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The Nexus between Neuroscience and Social Psychology

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To Audrey J. Franks and Danny, our son, without whose help this book could not have been written, and to our daughters, Tisa and Julie

Preface

As a career sociologist I first became interested in neurosociology around 1987 when a graduate student lent me Michael Gazzaniga's *The Social Brain*. If the biological human brain was really social, I thought sociologists and their students should be the first, not the last, to know. As I read on I found little of the clumsy reductionism of the earlier biosociologists whom I had learned to see as the archenemy of our field. Clearly, reductionism does exist among many neuroscientists. But I also found some things that were very social and quite relevant for sociology. After reading *Descarte's Error* by Antonio Damasio, I learned how some types of emotion were necessary for rational thought – a very radical innovation for the long-honored "objective rationalist." I started inserting some things about split-brain research into my classes, mispronouncing terms like amygdala and being corrected by my students. That instruction helped me realize how much we professors needed to catch up with our students. I also wrote a review of Leslie Brothers' *Fridays Footprint: How Society Shapes the Human Mind*. I thought if she could write so well about social processes maybe I could attempt to do something similar in connection with my field. For several years I found her an e-mail partner with a wonderful sense of humor. She even retrieved copies of her book for the use of my graduate students when I had assigned it for a seminar. Soon, after attending an ASA session on the social aspects of the brain, I was lucky enough to gather together the few people working in the area of social applications of neuroscience for a spontaneous dinner meeting. It was agreed that the name for our embryonic field would be "neurosociology." It was also then that I learned that the first person who wrote under this label was Warren TenHoughten who published *Science and its Mirror Image* with Charles Kaplan as early as 1973. Warren also published a news bulletin devoted to the brain and the social process. He is clearly the father of this new field. At that time I was editing an annual on the sociology of emotion and wanted to devote the next volume to social aspects of the brain and emotion.

In 1999, the year I retired from regular teaching, *Mind, Brain and Society* came out which I edited with Thomas Smith. One reviewer who was generally positive about the collection ended up saying that all sociologists should read this book, but that sadly, they would not. Needless to say he was accurate enough, but some positive signs were around the corner. One was the publication of Jonathan Turner's *On the Origins of Human Emotion* in 2000. Other encouraging signs had to do with a symbolic interactionist, David Maines, who invited me to write about neuroscience in his special issue of the *Journal of Symbolic Interaction.* When Professor Maines followed up on that and gave me the opportunity to write a section about neurosociology in Ritzer's 2007*, Blackwell Encyclopedia of Sociology* I thought we had "arrived" as an accepted part of sociology. This was confirmed when Stets and Turner requested a chapter on the neuroscience of emotion in their 2006 *Handbook on the Sociology of Emotion*.

In the Spring of 2008 I taught what I believed was the only course in neurosociology in this country, but I was wrong. Anne Eisenberg at SUNY Geneseo had been teaching a neurosociology course devoted to mental disorder for several years. One of the things which attracted me to teaching this course was that neuroscience could be seen as a hub which could be related to so many disciplines of the liberal arts.

Growing up a minister's son I had never been able to involve myself in many of the ecclesiastical separations – or better said – walls like the one between high church and low church and whether the communion wine actually turned into the blood of Christ. Certainly there were more important things to put one's mind to!

But I have learned that in respect to walls, academia was not that much different. Within my own department the division was between social structuralists and social psychology as if there could not be a cybernetic relation between the two. To me, Winston Churchill described the situation well in one of his remarkable sound