroxide pellets 2 lbs
methanol 5L
activated charcoal powder (E.G. norit A) 100 g
tartaric or maleic acid powder 200 g
small cylinder N_2 or N_2O or freon
HCL or sulphuric acid concentrated 500 ml
chloroform 5 L (optional but desireable)
ethanol 2 gal (optional but desireable)
NH_4OH concentrated 500 ml (optional but desireable)

IN ADDITION AT LEAST ONE OF THE FOLLOWING SETS OF REAGENTS

First choice	N,N-dicyclohexylcarbodiimide	500 g
	N-hydroxybenzotriazol (1-hydroxybenzotriazol)	500 g
	tetrahydrofuran	10 L
	methylene chloride	10 L
Second choice	N,N carbonyldiimidazole	200 g
	dimethylformamide	15 L
Third choice	★★anhydrous hydrazine	4 L
	HCl conc.	1 L
	sodium nitrite	1 kg
Fourth choice	★★phosphorous oxychloride ($POCl_3$)	200 ml
	chloroform	10 L
	methanol	5 L
Fifth choice	acetonitrile or dimethylformamide	15 L
	★★trifluoroacetic anhydride	500 g

COCAINE

The leaves of *Erythryoxylon coca*, from which cocaine is obtained, were used by the Incas at least 1,000 years ago. The annual consumption of coca leaf in South America (mainly Bolivia and Peru) by about twenty million users amounts to about 150,000 pounds of cocaine. They chew their leaves with lime (CaO, etc.) which degrades cocaine to ecgonine — but this compound still relieves hunger and fatigue. Cocaine produces little effect orally, so sniffing is the preferred route of administration. Regarding its supposed aphrodisiac properties, it is interesting that one native legend ascribed the magical origin of the coca leaf to the fascination of a conqueror for the bright eyes of a princess who loved him to death. The plant grows in Australia and Africa, as well as in Western South America, and much cocaine was produced in Java. Other species of the genus seem to produce little or no cocaine.

Coca-cola got its name from the coca leaf extract which it contained (as did a variety of wines) until 1904. Neither tolerance nor physical addiction to cocaine seem to occur, so sniffing it occasionally should be quite safe.

Cocaine has structural and pharmacological similarities to the active constituents of belladonna and jimson weed and can likewise space you out in very undesirable ways, expecially if used frequently. Also, as with every drug, some people are very sensitive to it and can become paranoid, etc. with very little exposure. Cocaine base ("free base") is much more euphorigenic than cocaine and consequently much more damaging. It seems to have the addictive pull of heroin for many users and is probably best avoided.

Coca leaf contains *l*-ecgonine, cinnamyl cocaine and alpha and beta-truxillyl ecgonine (cocamine), which can be converted to cocaine, but d-ecgonine or pseudoecgonine lead to isomers which are devoid of the strong central stimulating effects of *l*-cocaine. During the process of isolation from the leaf, *l*-cocaine is converted to *l*-ecgonine (tropan-3-beta-of-2-beta-carbonxylic acid), which is easily reconverted to *l*-cocaine (benzoylecgonine methyl ester).

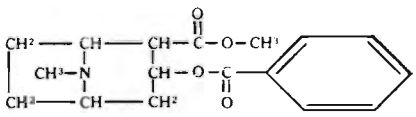
Cocaine Extraction

Cocaine can be extracted from the leaves with almost any organic solvent. Moisten the dried, powdered leaves with Na carbonate solution and extract with cold benzene or petroleum ether. Extract the organic solution with small amounts of dilute sulfuric acid and basify the extract with Na carbonate (the alkaloids precipitate). Dissolve the precipitate in ether, separate the ether from the aqueous Na carbonate and dry and evaporate in vacuum the ether. Dissolve the residue in methanol and heat with sulfuric acid or methanol-HCl; dilute with water and extract with $CHCl_3$. Concentrate and neutralize the aqueous layer and cool to precipitate methylecgonine sulfate, which is converted to cocaine in one step. The alkaloids can also be extracted directly from the powder with dilute sulfuric acid.

Cocaine from Coca Paste

This process (see Bull. on Narcotics 17,29(1965)) is optional since the paste is usually greater than 70% cocaine.

Dissolve 1 g coca paste in 10 ml 3% sulfuric acid, cool to 0° and add with stirring 8 ml 6% $KMnO_4$ and 10% sulfuric acid, 1 ml at a time over one hour. Let stand ½ hour and add powdered oxalic acid with stirring until the precipitate which has formed dissolves. Extract two times with ether, basify the aqueous solution with NH_4OH and extract four times with 18 ml ether. Dry and evaporate in vacuum the ether to get cocaine. The aqueous solution contains ecgonine, which can be converted to cocaine as shown below.



Cocaine

Cocaine Synthesis

The zinc-mercury amalgam used for reduction here and elsewhere can be prepared as follows. Add mossy zinc (powdered will probably do) to 1% aqueous $HgCl_2$, stir awhile, pour off the water and use the Zn-Hg residue for reduction.

Method 1 JGC 30,1138,2070(1960); CA 53,423(1959)

During one hour pass 70 g dry chlorine gas into a stirred solution of 68 g furan in 630 ml methylene chloride and 630 ml methanol at -40°. Protect from moisture ($CaCl_2$ drying tube) and use dry methanol. Alternatively, 160 g Br_2 or Cl_2 in 630 ml methylene

chloride (or methanol- in which case add 200 g anhydrous K acetate or pyridine) at -40° is added dropwise to 68 g furan in 630 ml methanol at -40° (keep temperature lower than -30° during the reaction). Stir ½ hour and pass in dry NH_3 (or concentrated NH_4OH) until pH is 8. Filter and wash precipitate with 3X50 ml methylene chloride. If only methanol has been used, after stirring ½ hour pour into 3 L cooled, aqueous, saturated $CaCl_2$ and extract with ether or methylene chloride. Dry and evaporate in vacuum the combined organic solutions to get 90 g 2,5-dimethoxy-2,5-dihydrofuran (I) as a colorless liquid (can distill 40/4) or 71/17). Ethanol can be used in place of methanol, but add 190 ml ether (if reaction temperature rises too high, the methyldiacetyl of male-indialdehyde is produced — this can be reduced to the methyl-diacetyl of succinic dialdehyde, which can be used in place of (II) to get (IV)).

Hydrogenate 47.5 g (I) in presence of 5 g Raney-Ni at room temperature and 1 atmosphere H_2 with stirring ($NaBH_4$-Ni reduction described at start should also work). After absorption of 7.2 L H_2 over two to three hours, filter and wash catalyst with 15 ml ethanol and evaporate in vacuum (or distill 77/20 for ethoxy compound, 53/22 for methoxy compound) to get 40 g 2,5-diethoxy (or dimethoxy)-tetrahydrofuran (II).

To a mixture of 360 g 50% KOH and 138 ml methanol, add with stirring at -5° 70.5 g dimethyl ester of acetone dicarboxylic acid (dimethyl-beta-ketoglutarate — see method 3 for preparation) and let temperature rise to about 25° over ½ hour. Let stand ten minutes, cool to 0° and add 65 ml ether. Filter, wash precipitate with 65 ml ethanol and 150 ml ether at 0° to get 75 g (III). To 322 ml 1N HCl at 80°, add 41.1 g (II) and stir twenty minutes; cool to 10°, add 211 ml 1N HCl, 98.2 g (III), 26.4 g Na acetate and 28.2 g methylamine HCl. Stir four hours at room temperature, cool to 10°, and saturate with 410 g KOH. Extract four times with methyl-Cl or benzene (75 ml each, fifteen minutes stirring) and evaporate in vacuum to get the methyl ester of tropan-3-one-2-COOH (IV), which precipitates from the oil (can distill 85/0.2). Test for activity. Dissolve 28.3 g (IV) in 170 ml 10% sulfuric acid; cool to -5° and treat with 3.63 kg 1.5% Na-Hg amalgam with vigorous stirring at 0°. See below for easier methods of reducing (IV).

Keep pH about 3.2 by adding 30% sulfuric acid and continue stirring ½ hour or until 3 drops of the mixture fail to give a red color with a 10% solution of $FeCl_3$. Filter and saturate the solution with

235 g KOH or K carbonate below 15°. Extract with 5X250 ml $CHCl_3$ and dry, evaporate in vacuum to get an oil. (The inactive isomer can be separated at this point (if desired) by letting stand five days at 0° (methyl ester of racemic pseudo-ecgonine precipitates)). Mix the oil plus any precipitate with an equal volume of ether and filter. Add 250 ml dry ether until no more precipitate forms, then filter (test precipitate for activity — if active, this step is unnecessary) and stir with activated carbon ½ hour. Filter and evaporate in vacuum, dissolve the brown liquid in 17 ml methanol, and neutralize with 10% HCl in dry ether. Evaporate the ether until the two layers disappear and let stand two hours at 0° to precipitate the racemic methylecgonine (V). Filter, wash with 1:1 methanol:ether at 0°. Can purify by dissolving in methanol and washing with 1:1 methanol:ether and ether. To prepare the Na amalgam, use an electrolyzer with an Hg cathode, Ni anode, and 40% NaOH solution; current about 29 amps, 7.5 volts.

Heat 9.35 g (V) on water bath ten hours with 18.7 g benzoyl-Cl and pour the liquid formed into 250 ml ether; evaporate in vacuum. The powder formed on rubbing the residue is dissolved in 85 ml ice water and neutralized with 20% NH_4OH. Racemic cocaine (VI) is filtered off, washed with 12 ml ice water and dried over $CaCl_2$. To get the HCl of (VI), dissolve it in seven times its weight of ether containing HCl in ethanol and wash the precipitate with 1:3 methanol:ether, then ether.

Alternatively, mixture of 4 g (V), 36 ml benzene, 1.6 g Na carbonate and 7 ml benzoyl-Cl; stir and heat 96-100° for ten hours. Evaporate in vacuum, cool to 0° and add 40 ml ice water. Acidify with HCl to pH 5 and extract with 3X20 ml ether. Neutralize the aqueous solution with 20% NH_4OH to separate an oil from which cocaine precipitates on standing (from JGC 30,3228(1960)).

For an electrolytic method of producing (I) see ACS 6,531 (1952). For other methods of synthesizing (II) see JACS 72,872 (1950), CA 42,2992(1948). For the reduction of the tropinone (IV) to ecgonine (V), lithium aluminum hydride or $NaBH_4$ give about 50%, the Na-Hg method described above about 40%, and Al triisopropoxide about 25% of the inactive pseudoecgonine. The latter method, which appears to be the best, involves heating at 82° 1½ hours in isopropanol with Al triisopropoxide (Chem. and Ind. 664(1957)). For $NaBH_4$, reflux six hours in methanol. A method said to be superior to that given above for the conversion of methylecgonine to cocaine follows.

Cocaine from Ecgonine BER 89,679(1956)

Dissolve 8.66 g ecgonine in 100 ml methanol and bubble dry HCl gas through for ½ hour. Let stand two hours at room temperature and then reflux gently for ½ hour. Evaporate in vacuum, basify with NaOH and filter to get 8.4 g methylecgonine (V) (recrystallize-isopropanol). 4.16 g (V) and 5.7 g benzoic anhydride in 150 ml benzene with $CaCl_2$ tube to exclude water and gently reflux four hours. Cool in ice bath, acidify with HCl and dry, evaporate in vacuum (or extract with ether, basify with NaOH, saturate with K carbonate and extract with $CHCl_3$:dry and evaporate in vacuum) to get 6 g red oil which precipitates (VI) with addition of a little isopropanol.

Method 2 JOC 22,1391(1957)

Suspend 40 g beta-ketoglutaric acid in a mixture of 60 ml glacial acetic acid, 43 ml acetic anhydride and stir three hours at 10°. Filter, wash precipitate with benzene and dry in vacuum over KOH about two hours to get 30 g beta-ketoglutaric anhydride (I). Dissolve 13.5 g (I) in 50 ml cold methanol and let stand one hour at room temperature. Add this solution to a solution of 10 g methyl-amine.HCl, 4 g NaOH in 850 ml water and stir in 125 ml 0.8N succindialdehyde (preparation below). Let stand twenty-four hours at room temperature, take pH to 4 with 6N HCl and wash with 35 ml $CHCl_3$. Dry and evaporate in vacuum (or basify with 20 ml 4N NaOH and 4 g $KHCO_3$, extract with 9X100 ml $CHCl_3$ and dry, evaporate 75% of the $CHCl_3$ on steam bath, then evaporate in vacuum) to get 16 g yellow oily 2-carbomethoxytropinone (methyl tropan-3-one-2-carboxylate). Recrystallize by dissolving the oil in 30 ml hot methyl acetate and add 4 ml cold water and 4 ml acetone; let stand three hours at 0°, filter and wash precipitate with cold methyl acetate. This product is identical with (IV) of method 1 and is converted to cocaine as already described.

Succindialdehyde JOC 22,1390(1957)

Suspend 23.2 g succinaldoxime powder in 410 ml 1N sulfuric acid and add dropwise with stirring at about 0° a solution of 27.6 g Na nitrite in 250 ml water over three hours. Stir two hours at room temperature (keeping air out), stir in 5 g Ba carbonate and filter. The succindialdehyde should then be extracted from the basic solution with ether and the ether dried and evaporated in vacuum. For succinaldoxime preparation, see JOC 21,644(1956) and JACS 68,1608(1946).

Method 3 JOC 22,1389(1957)

Add with stirring over 1½ hours 192 g powdered anhydrous citric acid in 32 g portions to 202 ml (383 g) fuming sulfuric acid (21%). Make the first two additions at 0° carefully; the other four at 15°. Stir one hour at room temperature, and for three hours at 35° and 17 hours at 25°. Add dropwise with stirring below 0°, 500 ml methanol over three hours. Keep about fifteen hours at room temperature and add to a stirred mixture of 700 g $NaHCO_3$, 500 g ice and 200 ml water. Filter, wash precipitate with 150 ml 50% aqueous methanol and extract the filtrate with 7X400 ml ether. Dry and evaporate in vacuum (can distill 85/1) to get 110 g oily dimethyl-beta-ketoglutarate (I). Use this in method 1 or as follows. Dissolve 33.6 g KOH in 150 ml methanol and add dropwise at 0° over ½ hour (or at room temperature over one hour) to 43.5 ml (I) in 10 ml methanol. Let stand three hours at room temperature, add 50 ml ether and refrigerate twelve hours to precipitate the dipotassium salt of monomethyl-beta-ketoglutarate (II). Dissolve 10 g succindialdehyde in 200 ml water at -5° and add 41 g (II) and 11.8 g methylamine.HCl. Let stand a few hours at room temperature and proceed as in method 2.

Method 4 JOC 22,1389(1957)

Mixture of 1.35 g Na methoxide (Na in methanol), 3.48 g tropinone (which can be obtained by K dichromate oxidation of tropine), 4 ml dimethylcarbonate and 10 ml toluene. Reflux ½ hour, cool to 0° and add 15 ml water containing 2.5 g NH_4Cl. Extract with 4X50 ml $CHCl_3$, dry and evaporate in vacuum and dissolve the oil in 100 ml ether. Wash two times with a mixture of 6 ml saturated aqueous K carbonate and 3 ml 3N KOH (dry and evaporate in vacuum the ether to recover unreacted tropinone). Take up the oil which separates in saturated aqueous NH_4Cl and extract it with $CHCl_3$. Dry and evaporate in vacuum to get an oil which is dissolved in hot acetone. Cool, add a little water and rub to start precipitation of 1.5 g 2-carbomethoxytropinone. This is identical with (IV) of method 1, and can be recrystallized and converted to cocaine as already described.

Other References

The various cocaine precursors and analogs seem not to have been tested for psychedelic activity. Cogentin (benzo-tropane) is hallucinogenic at a dose of about 4 mg. Synthetic compounds which may have activity are *l* -pseudo-cocaine, tropacocaine, eccaine,

eucaine, and benzoyl-N-methyl-granatoline (se BER 51,235(1918), Chem. Zentr. 1402(1939), JCS 41(1924), 1150(1925), 1429 (1932), 1511(1933), Q.J. Pharm. Pharmcol. 7,46(1934)). For a simple synthesis of pseudopelletierine, which can be reduced and acylated to give active compounds, see J. Pharm. Pharmacol. 22 (supplement),29(1970). For a review of tropane chemistry see Manske (Ed.), The Alkaloids 1,271(1951), 5,211(1955), 9,269 (1967) 13,351(1971). JCS 3575(1957), Acta Pharm. Suecica 7,239(1970) and JMC 16,1260(1973) contain further information on cocaine analogs. For Cogentin synthesis see CA 47,2218h-(1953).

It may be possible to partially oxidize butanediol to butanedial (succindialdehyde) and distill this as the reaction occurs.

Cocaine Manufacture and the Cocaine Traffic

(The following summary of cocaine preparation and trade was prepared by the California State Attorney General in 1973.)

The coca plant is an evergreen, native to South America, particularly the countries of Peru, Bolivia, Brazil, Chile and Columbia, and should not be confused with the cocoa plant, from which chocolate is made. Although the coca plant is natural to South America, it has been successfully cultivated in Java, West Indies, India and Australia.

The coca plant is grown on mountain slopes or terrace uplands that have a tropical or semi-tropical climate. Actually, the plant is grown under conditions which are little suited for other crops. These mountainous areas of South America vary in altitude from 1,000 to 6,000 feet above sea level and temperatures of 68 to 86 degrees Fahrenheit. The most suitable conditions for the development of the coca plant are clay type soils, rich in humus and iron content, situated in sheltered upland valleys and exposed to constant humidity and rain precipitation. Under ideal conditions, the plant can survive, for a century or more, growing steadily in strength. In the cultivation of the coca plant, the seeds are usually taken from a plant three or more years old. The seeds are placed in containers and germinated in damp sheltered nurseries. The seeds are watered heavily for five days until they begin to swell after which they are planted in a mixture of humus sand and earth, in equal proportions, shaded and abundantly watered. After about a week and a half, the shoots begin to appear and the germinated seeds can be transplanted within 2 months. The sparsely leaved plant is usually 6 to 10 inches

in height and is transplanted in the open since it has become resistant to most climatic variations. The young plant is usually planted in small trenches varying in density from 1 to 4 plants per square yard.

Once the young plant has been transplanted (usually in the wintertime) into open fields, there is very little the cultivator does except leave the plants to themselves. Where dampness is constant and rain is regular, even irrigation is unnecessary. After approximately 1 year from the transplanting, the coca plant yields its first crop of leaves which is generally the reason the coca bush has been cultivated in the first place. The plant normally yields 4 crops of leaves per year. The coca plant is a shrub-like bush which grows from 5 to 10 feet tall with widely branched trunks containing twigs which become densely populated with leaves toward the ends. The green smooth edged leaves vary from 1 to 3 inches long and smell very similar to tea leaves. Normally, in order for the harvesting of the coca leaf to be profitable, there must be a minimum of 72,000 plants for every 10,000 square meters and the plant must last for over 30 years. Approximately 10 million coca plants produce 700,000 kilograms of coca leaf.

The average coca leaf contains from ½ to 1% of the alkaloid cocaine although there are various factors influencing the cocaine content including atmospheric conditions, age and condition of the plant, quality of the soil, fertilizers used, timing of cultivation and harvesting, the drying process, etc. It is estimated that one man can harvest approximately 30 kilograms of leaves in a day.

The drying process is very important and takes approximately 2 days of at least 3 hours of daily sunshine. During the process, the leaves must be turned over for even drying. If the drying is too extensive, the leaves will become too dry and lose their commercial value. In the drying process, the coca leaf loses more than 75% of its original weight. The leaf is divided into 3 basic categories:

1. Dark green colored leaf, dried by mechanical means or by airing and pressed into bales. This form is best suited for use in export.
2. Dark colored leaf resulting from defective drying and deliberately beat in order to meet wide demand for consumption.
3. Leaves which as a result of neglect, dampness, delay in drying or disease, have lost some of their alkaloid content, and are of practically no commercial value. This type of

coca leaf is often used as a local fertilizer.

Once the leaves are dry, they are pressed and wrapped into packages of 50 or 30 kilograms. In 1965, 1 kilogram of dried coca leaf, in Bolivia, was valued at approximately one dollar.

The coca leaf is commonly chewed by the natives of South America. The natives claim that the cocaine depresses their hunger and increases their strength. The leaves are very bitter when chewed and are often flavored with another substance such as lime. It has been estimated that over 90% of the Indians chew the coca leaf. The native chews, on an average, about two ounces of coca leaf daily and is often characterized by blackish red deposits on his teeth.

The coca leaf is either consumed by the natives of South America or exported to other countries for consumption. Another use of the coca leaf is in the extraction of cocaine either for illegitimate or legitimate use. The majority of the legal and/or clandestine cocaine factories are in South America due to the cost and bulk of transporting the whole leaf. In 1961, Bolivia produced an annual crop of from 12,000 to 18,000 tons of leaves although only half reached the legal market. The alkaloid cocaine is extracted from the coca leaf in basically three different chemical procedures. These procedures are used both in licit and illicit labs in the production of cocaine.

Manufacture of Cocaine

According to a chemist who assisted in the legal manufacture of cocaine, there are three basic methods of extracting cocaine from the coca leaf:

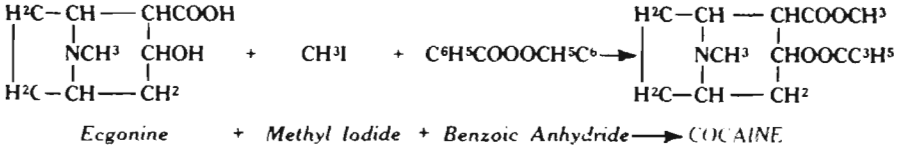
1. The dried coca leaf is treated, through a chemical process, with an acid solution such as sulfuric acid, producing raw cocaine or coca paste. The coca paste which contains approximately 70% cocaine, is put through another chemical process with hydrochloric acid creating a hydrochloric salt or cocaine hydrochloride which is soluble in water. This particular process is very time consuming and can take from 1 to 2 weeks to complete. This process is used by both the legitimate and illicit manufacturers of cocaine.
2. The dry coca leaf is treated in a chemical process with a basic solution such as sodium carbonate, producing raw cocaine. The raw cocaine is then put through another chemical process with hydrochloric acid creating a hydrochloric salt or cocaine hydrochloride. This process is less

time consuming than process No. 1 and it is probably the one preferred by the illicit manufacturer.

3. The third process is more advanced and technical than the other two procedures. The basic advantage of this process is that it gives a greater yield. The dried coca leaf, with its various alkaloids including cocaine, is broken down into ecgonine which is the chemical base or core of the cocaine molecule. The ecgonine is then treated with methyl iodide and benzoic anhydride in a chemical process creating pure cocaine.

Cocaine Synthesis

Coca Leaves
↓
Ecgonine
↓
Cocaine



Ecgonine + Methyl Iodide + Benzoic Anhydride ⟶ *COCAINE*

The Peruvian coca leaves, because of their richness, are commonly used in the extraction process as described in 1 or 2. When the dried coca leaves have a low cocaine content, the ecgonine process is preferred. Normally, it takes approximately 100 pounds of dried leaves to produce one pound of cocaine.

A chemist from the Federal Bureau of Narcotics and Dangerous Drugs, who was in Bolivia to observe clandestine cocaine operations, related the following step-by-step procedure for manufacturing cocaine. The method can be conveniently divided into three major steps: (1) extraction of cocaine from the leaf and chemical conversion to the sulfate; (2) treatment of cocaine sulfate with potassium permanganate and conversion to the free base (aka paste); and (3) conversion of the paste or free base to cocaine hydrochloride. In general, steps (1) and (2) are carried out in "sulfate" labs while step (3) is performed in "crystal" labs.

Coca leaves to cocaine sulfate

Step 1:

(a) A sufficient volume of warm water is used to dissolve 26 kgm of potassium carbonate. This solution is poured into a "cut-out" drum containing 250 pounds of dried coca leaves (the volume of solution is just enough to cover the leaves).

(b) The coca leaves and carbonate solution are treated in one of three ways:

1. The mixture is stirred by hand
2. The mixture is stepped on by the local Indians
3. The mixture remains untouched

(the first two methods generally take one day if done by strong individuals while the third method involves a period of four days; the treatment of the leaves with an aqueous solution of potassium carbonate allows penetration of the solution into the leaves converting any cocaine salts to the free base, allowing for subsequent extraction into kerosene).

(c) To the potassium carbonate solution and the leaves are added 200-400 L kerosene. The result of this is a greenish viscous liquid of about 300-400 L. Water and kerosene are immiscible but apparently "bridging" materials are extracted from the leaf which allows miscibility between the potassium carbonate solution and the kerosene; it was also explained that what we know as kerosene is also called benzin and paraffin, depending who is manufacturing the cocaine; this explanation clarified pre-existing conflicts about certain method terminology.

(d) The kerosene extract is separated from the leaves by draining through a plug in the bottom of the drum. The kerosene extract (300-400 L) is placed in another container and 1 L of concentrated sulfuric acid is added very slowly. A precipitate begins to come out of solution and settle to the bottom of the container (apparently kerosene-insoluble cocaine sulfate and other alkaloidal sulfates are formed).

(e) The liquid is separated from the sulfate precipitate and may be used to extract the next batch of fresh leaves (the liquid would probably have to be reconstituted, though, with potassium carbonate, etc.).

(f) The sulfate residue, about 1 kgm, is allowed to dry in the sun for about one day.

Cocaine sulfate to cocaine base (paste)

Step 2:

(a) Into a container holding 6 L of water and 360 cc of concentrated sulfuric acid the sulfate precipitate from the preceeding step is added and the solution stirred.

(b) In another container 1 L of water and 1 kgm of commercial potassium permanganate are mixed.

(c) The permanganate solution of (b) is slowly poured into the sulfuric acid solution of (a).

(d) The resultant purple-colored solution is then filtered through paper; if the filtrate is colored it is passed back through the filter (the use of potassium permanganate in the manufacturing process has been well-established; it is probably added as a decolorizing agent, with most of the colored residue remaining on the filter paper; commercial potassium permanganate is easily obtained in LaPaz through pharmacies; it is used by the local inhabitants to bathe the feet).

(e) To filtrate of about 6 L is added 1 L of ammonia; a precipitate is formed which is dried in the sun or under ultraviolet light (the resultant precipitate is cocaine free base or paste plus impurities).

Cocaine base (paste) to cocaine hydrochloride

Step 3:

(a) To the approximately 1 kgm of paste in a container is added 10 L of acetone and the resultant solution filtered through paper (the residue on the paper is probably inorganic in nature; ether can be used instead of acetone with some modification in the procedure; both ether and acetone can solubilize cocaine base while they are both good solvents for the crystallization of the hydrochloride salt).

(b) To the filtrate is added 10 L more of acetone; the resultant 20 L is passed through new filter paper. The temperature of the acetone should be about 15° C. in order to accept the hydrochloric acid and alcohol.

(c) To the 20 L of acetone are added 300 cc of concentrated hydrochloric acid and 300 cc of absolute ethanol; on the addition of absolute ethanol cocaine hydrochloride starts crystallizing out.

(d) After 3-4 hours crystal formation is complete and the cocaine hydrochloride crystals are collected on filter paper

and dried in air.

Kerosene, which is used in great volumes in the initial extraction procedure is not controlled in Bolivia and is, in fact, used by the populace for heating their homes. It would theoretically be very easy to obtain kerosene in large quantities through pharmacies in La Paz. The inorganic reagents such as sulfuric acid, hydrochloric acid, ammonia, and potassium carbonate are not controlled. Ether and absolute alcohol, on the other hand, are controlled substances. Diluted alcohol (about 50%) is not controlled though and, accordingly, can be converted to absolute alcohol.

Trafficking in Cocaine

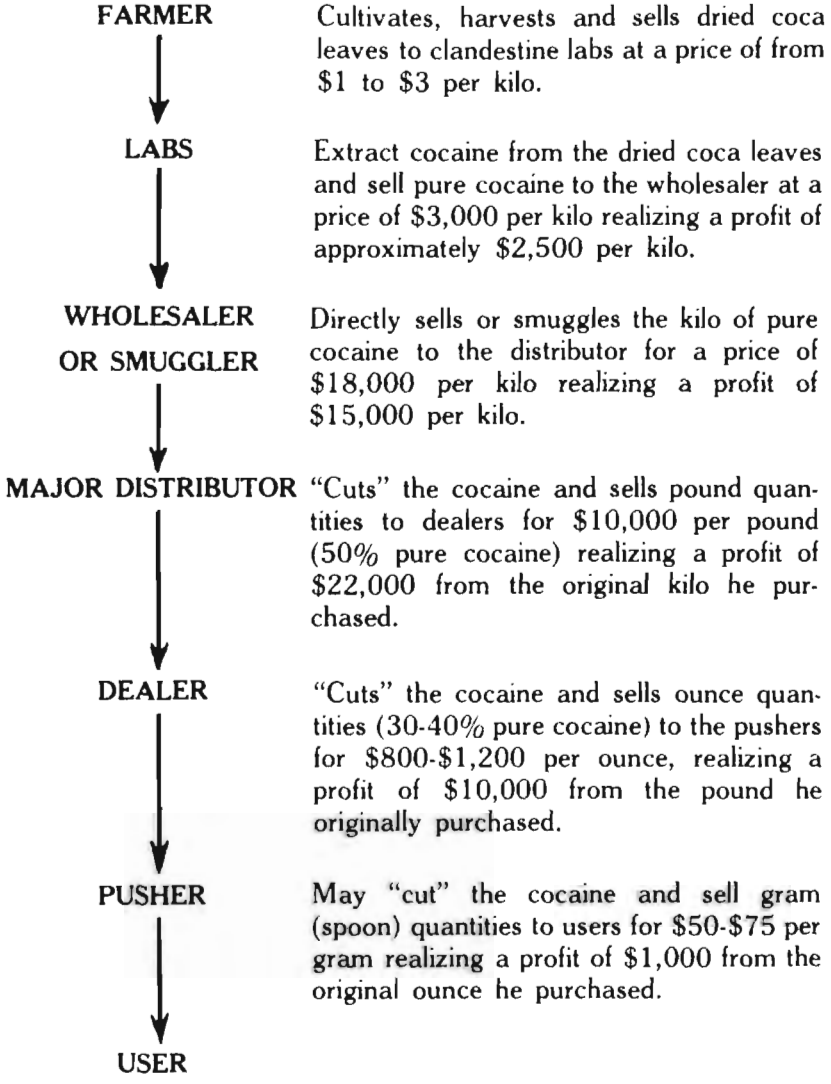
A. Legal

Once the cocaine has been legally produced from the coca leaf, it is exported to various countries for medicinal use, basically as a topical local anesthetic (applied to the surface, not injected, only treating a particular area). In the United States the crystalline powder is imported to pharmaceutical companies who process and package the cocaine for medical use. Merck Pharmaceutical Company and Mallinckrodt Chemical Works distribute cocaine in crystalline form (Hydrochloride Salt) in dark colored glass bottles to pharmacies and hospitals throughout the United States. Cocaine, in the alkaloid form (base drug containing no additives such as hydrochloride in the crystalline form) is rarely used for medicinal purposes. Cocaine hydrochloride crystals or flakes come in 1/8, 1/4 and 1 ounce bottles from the manufacturer and has a wholesale price of approximately $20 to $25 per ounce (100% pure).

Cocaine is still a drug of choice among many physicians as a topical local anesthetic because the drug has vasoconstrictive qualities (shrinks and stops the flow of blood). Synthetic local anesthetics such as novacaine and xylocaine (lidocaine) have also been discovered and used extensively as a local anesthetic.

B. Illegal

Hierarchy Of Cocaine Traffic



The original 100 kilos of dried coca leaf that it takes to produce 1 kilo of pure cocaine costs approximately $200. The kilo of pure cocaine will eventually be worth over $200,000 when sold to users in 25% pure gram quantities.

The illicitly manufactured cocaine from the various clandestine cocaine labs in South America, is smuggled to various countries including the United States for black market trafficking and use. Those involved in the smuggling of cocaine vary from a one man operation to organized syndicates. The smuggling methods are unlimited and vary with one's imagination. Often times, cocaine is first smuggled into Mexico rather than directly from South America to the United States. Cocaine, as is heroin, is usually packaged in hermetically sealed plastic bags or rubber condoms for smuggling purposes. Once the cocaine enters the US, it is then distributed through various sub-dealers down to the users. Illicit cocaine, basically, comes in three forms:

1. The hard tiny rock form which is readily available, especially to the large wholesaler or dealer.
2. The flake form which is generally fairly pure cocaine which has been broken down into tiny flakes and considered a delicacy among users of cocaine.
3. The powdered form which is usually rock or flaked cocaine diluted with other substances such as lactose or procaine.

In the illicit traffic of cocaine, as in many other drugs, there is a definite channel which the drug goes through from the harvester to the user. Initially, there is the farmer who cultivates, dries and ships the coca leaf to the illicit lab. The clandestine labs then chemically extract 90 to 100% pure cocaine from the leaf. From the lab, the cocaine is usually sold to smugglers or wholesalers at a price of $200 an ounce or $3,000 a kilo. The wholesaler smuggles the cocaine into the United States and sells it to a major cocaine distributor for a certain agreed upon price which varies and ranges from $18,000 to $22,000 a kilo. The distributor will then take the large quantity of cocaine and sell lesser amounts to a number of dealers. He may sell the cocaine in its pure form or dilute it and sell more for a lower price. Most of the traffickers keep in mind that cocaine loses its strength readily and sometimes the cutting or diluting agent will have a tendency after a period of time to begin destroying the cocaine content. When the dealers are in possesison of their ½ pound or pound of cocaine, they will most often dilute it with a cutting agent and sell it in ounce quantities to even smaller dealers. The cocaine

street pusher will in turn, sell it to the user in gram quantities.

The paraphernalia and diluting agents for the cutting of cocaine are very similar to those used for heroin. One of the basic differences between "stepping on" (diluting) cocaine as compared to heroin, is that cocaine is usually only diluted down from 20 to 40%. The process for cutting cocaine varies from individual to individual with often times the large dealer using a more elaborate process, but the basic operation is the same throughout cocaine traffic. The basic paraphernalia used is:

1. Diluting agent
2. Scales
3. Measuring spoons
4. Flat nonporous surface
5. Razor blade, playing card or some other sharp-edged instrument
6. Sifter or nylon stocking
7. Funnel
8. Packaging container such as rubber condoms, tinfoil bindles or plastic baggies

The cutting or diluting agent used for cocaine again varies with the individual and the substance that is readily available to that individual. Some of the common cutting agents for cocaine are:

1. Procaine which is a synthetic preparation in powder form used as a local anesthetic.
2. Mannite, a sugar substance used as a laxative produced in Italy.
3. Menita, a milk sugar from Mexico and South America.
4. Lactose or Dextrose, a white powdered milk sugar used as a baby food supplement and purchased readily in the United States in any drug store.
5. Powdered methamphetamine also known as speed.
6. Epsom salts.
7. Quinine used to treat leg cramps and malaria.
8. Powder vitamins purchased in health food stores.
9. Just about any soluble powder that is not disruptive to the body can be used, such as baking soda, powdered sugar, powdered milk, starch, etc.

The dealer will either be told the percentage of cocaine by a trusted "connection" or he will be able to approximate the percentage by various means. Some of the ways of ascertaining the approximate percentage of cocaine and the cutting agent are:

1. *Quantitative chemical analysis* which is an elaborate process requiring a qualified chemist and some elaborate laboratory equipment.

2. *Cocaine drug testing kits* either manufactured for law enforcement purposes or produced by the underground. These testing kits are simply presumptive color tests. The basic color test used for cocaine is cobalt thiocyanate. The cocaine or any of the other substances from the caine family will form a brilliant blue flaky precipitate in the cobalt thiocyanate. This is an indication that the product is cocaine, procaine, tetracaine, etc. In order to determine whether there is actually any cocaine and not all procaine, stannous chloride is added to the precipitate causing all of the caines except cocaine to dissolve. If the dealer suspects that the cocaine has been cut with another caine, he can then make a partial determination as to how much of the procaine or other caine is contained in the total powder.

3. *Chlorox test.* It is alleged that the dealer can take suspected cocaine and drop it in a vial of clorox. Presumably the cocaine will dissolve completely and procaine will turn a reddish orange color with any other cut trailing to the bottom of the vial as residue.

4. *Water Test.* It is also alleged by the street dealers, that a determination can be made as to how much cut is in the cocaine by placing the powdered substance in a glass of water. The cocaine will dissolve almost immediately leaving the remaining cut which normally will dissolve slower and not as clear.

5. *Burning test.* The powdered cocaine is placed on aluminum foil and held over a low flame or match. The cocaine will burn clear. A sugar cut will darken and burn a dark brown or black therefore the larger the cut, the darker the burn. Crystallized speed or methamphetamine will pop when burned. Salts do not burn and remain as residue (cuts such as procaine or quinine also burn fairly pure although it is alleged that procaine can be detected by a bubbling of the substance before it burns clear).

6. *Methanol test.* Most common cuts do not dissolve in pure alcohol although cocaine does. Unfortunately for the dealer, procaine and methamphetamine also dissolve in pure alcohol. It is imperative that pure methanol be used since any water in the alcohol will tend to dissolve sugar and salt. Methanol can be obtained in most paint supply stores as methalated spirits. The dealer will take two equal amounts of the cocaine substance and place the equal amounts in two teaspoons next to one another. At this time, ¼ of a teaspoon of pure methanol is added to one of the spoons. The mixture is then stirred and any powder that remains is compared to the original unaltered amount in the second teaspoon to determine the percentage of the cut. If, for example, 20% of the original amount did not dissolve, the substance tested would be no more than 80% pure. If the suspected cut is procaine, the cocaine substance can be added to sodium carbonate solution. This would dissolve all the cocaine leaving just the procaine.

7. *Use test.* Some dealers will test the percentage of cocaine by inhaling (snorting) it into the nostrils. This is probably the best and most common street test in determining the purity of the cocaine. The tester should standardize the amount snorted so that he will have the ability to distinguish. The tester will look for the swiftness of the high and the "freeze" or numbness the substance causes. If the nasal passages burn and the eyes tear, there is a good possibility the cocaine has been cut with speed. Sugar and salt cuts will often times cause a post nasal drip. Excessive sweating and hyperactivity could mean either a speed or quinine cut was used. Excessive diarrhea would denote a laxative type cut such as epsom salts or menita. Speed tends to cause irregular bowel movement. A greater degree of numbness indicates the presence of procaine or other local anesthesia.

8. *Taste test.* Cocaine has a bitter taste and the addition of any cut will tend to alter that taste. A milk sugar cut will sweeten the cocaine although dextrose has a tendency to sweeten the substance more than lactose. Procaine will be bitter to the taste but will tend to numb the gums and tongue quicker and longer than cocaine. Salt has an after taste and epsom salts are a bit more sour in taste and sandy in texture.

9. *Observation test.* Pure cocaine crystals have a shiny almost transparent appearance and even when crushed, will retain the

crystalline sparkle. The crystalline sparkle of cocaine will be dulled by most cuts. Dextrose has less dulling effect than lactose although a speed cut usually dulls the crystals less than most other cuts. Although salts have a crystalline structure, they tend to be duller than the cocaine crystals. An alleged indication of the purity of the cocaine is the tiny rock-like material contained within the total substance. The tiny rocks are allegedly pure cocaine as they come from the manufacturer. The rock or hard substance can be felt by feeling the powdered substance.

Once the dealer has ascertained the purity of the cocaine and/or the cut or diluting agent used, he is then ready to begin the process of "stepping on" the cocaine. Most dealers will dilute a small portion of the cocaine and then re-test it. Most of the dealers claim that they usually only cut the amount of cocaine that will immediately be sold due to the fact that the cuts have a tendency to destroy the stability of cocaine. It is therefore advantageous to the dealer to keep the cocaine sealed in a cool place such as the refrigerator and in an amber or dark-colored jar to retain the strength of the drug as long as possible. Dealers claim that with time, moisture, warmth, air and sunlight tend to decrease the potency of the cocaine.

The process for "stepping on coke" again varies with individuals but the two basic formulas are similar to those of heroin and are as follows:

1 ounce of Lactose added to 1 ounce of 100% Cocaine = 2 ounces of 50% Cocaine
2 ounces of Lactose added to 2 ounces of 50% Cocaine = 4 ounces of 25% Cocaine
2 oz. Lactose added to 1 oz. 100% Cocaine = 3 oz. of 33 1/3% Cocaine
3 oz. Lactose added to 1 oz. 100% Cocaine = 4 oz. of 25% Cocaine
4 oz. Lactose added to 1 oz. 100% Cocaine = 5 oz. 20% Cocaine

The dealer will measure out the desired amount of cocaine, for instance five level teaspoons, and place it in a pile on a flat nonporous surface such as a record album, mirror or glass plate. He will then measure out the desired amount of lactose and place it in a separate pile on the same surface. Then, using a playing card, razor blade, knife or any sharp edged instrument, the dealer chops the cocaine to take out all the lumps so the cocaine is a fairly fine powder. The cocaine is then sifted through a sifter or nylon stocking producing a fine fluffed powder and removing foreign material from the substance. Once through the sifter, the cocaine usually has a little more volume since it has been fluffed. The cocaine is sifted into a pile and the same process is repeated with the diluting agent. The dealer

will then mix the pile of cocaine into the pile of diluting agent. Once this has been accomplished, he sifts the diluted cocaine through a sifter trying to get the mixture as equal as possible. The dealer may resift the diluted cocaine to assure an equally distributed mixture. The sifted cocaine is placed in a single pile. At this time, the dealer is ready to place the cocaine into packages for sale.

In larger quantities, the cocaine is usually packaged in either airtight rubber condoms or plastic baggies that are also airtight. A rubber condom will usually hold from ½ ounce to 3 ounces of cocaine whereas a plastic baggie can hold up to 6 ounces of cocaine. It appears that most dealers prefer using the plastic baggie since it is believed that synthetic hard plastics and rubber tend to react unfavorably with cocaine in terms of chemical composition and therefore in time, decrease the potency of the cocaine. Smaller amounts or gram quantities of cocaine are usually packaged in smaller airtight clear plastic bags, paper bindles or tin foil bindles. It is very uncommon to see cocaine packaged in toy balloons the way heroin is packaged because of the action of the rubber with cocaine.

Once the dealer has diluted the cocaine, he will measure out the desired amount to be packaged. This can be done by measuring it on a scale.

For ounce quantities, the dealer will measure on a scale approximately 28 grams and then place this powder into a rubber condom or a plastic baggie. The dealer will then, using a rubber condom, tie a knot in the condom and possibly fold the open end back over for added protection. When using a plastic baggie, the dealer will get as much of the air out as possible and either fold the baggie over and seal it with scotch tape or use a twister to seal the end of the baggie. Another method of determining the proper amount of cocaine to be packaged is by using measuring spoons. If the dealer is going to use the most common measure of cocaine, that is a "spoon" or approximately a gram, he will measure out a level half teaspoon and place it in the proper packaging device. When using paper bindles, the dealer will place the cocaine on the extreme inside of the paper bindle, usually a square piece of paper with 4 inches by 4 inches being a common size and drawing the two opposite ends together to form a triangle. The dealer will then begin at the base of the triangle and fold approximately ¼ inch folds in the paper bindle until there is approximately an inch of unfolded triangle left at the top. The outer wings of the paper bindle are then folded inside and the unfolded top of the bindle is folded and tucked into the

wings. When using tin foil, the dealer will put the desired amount inside a square piece of tin foil, fold the square over into a rectangle, seal the top with a small fold and then fold the extreme ends into the inside.

Once the cocaine has been packaged, it is ready to sell to either smaller dealers or to users.

How to Grow Coca Plants

1. Seeds should be planted as soon as they fall from the bush. If they dry out, they will die right away. The only way to keep them for a maximum of about two weeks, is to keep them in moist (not wet) sphagnum in a cool place. Often this initiates germination, so they must be watched for rot or premature germination. Under no circumstances should they be kept dry, since even room humidity is too dry.

2. Vermiculite seems to be the best medium for coca germination, fine grade if possible. Styrofoam cups are OK, but I prefer small plastic pots, 2"diameter, with holes in the bottom. Seeds should be planted no deeper than one inch. Pots should be raised so as not to saturate the medium. Coca, whether as a seedling or a mature plant, never likes to have wet feet. I think it is better to start them in small pots rather than flats, so there is less damage to the root system when they are transplanted. Forget the hot pad -- I think it is completely unnecessary. Seedlings usually come up in 2 to 4 weeks if they are viable.

3. Since most people don't have enough room in their shower stalls for plants, I'd say forget this one, too. Seeds will germinate in any warm place, even if the humidity is not too great. A better idea is to place your germination pots in a terrarium with a coarse gravel layer on the bottom. Do not seal over and allow plenty of ventilation if you choose to place a layer of glass over the terrarium. Any box of this sort will do. If possible, place a Growlux fluorescent fixture, with two 40 W bulbs, over the terrarium, especially after seeds germinate. A common problem at this state is etiolation (too little light) which makes the plantlets weak and very susceptible to damping off, a fungus attack of the tender stems.

4. Water the seeds when the vermiculite starts to dry out. Once a day is probably too often, unless you live in a very dry apartment. But if the drainage is good and you have plenty of holes in the bottom of the pots, excess water should drain off.

Fungal attack is a real problem in a humid atmosphere and another reason for keeping the plants out of your shower, a basically unhygenic place for plants.

5. Transplanting: plantlets can remain in vermiculite starting pots until they are about 2-3 inches tall. The growlights should be about a foot above the plants. I do not recommend clay pots at this stage. They dry out too fast, especially in a dry apartment. Even in one day, a fast-drying shock can kill your plants. It is better to move into plastic pots, but the size should be increased gradually. A big pot is not necessarily good for a small plant, in fact it is not a good idea at all. From styrofoam cups, I suggest a two-inch pot, then increase 1-2 inches per transplanting.

6. Soil mixture: forget the vermiculite from now on. It holds too much moisture and makes for saturated, unhealthy soil. I suggest the following: ¼ coarse clean sand, ¼ perlite, ¼ sterilized loam, and ¼ milled peat. If this seems too light, increase loam and peat. Some sterilized organic compost, screened, may also be added for nutrition.

7. Even when the plants are still in vermiculite, feeding with soluble plant food is recommended. They are heavy feeders and every three weeks or more often is not too often to fertilize. When plants are older it is important to give them iron in the form of iron chelate, available as a red powder sold as KEELATE on the West Coast. A yellow powder, not as good, is sold as SEQUESTRENE. This element should be added about every six months, but strictly according to instructions. Soil must be flushed three times after applying the dissolved iron compound to avoid burning roots. Most yellowed or bleached out leaves are caused by iron deficiency, but this also occurs when plants go deciduous. Periodically, the whole coca bush turns yellow and drops its leaves, every one. Most people freak out when this happens, but if it is otherwise a healthy, vigorous plant, then this is normal. After dropping, new flushes soon appear to renew the foliage. This is more likely to happen with *Erythroxylum coca* than with *E. novogranatense*.

8. Transplanting depends on the size of the plant and how fast it is growing. If you think your plant needs transplanting, look at the holes in the bottom of the pot to see if any roots are present. If so, then the roots have probably filled the pot and it is time. You can also carefully de-pot the plant by tapping upside down

on a table edge. Repotting is probably unnecessary unless the roots have encircled the inner periphery of the pot. Again, the size of the pot should be increased gradually for best growth.

9. Watering: most city water, is unsuitable for coca. They are calciphobes and don't like heavy salts in the water. Best to use rainwater, melted snow, bottled spring water or distilled water if they are available. Plants should only be watered if the soil dries out. Stick your finger in the soil. If it feels moist, don't water.

10. Bugs: coca is amazingly resistant to insects and mites. Mealy bugs are the worst offenders. These may be removed with a forceps or cotton swab dipped in 50-70% alcohol. Keep infested plants in quarantine. Malathion may be used as a last resort, but then leaves cannot be used until the next flush (of leaves).

11. Light: warm, sunny exposure indoors. Full sun (through a window) will not hurt plantlets over 3 inches tall. But no full sun outdoors until they are 3 feet tall. If plants are put out in the summer, they should be protected from sun, rain, and wind, until they are large and strong. Put them in a shady place first, under a tree, etc., and gradually move to a sunnier location. Breezes are good for plants and even indoors a fan on low should be directed towards the plants. It makes them stronger.

12. Plants can also be grown entirely under growlights, or a combination of growlights and window light. Most apartments are not sunny enough for strong growth, so especially in winter, give the plants accessory light. Growlux Widespectrum Tubes seem to work well. I use one Growlux and one regular Sylvania Lifeline tube in each fixture. They work very well. The lamps are suspended 6 inches to one foot above larger plants.

13. Careful removal of the older leaves does not harm plants, but they should be strong and healthy to allow this, and probably three years old if grown indoors.

14. Coca does not like extremes of any kind. 50° F. is the lowest permissible temperature, 90° F. the highest. Sudden temperature changes are especially damaging. Likewise, sudden changes in air humidity or soil moisture. *E. novogranatense* tolerates extremes, especially droughts, better than *E. coca*, which is a much more delicate plant, but the one which

produces the most alkaloid.

15. Coca cuttings root very poorly. I have managed to root some *E. novogranatense* cuttings only after six months in perlite with an initial application of Hormodin #1 rooting hormone. It is better to fertilize your flowers and plant seed. Some varieties are self-compatible (self-fertilizing). Others require two plants of different stylar lengths (long styled x short styled) to produce seed. This is routinely accomplished by bees and other insects in the greenhouse during the summer months and can be done with a fine artists brush at home, merely by dusting pollen from flowers on one plant to those on another with opposite stylar form.

In California, outdoor cultivation of coca is possible only around San Diego, if there. Trujillo Coca would probably do well there under irrigation and intensive care. Elsewhere, forget it. I do not subscribe to growing it commercially indoors and doubt if the produce would be worthwhile. Greenhouse and apartment grown leaf is very inferior in flavor and potency. Fresh air and sunshine are in order (as with Cannabis).

Additional Notes

1. When plants are sprouting, it is OK to have several of them in the same pot -- a 5-inch clay pot will do for between 4 and 7 sprouts. When they reach at least two inches tall, it is good to transplant them into individual pots using the soil mixture recommended earlier.

2. In handling the young plants, no matter how tall or short they are, always be careful not to touch the young plants or to touch them as little as possible, particularly on the roots and on the tips of the stems. The tips of the stems are where the shoots come from that allow the plant to grow, and even when the plant is mature, never touch the end of the stems and never remove the leaves that cling precariously to the end of the stem.

3. Don't freak out when the plants go deciduous, usually about a year or a year and a half from sprouting. They drop almost all their leaves except the ones at the tip of the stems, turn yellow and mottled, and you think they're dying. They're not -- in fact, they're growing! Within a few days, little spike-shaped green sprouts will appear, and tiny, usually white, flowers. After a few years, the flowers will start producing little

seedpods, roundish oval shaped green pods that the flower may still cling to. These then dry and turn slowly red on the plant, reaching a bright red like a cherry-colored coffee fruit, which contains the albumin and nourishment for the tiny seed in the center. Usually the shrubs will go through the leaf-fall several times, about once every 2 or 3 months, before the seedpods appear. Don't expect seeds until the plant is 3 to 5 years old.

4. Back to when the plants are still sprouts. Every day -- usually in the morning, but it depends on what fits your schedule best -- once a day, flush the pots with clean water, preferably rainwater or distilled. Literally hold the whole pot (without its saucer) under very gently flowing water poured into the vermiculite or soil without touching the plant. The soil or medium should almost let the water drain straight through, retaining moisture but not water in the medium. This is the way to "water" a young plant. When they get older, you can just water them regularly like any other plant, but lightly, daily.

5. The most important thing in tending young plants is to keep the temperature *even* and constant, day and night, around 64° F. They can stand slightly higher or lower temperatures but they can't stand *shifting* temperatures.

6. Once the plants get to be above a foot, they are pretty well established. After that first scary leaf-dropping, you will learn to recognize that process when it happens as described in Note 3 above. There is a different phenomenon that looks somewhat similar that happens to plants if they go through a sudden temperature change, especially if it gets cold suddenly or if they are exposed to cold fog and winds without much warm sunlight. In this case, the leaves very quickly become dry and crinkled and turn deep brown and yellow-brown mottling, at first on their leaf tips and soon covering the whole leaf. This means your plant is about to die. The only thing to do is to lightly spray the leaves with pure (not tap) water and keep the plants at a constant warm temperature and talk to them and keep careful watch on them. Don't over-water, but keep the leaves themselves warm and moist. The plant has a 50% chance for recovery.

MISCELLANEOUS PSYCHEDELICS

Mexican Mint

Leaves of the Mexican mint Salvia divinorum are chewed by some Mexican Indians for their hallucinogenic properties. Various other species of this genus grow in the USA (e.g., the purple sage), but chewing and swallowing a handful of winter leaves of five different species growing in the western USA produced nothing other than mint-flavored burps. Either a larger amount is necessary, or only the Mexican species is active. Nurseries and seed companies sell various species. *Salvia divinorum* (hojas de la Pastora) is cultivated by the Mazatecs of Oaxaca, Mexico and seems not to grow wild. They use the juice from about sixty leaves. The chia seeds popular with natural foods people come from a species of Salvia.

Catnip

Smoking the leaves of catnip *(Nepeta cataria)* produces only mild effects in man. However, the pure active agent, cis, trans-nepetalactone, seems not to have been tested on man. Seeds are available from several companies and the freshly picked leaves are probably more potent. Catnip is not orally active in cats. For synthesis see Corsi Semin. chim. 11,93(1968) et seq.; BCSJ 22,1737(1960); Proc. Chem. Soc. 166(1963). JOC 37,3376 (1972) gives a synthesis of dihydronepetalactone (more attractive to cats than nepetalactone).

Nitrous Oxide

The laughing gas trip is interesting, but very short (a few minutes). Since breathing N_2O or N_2O-Air for longer periods will produce anoxia, mixtures containing 20% O_2 and up to 80% N_2O can be breathed for longer periods. Do not breathe gas directly from a tank, since this can freeze your lungs, and do not fit a mask tightly over the face.

LAUGHING GAS (And/Or Press, 1973) is the best reference on the psychedelic effects of nitrous oxide. N_2O can be produced by heating ammonium nitrate at 240° until gas evolution ceases (the

gas should leave the flask through a tube passing successively through a water trap and a water filled bottle, before collection in a plastic bag).

Rat Root

The root of the plant *Acorus calamus* (also called flag root and sweet calomel), which grows over much of the world, is chewed by the Cree Indians of Canada to produce psychedelic effects. The active compound seems to be asarone — a precursor in an hallucinogenic amphetamine.

Ibogaine

This compound, the active constituent of *Tabernanthe iboga,* a plant used for its psychic effects by African natives, has recently been synthesized. However, there seems to be nothing in the trip it produces to justify the arduous synthesis (likewise for the structurally similar yohimbine).

Kava Kava

Extracts of the plant *Piper methysticum* have been used in Polynesia, probably for thousands of years, and *Piper plantagiveum* is similarly used in Mexico and the Caribbean. They produce a sleepy, relaxed feeling with eventual difficulty in walking. Dihydromethysticin seems to be the most active constituent, but even this has little effect until about 3 g is taken. There would appear to be no point in synthesizing this or the other active compounds, but those interested may consult JOC 24,1829(1959) and Prog. Chem. Org. Nat. Prod. 20,131(1962), and Pacific Sci. 22,293(1968). For the best review see Bull. on Narcotics 25:59-74(1973). Some people find kava extracts quite pleasant. There is very little human research on these compounds and probably won't be (unless they become popular psychedelics).

Heimia

The leaves of various *Heimia* species (sinicuichi to the natives), found in the highlands of Central and South America, are reputedly psychedelic. One species is also found in the southern US. The hallucinations are mainly auditory and the active compound appears to be cryogenine (vertine).

Betel Nut

The nut of a palm tree is chewed by millions is Asia and elsewhere with the leaves of *Piper betel* to produce mild stimulatory effects. Arecolin and arecaidinen are among the active constituents, but they

appear to be psychedelically uninteresting.

Canary Weed

The blossoms, and possibly the leaves and beans, of *Genista canarienis* and probably the related genus *Cytisus* give a mild psychedelic effect when smoked. These plants are available at many nurseries.

Club Moss

The club moss *Lycopodium gnidiodes* (known as somarona to the natives of Madagascar) is said to produce effects similar to those of marijuana when smoked. Other species of this genus are found in the USA, and the pictures are given in any botany text. Some members of the genus *Myrothamnus* are also active.

Nutmeg

This trip is best avoided since it produces delirium and other toxic effects.

Mimosa

The roots of the sensitive plants of the genus *Mimosa* are supposed to be psychoactive. They are known to contain DMT.

Phenothiazines

Some phenothiazine derivatives (tranquilizers) can be hallucinogenic at high doses (e.g., imipramine (Tofranil) at oral dose of about 1 g and Ethopropazine (Parsidol) at 100 mg).

Morphine Analogs

Some of the morphine analogs can occasionally be hallucinogenic. Nalline (Nalorphine) used to monitor heroin use, M285 (Cyprenorphine) and cyclazocine are some of the better known examples. See the Merck Index for references to the synthesis of these compounds.

Morphine Analogs — Psychopharmacologia 30,108(1973) describes a thebaine derivative, active at less than 100 micrograms, which produced a trip described as a combination of downers, LSD and itching powder.

Dextromethorphan, contained in many nonprescription cough medicines, will produce a heavy psychedelic trip, but the nausea characteristic of the opiates may constitute a problem. Kosterlitz and Villareal (Eds.) AGONIST AND ANTAGONIST ACTIONS OF NARCOTIC ANALGESIC DRUGS (1972) and Braude et al. (Eds.) NARCOTIC ANTAGONISTS (1973) are useful.

PCP

This compound (also known as Sernyl, Phencyclidine, angel dust and 1-(1-phenylcyclohexyl) piperidine) has been used as an animal tranquilizer and as a general anesthetic for human surgery. Clinical tests have shown that it has a strong tendency to produce bummers, even in people who dig other psychedelics, but under appropriate conditions some subjects like it. It produces no visual effects, a tendency to fear and anxiety, and could not easily be confused with any other psychedelics. The trip is short (about two hours) at least with low doses (about 10 mg). PCP is probably a waste of time.

The common practice of mixing PCP with LSD is stupid since they are antagonistic.

Antiparkinson Drugs

Various drugs used in the treatment of Parkinson's disease (e.g., Benactyzine) can be hallucinogenic at higher doses. However, since they seem to produce a trip like that of the glycolate esters (Ditran, etc.), which they structurally resemble, these compounds should be avoided.

Belladonna

This drug got its name from the practice of certain Renaissance ladies who used it to dilate their eyes, thus enhancing their beauty. Hyoscyamine is the active constituent of the shrub *Atropa belladonna* and of jimson weed *(Datura stramonium)*. The related drug scopolamine occurs in various plants such as henbane *(Hyoscyamus niger)*. These compounds are found in many nonprescription cold remedies, motion sickness pills, etc. The hallucinogenic effects of these plants have been known over much of the world for millennia, and have been widely used by poisoners, oracles, witches, doctors, priests, and heads. They first produce excitation, dry mouth, increase in heart rate, etc., and later hallucinations and nervous depression. The trip is *very* heavy, people frequently being delirious and hallucinating for long periods with a total loss of ability to tell the real from the imaginary; carrying on conversations with imaginary people, smoking nonexistent cigarettes, etc. These compounds are not to be recommended as psychedelics since they have a strong tendency to make you sick, delirious and totally spaced out.

Ditran and Other Glycolate Esters

There is usually complete amnesia for all but the early portion of the experience. However, judicious use of small quantities may

provide a separate reality unattainable by any other means (see R. Alpert BE HERE NOW (1971) near the end of the Bhagavan Das section where he describes JB-318 (a glycolate ester)). Originally this book contained a chapter on these compounds, but after several trips, I decided they were too heavy for general consumption. A careful study of the effects in man of ditran, scopolamine and atropine has appeared (Psychopharmacologia 18,121(1973)). The study concluded that the 3 drugs are qualitatively similar and that the effects are best classified as simple delirium.

MTQ

Also known as methaqualone, Quaalude, 'ludes and wallbangers. This drug is addictive, sometimes fatal (especially when combined with alcohol) and is best left alone.

Aminotetralins

A new class of compounds with probable hallucinogenic activity is 2-amino-7-hydroxytetralins. Life Sci. 12, pt. 1,475(1973) gives references and JMC 16,804(1973) gives a synthesis of related compounds.

Ketamine

Snorting ketamine gives brief but bizarre effects. See CA 61:5569d or US Patent 3,254,124. for synthesis and the recent writings of John Lilly and others for effects.

LITERATURE AND CHEMICAL HINTS

Journal Abbreviations

ACS = Acta Chemica Scandinavica
AP = Archiv der Pharmazie
BCSJ = Bulletin of the Chemical Society of Japan
BER = Berichte der Deutsche Chemische Gesellschaft
BSC = Bulletin de la Societe Chimique de France
CA = Chemical Abstracts
CCCC = Collection of Czechoslovakian Chemical Communications
CJC = Canadian Journal of Chemistry
CPB = Chemical and Pharmaceutical Bulletin
CT = Chimie Therapeutique (chimica Therapeutica)
GCI = Gazzetta Chimica Italiana
HCA = Helvetica Chimica Acta
JACS = Journal of the American Chemical Society
JBC = Journal of Biological Chemistry
JCS = Journal of the Chemical Society
JGC = Journal of General Chemistry (English translation of Zhurnal Obschei Kimii)
JHC = Journal of Heterocyclic Chemistry
JMC = Journal of Medicinal Chemistry
JOC = Journal of Organic Chemistry
JPS = Journal of Pharmaceutical Science
LAC = Leibigs Annalen der Chemie
MON = Monatshefte fur Chemie
REC = Recueil Travaux Chemiques
TET = Tetrahedron
TL = Tetrahedron Letters

Chemical Hints

Much useful information can be found in any lab text in organic chemistry such as that of Wiberg.

Much information on chemicals, equipment, etc. can be obtained from the various trade journals and newspapers such as *Chemical Marketing Reporter*. Many companies sell used tabletting machines (e.g., Union Std. Equip. Co. in New York and Chicago and Chemical and Process Mach. Corp. in New York).

Drying

Shake the solution with an anhydrous salt such as $MgSO_4$, Na_2SO_4, etc. and filter out the salt. Solids can be dried by spreading on a filter paper at room temperature or drying in an oven at low heat.

Solvents

All solvents should be anhydrous unless otherwise specified. This can sometimes be done by drying as above and is to be attended to especially in the case of ethanol which is available in 95% or 100% (100% takes up water from the air very rapidly).

Joints

Whenever apparatus with ground glass joints is used, Dow silicone grease provides excellent lubrication and airtight seal.

Petroleum Ether

This usually refers to the light boiling fraction (60° - 80°) of petroleum ether which must not be confused with "ether" which refers to diethyl ether.

Vacuum Evaporation

This requires a heavy-walled flask. Ordinary lab vacuums are about 15 mm Hg. A simple water-forced suction vacuum requires only a water source to produce a vacuum of about 25 mm Hg, which is satisfactory for most purposes. Evaporation causes the temperature to drop which slows evaporation. Running a stream of warm water over the flask or putting it in a warm water bath avoids this. To avoid difficulties in getting residues out of the bottom of the flask, it is useful to do the evaporation in a vacuum exsiccator shaped as shown or in a flat dish in the exsiccator. Whenever a forced water vacuum is used, it is wise to place a water trap between the vacuum and the solvent being evaporated to prevent water from entering when the pressure fluctuates.

Vacuum Exsiccator

Stirring

This can be done in the old way with a stirring propeller entering through one of the necks of the flask, attached to a nonsparking motor. It is easier to sit the flask on a magnetic stirrer, and drop a magnetic stirring bar (preferably Teflon coated and egg shaped for round-bottom flask) in the solution.

Heating and Refluxing

Do not smoke or have any flames (such as pilot light on gas appliances) around when using organic solvents, especially ether. Bunsen or other types of gas burners are generally outmoded. Much better are electric heating mantles available for each size of round bottom flask. Put a rheostat in the circuit to regulate the temperature of the mantle. For refluxing, adjust the rheostat so that the vapor level in the water-cooled condenser is about a quarter of the way up the condenser. Heating plates or combination heating plate-magnetic stirrer is also useful.

Ventilation

If a lab hood is not available, some forced air ventilation such as a large fan near a window is advisable, especially if ether is used.

Lithium Aluminum Hydride

Lithium aluminum hydride is expensive and often difficult to obtain. It can be synthesized (JACS 69,1197(1947)), but this is rather tricky. Its use can usually be circumvented by using a different reducing method or a different synthetic route.

Safety

An explosion shield, asbestos gloves, face mask and tongs are desirable.

A substitute for Raney-Nickel, JACS 85,1004(1963)

For the use of $NaBH_4$-Nickel in hydrogenation see JOC 38,2226(1973). For various articles on hydrogenation see Ann. N.Y. Acad. Sci. 214(1973).

5 mMoles Ni acetate in 50 ml water in 125 ml Erlenmeyer flask; connect as below to Hg pressure outlet. Flush with N_2, stir and add over 30 seconds with the syringe, 10 ml 1M $NaBH_4$ in water. After hydrogen evolution ceases, add 5 ml more of $NaBH_4$. Decant the aqueous phase, wash solid with 2X50 ml ethanol to get the Ni-boride catalyst as a black, granular solid. Hydrogenation can then be done as described below at room temperature and atmospheric pressure.

A Highly Active Raney-Nickel Catalyst, JOC 26,1625(1961)

Add with stirring, in small portions over ½ hour, 40 g 50% Raney-Ni to 600 ml 10% NaOH in a 1 L three-neck flask and continue stirring one hour. Let the Ni settle and decant the solution. Wash residue with 5X200 ml water, 5X50 ml ethanol, always keeping the Ni covered with liquid. Store under ethanol in refrigerator. Hydrogenation with this catalyst can be carried out in a low pressure Parr bottle (e.g., 30-80 ml ethanol, 5-10 g Ni suspension, 1-2 ml 20% NaOH, 40° - 50° and 40-60 PSI H_2).

A New Method for Hydrogenating at Room Temperature and Atmospheric Pressure

Method 1: External Generation of Hydrogen JACS 75,215(1953)

This method reduces the solvent volume in the reducing flask for large-scale work. Add 1M $NaBH_4$ in water to an aqueous HCl or acetic acid solution containing a little $CoCl_2$, if necessary for a rapid rate.

Method 2: Internal Generation of Hydrogen JACS 84,1494-5, 2827-30(1962)

Three-necked flask fitted with a graduated dropping funnel or a 50 ml burette, an inlet port fitted with a rubber serum cap, and an Hg manometer which allows gas to escape when the pressure exceeds about 25 mm above atmospheric pressure. At room temperature (25° water bath) with stirring, add 1 ml 0.2M chlorplatinic acid (commercial 10% is about 0.2M) to 40 ml ethanol and 1 g decolorizing carbon (e.g., Darco KB — may omit this but the reaction is slower). Flush with N_2 if possible and add 5 ml 1M $NaBH_4$ (prepared from 3.8 g $NaBH_4$, 95 ml ethanol, 5 ml 2N NaOH) rapidly to a vigorously stirred solution (black precipitate forms). After about one minute inject about 4 ml concentrated HCl or glacial acetic acid to initiate hydrogen generation. Then inject about 0.02M of the unsaturated compound. Add $NaBH_4$ dropwise so that flask pressure remains about atmospheric pressure. Reaction is over when uptake ceases. $NaBH_4$ addition can be made automatic by putting a syringe full of it in an Hg-filled tube (about 15 mm Hg, with holes so that as the pressure drops, more solution enters). This apparatus is available from Delmar Scientific Labs. Can also use $PdCl_2$, $PtCl_4$, Ni, Rhodium, PtO_2, platinum-carbon catalyst, palladium-carbon catalyst in place of shloroplatinic acid, but the last three are poor. Other salts can be used in place of the chlorides.

Note that the above procedures permit hydrogenation without the

use of hydrogen tanks or special hydrogenation apparatus (Parr bottles, etc.).

Other references on the use of boron compounds for reduction: Org. Rxns. 13,28(1963); JACS 86,3566(1964); JOC 28,3261 (1963); JCS 371(1962).

Crystallization

Extreme dryness of solvent is often necessary for crystallization. This can often be accomplished (e.g. for diethyl ether) by carefully adding lithium aluminum hydride to the predried solvent, mixing thoroughly to allow reaction with water and filtering. A simple method of generating HCl gas for crystallization is to add concentrated sulfuric acid dropwise to concentrated HCl and pass the resulting gas through drierite (or similar water absorbing substance) prior to bubbling it through the solution of the base in ether or other solvent.

Diazomethane Org. Synth. Coll. Vol IV,250(1963)

CAUTION: Diazomethane is explosive (sharp edges trigger it) and poisonous, so avoid ground glass joints, chipped glassware, etc.

Fit a 125 ml distilling flask with a condenser and a long stem dropping funnel. The condenser is connected via an adapter to a 250 ml Erlenmeyer flask. Through the second hole in the stopper of the Erlenmeyer is placed an outlet tube bent so as to pass into and nearly to the bottom of a second Erlenmeyer which is not stoppered. Cool both receivers in an ice-salt mixture and place 10 ml ether in the first flask and 35 ml ether in the second flask. The inlet tube is below the surface of the ether in the second flask. Place 6 g KOH dissolved in 10 ml water, 35 ml Carbitol (monoethylether of diethylene glycol), a magnetic stirring bar and 10 ml ether in the distilling flask. Adjust the dropping funnel so that the stem is just above the surface of the solution in the distilling flask. Place a solution of 21.5 g p-tolylsulfonylmethyl-nitrosamide (org. Synth. C.V. IV,943(1963)) in 125 ml ether in dropping funnel. Heat the distilling flask in a water bath at 70-75° with magnetic stirring and add the nitrosamide at a regular rate over 15-20 minutes. Then add more ether from the dropping funnel at the previous rate until the distillate is colorless (50-100 ml ether). The distillate contains about 2.8 g diazomethane. If desired, the diazomethane may also be prepared in ethanol.

For the in situ generation of diazomethane see TL 1397(1973).

Use powders or residue of an extraction.	Add 2 drops of color reagent. Compare color produced with reference compounds on spot plate or other white porcelain surface.	Color Reagents: ρ-DMAB-TS: To a cool soln of 65 ml H_2SO_4 in 35 ml H_2O, add 125 mg *para*-dimethylaminobenzaldehyde, dissolve, add 1-2 drops of $FeCl_3$-T.S. (9 g $FeCl_3$ in 100 ml H_2O). Ethanolic ρ-DMAB: dissolve 2 g of *para*-dimethylaminobenzaldehyde in 50 ml ethanol, qs to 100 ml with HCL.

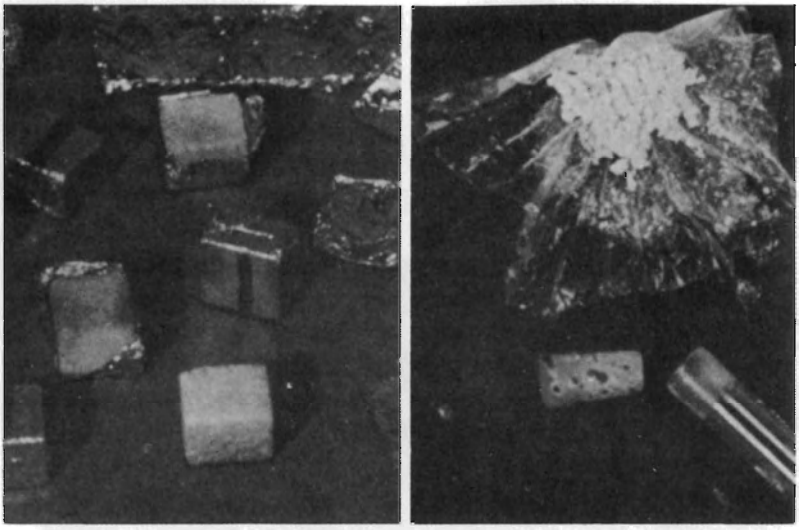
Spot Test for Some Psychedelics

Compound	Reagent and color formed	
	p-DMAB-TS	Ethanolic *p*-DMAB
LSD	Blue	Purple
Lysergic acid	Blue	Purple
DMT	Yellow	Purple
DET	Yellow	Purple
Bufotenine	Green	Blue
Ibogaine	Yellow-green	Green-blue
Psilocin	Brown	Deep blue
Psilocybin	Yellow-green	Purple
Ergonovine	Blue	Purple
Indole	Yellow	Orange
Tryptamine	Yellow-green	Purple
STP	Light yellow	—
Blank	Colorless	Light yellow

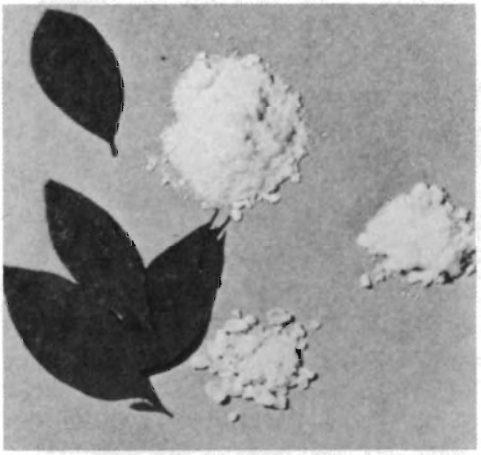
MISCELLANY
ON UNDERGROUND LABORATORIES

LSD. In 1971, about 274,000 LSD dosage units were seized; in 1972, 340,000; in 1973, 490,000. In the first four months of this year, already 364,000 units had been seized. It is estimated that only a fraction of the amount of LSD available is seized. Sixty-four sets of LSD punches are known to have produced LSD for the illicit market during 1973, by contrast with the previously recorded high of 27 sets of punches known to have been operative in 1971.

Cone-shaped LSD tablets were seized by BNDD agents in Detroit in June. These were the first LSD tablets encountered in this shape. The seizure consisted of 10,000 brick-red tablets. Analysis revealed approximately 40 micrograms of LSD per tablet. The method of packaging was also a first. The tablets were in plastic bags (1,000 per bag), folded in such a way as to form a cone. Each cone-shaped tablet measured six millimeters from base to apex, with the base slightly larger than the cone, giving a collared effect. The collar was 6.8 millimeters in diameter and 1.8 millimeters thick. On the collar face opposite the cone was a truncated cone approximately the same thickness as the collar. *(Nov. 1970)*



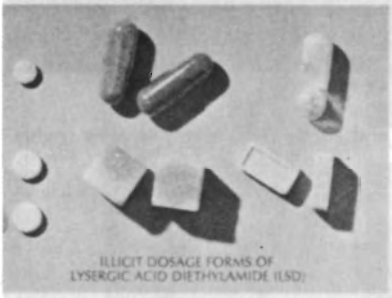
Late 60's European LSD on sugar cubes and candy (left) and mescaline (right).



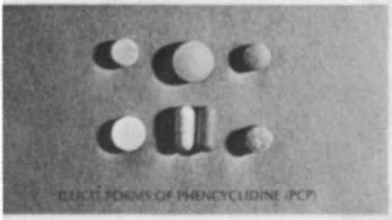
Coca leaves and cocaine hydrochloride. *Above*, an unusual crystalline form; *below* cocaine as it usually appears on the illicit market.

Hallucinogens
LEGITIMATE DOSAGE FORMS OF
LYSERGIC ACID DIETHYLAMIDE (LSD)

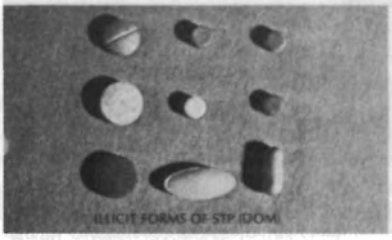
PEYOTE CACTUS, BUTTONS AND


ILLICIT DOSAGE FORMS OF
LYSERGIC ACID DIETHYLAMIDE (LSD)

PSILOCYBE


ILLICIT FORMS OF PHENCYCLIDINE (PCP)

LEGITIMATE DOSAGE FORMS OF PSILOCYBIN


ILLICIT FORMS OF STP (DOM)

DIMETHYLTRYPTAMINE (DMT)
ON TOBACCO AND PARSLEY LEAVES

The Perils of PCP

On January 16, 1974, a postal deliveryman on his rounds in Rockville, Maryland, found the owner of what purported to be an electronic circuit manufacturing plant lying unconscious in his laboratory.

The deliveryman called the local fire and rescue squad, who found on the premises quantities of ether, alcohol, and other inflammable substances. The rescue squad called the fire marshal. Upon examination of the laboratory, the marshal called DEA.

The presence of an illicit laboratory in the suburbs of the nation's capital (pictured on this page) had not gone entirely undetected. Federal authorities were first alerted to the possibility when a Wisconsin chemical firm informed DEA's Milwaukee office of orders received from the Rockville plant for precursors used to produce phencyclidine, a potent hallucinogenic drug, more commonly known as PCP.

A check with the Montgomery County police soon revealed that they, too, had the plant under investigation through a lead supplied to them by a laboratory apparatus distributor.

DEA and the county police were in the process of subpoenaing records from the two companies that had provided the leads when the call came from the fire marshal that brought the case to a sudden head.

The laboratory operator, when he woke up, was arrested, and is now awaiting trial in Montgomery County charged with the illegal manufacture of PCP. (As it turned out, he was found to be suffering from an overdose of a drug prescribed by his doctor.)

Seized on the premises were more than 90 pounds of PCP with a street value of $25 million—half of it in liquid form, the other half in powder form.

PCP in liquid form is sprayed on marijuana, parsley, oregano, or other plant leaves, and sold as "angel dust." In powder form it is sold under the deceptive name of "peace pills."

Developed as an animal tranquilizer by Parke-Davis & Co., a pharmaceutical firm in Detroit, it is now manufactured legally only by Bio-Ceutics, a firm in St. Joseph, Missouri. The drug is not prescribed for human beings because the range between effective and toxic doses is narrow.

Its unobtrusive but wide illicit diffusion is attributable in part to a reputation for being similar to—but safer than—LSD. Physicians, however often find PCP "trips" difficult to treat due to ignorance of the drug's identity; it is often sold to the unwary as mescaline, LSD, THC, or mixed with other drugs for illicit sale.

On March 1, six weeks after the Rockville seizure, a second major PCP ring closed down when DEA agents, after obtaining a search warrant, raided the attic of a small private home on the outskirts of Detroit, Michigan.

In the attic was an elaborate laboratory stocked with half a million dollars worth of drugs and equipped with an impressive array of test tubes, chemical filters, scales, and chemistry textbooks. Chemicals from the laboratory were pressed into pills at several other locations.

The entire drug ring, it was estimated, produced about a million PCP pills per week.

How many PCP users there are in the country is difficult to estimate. Its effects include feelings of weightlessness, diminishing

body size, and catatonic rigidity, accompanied by a sense of dying or already being dead.

A physician at Detroit's Lafayette Clinic noted that the drug was so powerful his hospital was forced to discontinue tests of it when it could not find enough subjects who were willing to try it twice.

MDA LABORATORY FOUND IN DENVER

On May 24, 1974, a senior at the University of Colorado, was sentenced in the state's U.S. District Court to four years in prison and three years parole for manufacturing an hallucinogenic drug and possession for distribution.

His longtime partner, who was found guilty on the same two counts, received an indeterminate sentence under the Federal Youth Corrections Act not to exceed four years.

These were the largest producers on record of a drug called MDA—methylenedioxyamphetamine. Chemically related to both mescaline and amphetamine, MDA is a potent stimulant with a history of reported fatalities since it was first synthesized in the 1930's. Its hallucinogenic potency is reported to be three times that of mescaline.

The pair, who had been the subjects of recurrent investigations by federal enforcement officials, were spotted one morning in a passing car by a DEA agent working out of the sheriff's office in Boulder, Colorado.

The agent had, as it happened, been investigating their activities only last summer at an abandoned missile site 50 miles north of Cheyenne, Wyoming.

Previously, in 1971, they were believed to be operating a clandestine MDA laboratory in Eugene, Oregon, under the name of Northwestern Orangefield Oil and Aromatics Company.

DEA records also indicate that he had earlier been implicated in operations of clandestine laboratories in Los Angeles in 1966 and Boulder, Colorado, in 1967.

"They've popped up here and there for a few months at a time," said the undercover agent who recognized them. "But we never got enough evidence on them for a warrant."

He stopped them, he said, "to get ID's and to see what was going on."

In the possession of one of the suspects, he found a small caliber pistol as well as a large number of suspected amphetamines.

The two suspects were then taken to DEA's regional office in Denver. Both were later booked into Denver City Jail.

Meanwhile, the agents had found in the suspects' car records of a company called Solar Metallurgicals with a Denver address. The company, located in a large one-story cinderblock building, was unoccupied when they got there. Walking around the building, they noted a pervasive aroma of ether, although the windows were lined with tape.

They notified the Denver police, whose narcotics officers were, in fact, already in the process of investigating this company.

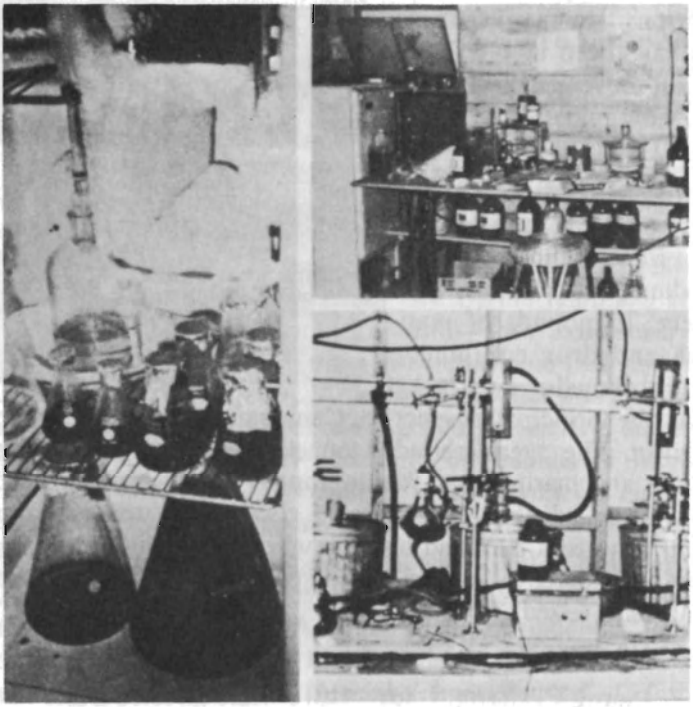
Late that afternoon a search warrant was executed by federal and local narcotics officers, resulting in the discovery of the largest illicit laboratory of its kind ever encountered by drug enforcement authorities.

They seized about 80 pounds of MDA in various stages of production. It is estimated that one ounce of MDA can be made into 14,000 dosage units, which sell on the illicit retail market for $3 each.

Washington, DC—DEA agents and Arlington County Police cooperated on a buy that netted a kilogram of cocaine and the arrest of four South American smugglers. The action began with an informant's phone call advising police that he had possible access to a large amount of cocaine. The drug, smuggled into the United States taped to the bodies of women couriers, was offered by a Peruvian identified as "Coco." The police requested DEA's help and together they set up two surveillance teams. After the informant had actually seen the cocaine in a suburban Washington motel room, he returned with a DEA undercover agent. The surveillance teams moved in once the substance was positively identified as cocaine. The kilogram cache was retrieved from its hiding place under a bed, and four Peruvian nationals were arrested. (1974)

Coos County, OR—A routine traffic check of a vehicle with Texas license plates revealed that it was registered in the name of a fugitive wanted by DEA. Surveillance of the vehicle resulted in issuance of two Oregon state search and seizure warrants. As a result of these warrants, nine defendants—four men and five women—were apprehended, including two DEA fugitives. A third fugitive, escaped during the search and is now being sought. Seized on the premises of the two searched residences were two well-equipped and operational methamphetamine laboratories and a total

ILLICIT LAB Seeing how dry the grass was, the landlord stopped to tell his tenant that he must water the lawn. When he knocked at the door he got no answer but smelled a pungent odor which he thought to be a dead body. Upon investigation, the Denver Police discovered the house contained an illicit STP and LSD laboratory. The entire water supply had been diverted to the laboratory.



of forty firearms, including two machine guns, a revolver with a silencer, a sawed-off shotgun, three pipe bombs, and an electronically detonated bomb. The presence of extensive "Weatherman" literature, in addition to the arsenal of weapons, has raised suspicions that the defendants may have been involved in a militant movement — a possibility now under investigation by the FBI. (1974)

Troy, Michigan — Special agents arrested seven suspects and seized 20 ounces of Phencyclidine (PCP), 85,000 LSD tablets, 75 pounds of marijuana and drug equipment. Simultaneously, agents arrested the principal suspect, a Canadian, at Clinton Township, Michigan. The agents seized 2 ounces of PCP, 8000 baribiturate capsules and marijuana....**Washington, DC** — Agents arrested two men and seized about 8 ounces of cocaine.... **Yuma, Arizona** — Agents arrested a man and his wife when they delivered a pound of heroin to undercover agents. The suspects are Mexican nationals. A car was also seized.

INTERNATIONAL

JULY..**Luang Prabang, Laos**—GSI officers arrested a Lao national in possession of 11 pounds of opium...**Arica, Chile**—A joint investigation with Chilean Customs resulted in the arrest of a subject in possession of 4.4 pounds of cocaine and cocaine laboratory equipment...**Vancouver**—A joint DEA and Royal Canadian Mounted Police investigation culminated in the arrest of 18 suspects after

the seizure of 800 pounds of hashish and 200 pounds of marijuana in a converted mine sweeper off the coast...**Columbia**—Colombian authorities arrested two subjects in possession of 20 pounds of coca paste...A cocaine laboratory near **La Vega** was raided and three defendants were arrested...Acting on information from DEA, Colombian agents seized a kilogram of cocaine and arrested a major violator...

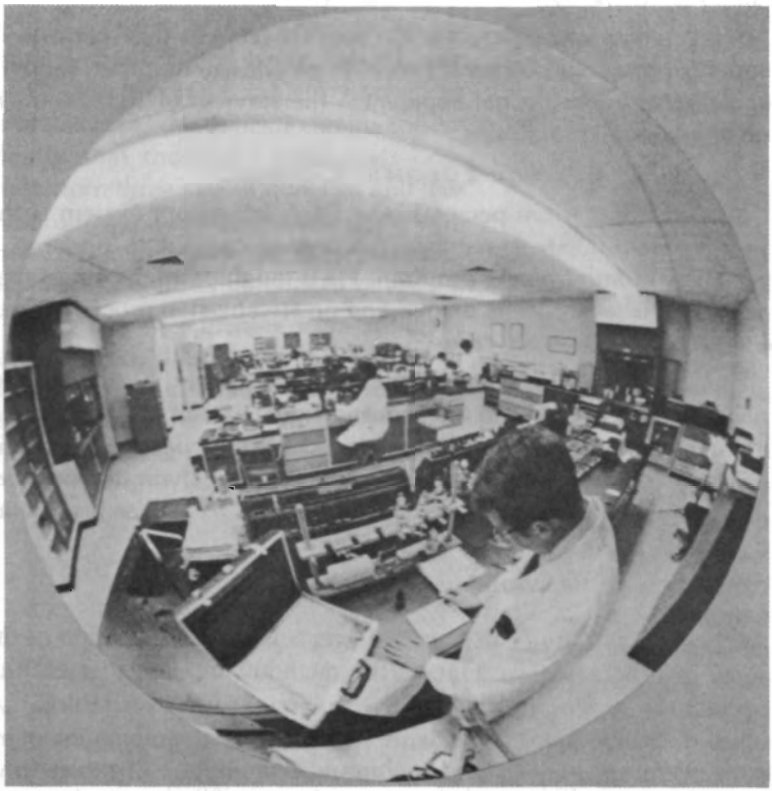
JUNE...**Oquendo, Peru**—Agents from the Lima District Office assisted Peruvian authorities in an investigation which resulted in the seizure of a cocaine crystal laboratory. Four persons were arrested and small amounts of cocaine, coca paste and laboratory equipment were seized...**Nuevo, Laredo**—Special agents from Region 11 assisted Mexican Federal Judicial Police in the arrest of three Mexicans in possession of 24 pounds of cocaine and 2 pounds of brown heroin...**Santiago**—Chilean Police arrested three Chilean nationals and seized 2.2 pounds of cocaine...**Tocumen International Airport, Panama**—Panamanian Customs officials seized 4.5 pounds of cocaine and arrested three Mexican nationals.. ...**Okinawa**—In cooperation with the U.S. Air Force OSI and the U.S. Marine CID, special agents arrested two American civilians and one U.S. military man. An investigation led to the seizure of 4.4 pounds of heroin, a half ounce of liquid LSD and a quantity of "window pane" LSD...**Beirut**—Special agents assisted the Lebanese Judiciary Police in arresting two Syrian nationals and in seizing 27.5 pounds of opium...**Panama**—Two individuals were arrested by local authorities when they delivered 5.5 pounds of cocaine to undercover agents...**Ankara**—One man was arrested for selling 21 pounds of morphine base to a TNP undercover officer. He subsequently surrendered an additional 50 pounds of morphine base...**Milan**—The Italian National Police arrested a Chilean citizen at the Milan Airport in possession of 4.4 pounds of cocaine...

MAY...**Mexicali, Mexico**—Special agents assisted Mexican Federal Judicial Police in the arrest of one man in possession of 4 ounces of brown heroin...**Tijuana**—As three Mexican nationals delivered 20 ounces of brown heroin to an undercover agent, they were arrested by Mexican Federal Judicial Police...**Bogota**—Colombian authorities rounded up six Colombians and seized 20 ounces of cocaine and undetermined amounts coca leaves, chemicals and laboratory equipment...**Tijuana**—With agents acting undercover, the Mexican Federal Judicial Police seized 1,104 pounds of marijuana concealed in a load of watermelons on a truck from

Sinaloa...**Bombay**—Indian CBI Officers arrested three defendants and seized approximately 200 pounds of processed opium as it was delivered to an undercover special agent...**Santa Ana**—Special agents of the Nogales and Tucson District Offices assisted Mexican Federal Judicial Police in arresting one man in possession of approximately 3 pounds of brown heroin...**Tecate, Mexico**—Working in cooperation with agents from the San Diego District Office, Mexican Police arrested three defendants as they delivered 23 ounces of heroin to an undercover agent...**Popayan, Colombia**—Colombian authorities arrested one man and seized 9 pounds of cocaine...

APRIL...**Karachi, Pakistan** — Assisted by U.S. agents, Pakistani authorities completed an investigation that resulted in the arrest of five defendants and the confiscation of approximately 300 pounds of opium..**Santo Tomas, Mexico**—After placing a package containing 6 pounds of cocaine at a point on a clandestine airstrip, a man was arrested by Mexican Federal Judicial Police. As two men who were to take possession of the cocaine package arrived they also were arrested. Seized along with the cocaine were the Beechcraft airplane, which had been utilized to make the drop, and a van... **Vancouver, BC**—A four-month international investigation trailing from Canada to Tennessee to Switzerland climaxed in the arrest of two defendants, one a U.S. citizen. At the time of arrest the subjects were in the process of operating a clandestine MDA laboratory which was disguised as a perfume factory. During the search of the laboratory, 15 pounds of MDA powder, 300 pounds of MDA liquid, and enough chemicals and precursors to produce an estimated 2,000 pounds of MDA were seized..**Sonora, Mexico**—Special agents the Hermosillo District Office assisted the Mexican Federal Judicial Police in the search of passengers on a train originating in Sinaloa. A woman and her mother were arrested in possession of 4.5 pounds of brown heroin.. **Laza, Bolivia**—Bolivian authorities assisted by U.S. agents seized a cocaine laboratory near Laza and two defendants were arrested..**Beirut**—Assisted by U.S. agents, the Lebanese Judiciary Police arrested one man as he delivered 5 pounds of tan heroin. (Fall 1973)

ROLE OF THE *DEA* LABORATORIES IN DRUG BUSTS



Evidence in drug investigations may exist in any form -- tablets, capsules, powders, liquids -- and can be present as large samples consisting of hundreds of containers, or as a minute residue.

The accurate analysis of these substances is the responsibility of the Drug Enforcement Administration's forensic laboratory system. This system consists of six regional laboratories -- in New York, Chicago, San Francisco, Dallas, and Washington, D.C. -- together with a special testing and research center in McLean, Virginia.

In the last fiscal year the DEA laboratories, under the direction of 120 professional chemists, analyzed 45,000 separate exhibits of drug evidence. In addition, they stand ready to offer assistance to any duly authorized law enforcement agency, at home or abroad, in laboratory planning, evidence handling, drug analysis, or court testimony at no cost to requesting agency.

Before going on to describe the specific services they perform in support of drug enforcement, I want to emphasize that they serve to supplement -- they do not supplant -- the services of state, county, and municipal laboratories.

The Forensic Chemist

The most important person in the DEA laboratory system is the forensic chemist. DEA requires the trainee chemist to undergo a special six-month training program. He is taught from the outset that each piece of evidence is unique and no step-by-step procedure can be written to cover all cases.

This training program is designed to acquaint him with new analytical procedures and to encourage independent thought, sound judgment, and ingenuity in the analysis of drug evidence. The new chemist is made aware of the importance of the chain of evidence, and the need for security in handling evidence, as well as his role as an expert witness.

Source Identification

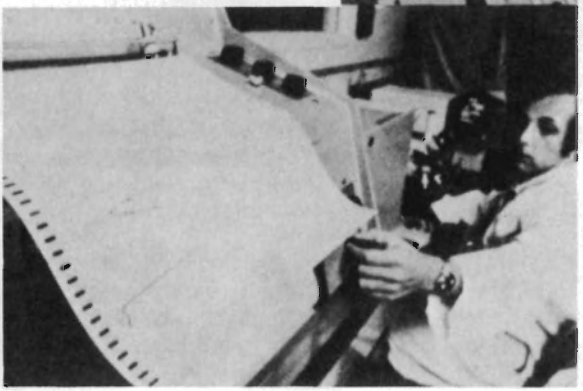
A major concern of DEA special agents is the identification of the source of drug evidence. One of the methods they use to meet this requirement is through "ballistics examinations" of tablets. A ballistics examination, in the sense used here, is a combination of in-depth chemical analysis and tool-mark examination of tablets and capsules for the purpose of identifying the manufacturer of the drug. The technique consists of accurate measurements of size scoring, imprints, or bevels; the microscopic examination of the imperfections

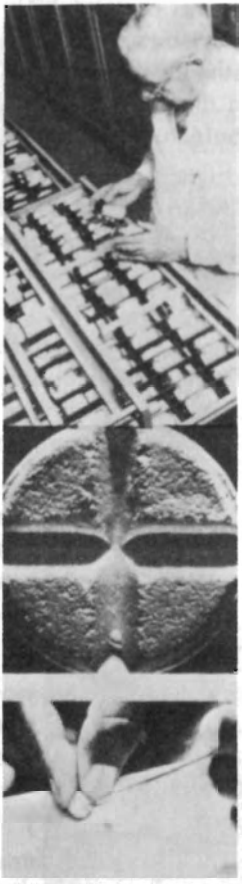
of the surface; the identification of all the components of the exhibit, primarily through microchemical tests; and comparison with exhibits contained in the Administration's National Authentic Drug Reference Library. These are exhibits obtained from drug firms and an accumulation of exhibits from clandestine manufacture.

Using this type of analysis, we are able to identify the manufacturing source of commercial dosage forms and to relate exhibits originating from common clandestine sources. In this way we are able to show diversion of legitimate products into illicit channels and to identify illegal distribution systems and marketing levels.

In the past year—to give you an example—the US has been flooded with small amphetamine tablets known as "minibennies." Ballistics examination indicates that most of these tablets originate from three sets of punches and dies used on multiple punch tableting machines. To date, over 30 million "minibennies" have been purchased or seized.

As with source identification of tablets and capsules through ballistics examination, we are also attempting to determine common sources of powers. We have developed methodology which will



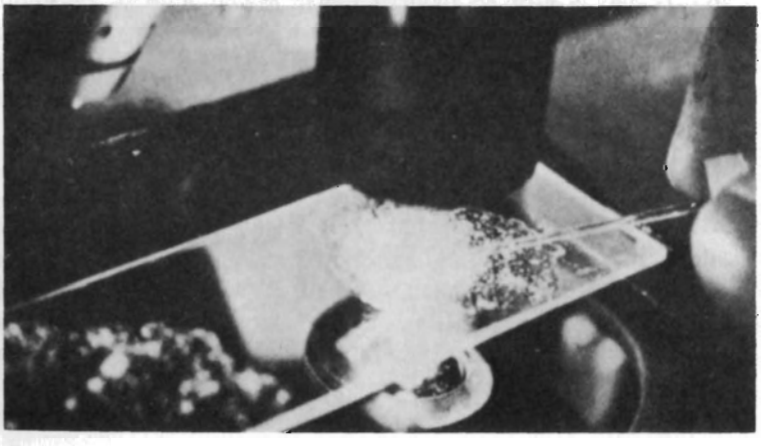


provide intelligence on heroin evidence. This is not done routinely, but only on specific request. The technique has been used to trace distribution routes and to assist in the development of conspiracy cases. The technique consists of microscopic examination, the determination of elemental composition, and the determination of the ratios of heroin hydrochloride, morphine, 0^3 and 0^6 monoacetyl morphine, codeine, and acetyl codeine.

Special Analysis

Quantitative analysis of drug evidence is standard procedure in our laboratories. The nature of the charge and the sentencing of the defendant is, in many instances, dependent on the amount and purity of the drug. Large quantities and high purity usually indicate the higher echelon drug trafficker. Rapid, accurate, quantitative laboratory analysis can therefore be an aid to enforcement strategy.

In one conspiracy case, information was obtained that indicated a transfer of heroin had taken place in a garage. During the transfer one of the bags of



heroin had allegedly fallen and broken. Six months after the transaction had taken place the laboratory was asked to verify this information, even though the heroin had reportedly been swept up and there was no visible trace of it.

The laboratory devised a special vacuum pump and filters to take samples from various sections of the garage. The laboratory was able to confirm the presence of heroin, using rigorous isolation techniques combined with fluorimetry, thin-layer chromatography, and mass spectrometry. The laboratory's work played a major role in the successful prosecution of this case.

Recently, the compound 1, 3-dephenyl-2-methylaminopropane hydrochloride was identified in two different samples of methamphetamine powder. The identification was based on a combination of UV, IR, NMR and mass spectrometry. The presence of this compound in methamphetamine indicates that the clandestine operators were syn-

thesizing phenyl-2-propanone (P2P) from phenylacetic acid rather than purchasing this essential raw material. A byproduct of this synthesis is dibenzylketone, which, if not removed, would react when methamphetamine is made and produce 1, 3-diphenyl-2-methyl-aminopropane. This identification is very valuable intelligence for our agents who are looking for clandestine drug operators.

Methaqualone is being widely abused by youths in this country. Recently, in the northeast, some abusers were stricken with severe side effects, including bloody urine and gastrointestinal cramps. The tablets were found to be of clandestine manufacture. They contained fairly large amounts of impurities from a poor synthesis. The impurities were o-toluidine, o-aminobenzoic acid, and o-methyl acetanilide—again proving the old proverb "Let the buyer beware."

Clandestine Laboratories

In the past year, our forensic chemists participated with special agents in the seizure of over 30 domestic clandestine laboratories which were producing LSD, phencyclidine (PCP), dimethyl tryptamine (DMT), methamphetamine, and liquid hashish. DEA chemists have also examined illegal laboratories in Europe, South America, and the Far East. These laboratories were producing heroin or cocaine.

In examining a seized illegal laboratory, we feel that the following information is best acquired by a chemist: production capability; estimated length of time in operation; source of chemicals and equipment; methods of waste removal; efforts at concealment; method of manufacture. This and other information can be used to measure the impact of an immobilized laboratory and can provide possible means to assist in the detection of similar laboratories.

Our chemists also have had the opportunity to participate with special agents in debriefing informants regarding the manufacturing of clandestine drugs. There is much literature on the commercial manufacture of most drugs of abuse. Clandestine manufacturers, however, do not always follow these procedures or use the same equipment and techniques. It is therefore necessary for a law enforcement agency to determine exactly how the drugs are made. This information has many investigative and intelligence ramifications.

Information From Drug Evidence

The laboratory is the focal point for almost all information regarding a purchase or seizure of drug evidence. This information

must be retrieved, evaluated, and reported to the proper parties in a timely manner. Information retrieval and reporting mechanisms are therefore an important and integral part of our laboratory system.

Our laboratory data processing system is known as STRIDE (System to Retrieve Information from Drug Evidence). It is now in its third year of operation. In 1974, we will be installing in each laboratory computer terminals connected to the main computer in Washington. Every piece of evidence analyzed is entered into the system. The type of information includes: the subject's name; where the purchase or seizure was made; the amount of money expended; the suspected drug; what the drug was found to be; the purity of the drug; and what excipients and adulterants were present.

The system is designed to serve several purposes. It provides information for decisions as to whether or not a drug should be controlled by showing how much and in what form it is appearing in the illicit market. The "Early Warning System"—designed to make DEA aware of new abusable drugs—relies on STRIDE as one of its input sources.

Our Office of Intelligence also uses this system. By comparing potencies and adulterants in various exhibits, distribution systems can be identified, individuals can be tied together, and trends can be shown. Moreover, the use of a unique cutting agent for heroin such as methapyrilene, appearing in one section of the country, can provide investigative leads to our special agents.

The computerized laboratory analytical data of heroin exhibits is used to calculate the price per milligram of pure heroin. The price-purity data can be used by statisticians as a market index—like Dow Jones—to determine trends and changes in the domestic heroin market.

International Liaison

Drug abuse is an international problem. We exchange scientific information with police laboratories in over 60 countries, as well as the U.N. Laboratory and Interpol. Recently, the importance of our foreign liaison paid off when Canadian authorities brought to our attention 4-methoxyamphetamine, a new hallucinogen that was causing deaths. Shortly thereafter this drug made its appearance in the United States. The information supplied by Canadian authorities enabled DEA to bring this drug promptly under control.

Conclusion

The role of the forensic drug laboratory has changed over the last

few years and is continuing to change. We must keep pace with these changes by using the most modern instruments and techniques. Demands are increasing from drug law enforcement officers for more information on exhibits for intelligence purposes. We must also be ready to respond to increasingly sharp questions from attorneys, who are today better prepared and more knowledgeable about drugs than ever before. The conclusions reached by the laboratory must leave no room for doubt since they are used within the criminal justice system. The forensic laboratory, in the final analysis, is an instrument of justice.

DEA WATCHED LIST OF CHEMICALS

(Compiled by Richard C. Hall III)

Many of these chemicals are suspicious only if ordered by individuals, in large or in repeated orders. Others are suspect under any conditions.

Acetic Anhydride
Acetone Dicarboxylic Acid
N-Acetylanthranilic Acid
N-Acetylmescaline
Aluminum Foil (?)
Ammonium Acetate
Anthranilic Acid
Barbituric Acid
Benzaldehyde
Benzocaine
Benzyl Methyl Ketone
Beta Keto Glutaric Acid
mono-Bromobenzene
Butacaine
Chloroamphetamine
o-Chloroaniline
Chloromethanamphetamine
Citral
Cyclohexanone
Dextrose, anhydrous
Dextrose, monohydrate
5,5-Dibromobarbituric Acid
2,5-Diethoxytetrahydrofuran
Diethylamine
Diethylamine Malonate
1,3-Diethyl-2-Thiobarbituric Acid
Dihydroergotamine
Dimethylamine
Dimethyl Acetone
Dimethyl Beta Keto Glutaric Acid
Dimethyl Sulfoxide (DMSO)
Ephedrine
Ergocristine
Ergocryptine
Ergonovine
Ergotamine
Ergothioneine
Ethyl Ether
Formamide
Formic Acid
Glyoxylic Acid
Hexane
Hydrogen
Hydrogen Iodide
Hydroxylamine
Hydroxylamine Hydrochloride
5-Hydroxyuracil
Indole
Isobarbituric Acid
Lactose
Lidocaine
Lithium Aluminum Hydride
Magnesium Metal (esp. Turnings)
Malonic Acid
Methylamine
Methylamine Hydrochloride

2-Methyl Benzoxazone
3,4-Methylenedioxy
compounds (any)
N-Methylmescaline
N-Methyl Formamide
Monoethanolamine
5-Nitrobarbituric Acid
Nitroethane
5-Nitrosothiobarbituric Acid
Olivetol
Oxalyl Chloride
Phenyl-2-Propanone
Phenylacetic Acid
Phenylacetone
Phenyl Magnesium Bromide
Phenylpropanolamine
Phosphorus Oxychloride
Piperidine
Piperonyl & related
compounds
Potassium Cyanide
Procaine
Quinine
Sodium Acetate
Sodium Cyanide
Sodium Formate
Sulfanilamide
Thiourea
Toluene
p-Toluene Sulfonic Acid
o-Toluidine
Toluol
Trifluoracetic Acid
2,4,5-Trihydroxypyrimidine
3,4,5-Trimethoxyben-
zaldehyde
Tryptophan
Tyrosine
Urea

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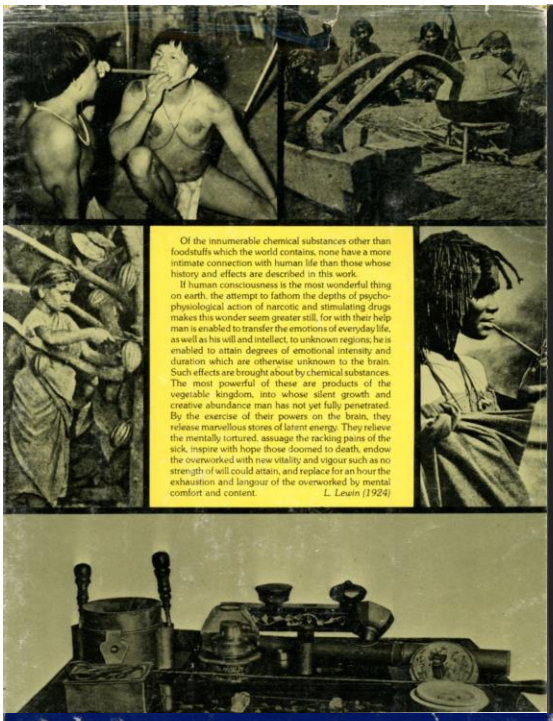

Of the innumerable chemical substances other than foodstuffs which the world contains, none have a more intimate connection with human life than those whose history and effects are described in this work.

If human consciousness is the most wonderful thing on earth, the attempt to fathom the depths of psycho-physiological action of narcotic and stimulating drugs makes this wonder seem greater still, for with their help man is enabled to transfer the emotions of everyday life, as well as his will and intellect, to unknown regions; he is enabled to attain degrees of emotional intensity and duration which are otherwise unknown to the brain. Such effects are brought about by chemical substances. The most powerful of these are products of the vegetable kingdom, into whose silent growth and creative abundance man has not yet fully penetrated. By the exercise of their powers on the brain, they release marvellous stores of latent energy. They relieve the mentally tortured, assuage the racking pains of the sick, inspire with hope those doomed to death, endow the overworked with new vitality and vigour such as no strength of will could attain, and replace for an hour the exhaustion and languor of the overworked by mental comfort and content.

L. Lewin (1924)

Cocaine Fiends and Reefer Madnes

History of Drugs in the Movies 1894 - 1978

Michael Starks

COCAINE FIENDS AND REEFER MADNESS is an exhaustive exploration of the history of the depiction of psychoactive drugs in motion pictures from Thomas Edison's *Opium Smoker* (1894) to *Cocaine Cowboys* (1978). Included are over 400 silent and 1,000 sound films as well as nearly 500 drug-abuse films, 85 experimental films, and 135 television programs. More than 150 stills, most never before published and many extremely rare, illustrate the text.

The book is arranged chronologically as well as by drug type and often by country. The use of drugs by film people, censorship of drug themes in films, and the influence of drugs on the content and style of films are discussed.

Some of the films have only trifling references to drugs — "What's he been smoking?" in *Gold Diggers of 1933*, while others are concerned with little else such as *Cocaine Fiends* and *The Trip*.

COCAINE FIENDS AND REEFER MADNESS shows that drug films were made in nearly every country and period that produced a significant body of films. In searching them out, the reader visits Edison's first film studio, reflect on the filmic consequences of Cocteau's opium addiction with Kenneth Anger's early experiences with magic mushrooms, see Charles Laughton smuggling cocaine inside a statute of the Buddha, and watch Douglas Fairbanks, Sr., consuming vast quantities of opium and cocaine in a World War I Sherlock Holmes parody. Heroin makes junkies writhe and scream in *The Panic in Needle Park* (1971) and the *Devil's Needle* (1916), and LSD leads to murder in *Mantis in Lace* (1968) and to spiritual rebirth in *Turn On, Tune In, Drop Out* (1967).

From the very beginning, filmmakers have struggled to free themselves from censorship and manipulation by special-interest groups, and this struggle is clearly evident in the history of drug films. Only recently has it been possible to portray drug users and drug effects candidly, and the increasing accuracy and power of such films is examined.

Pop Culture
Film History

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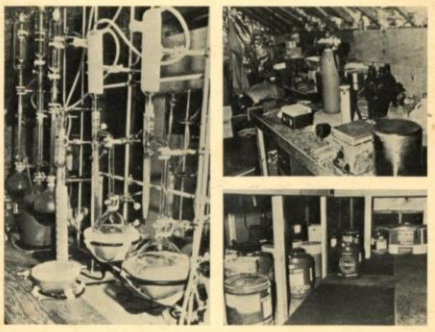

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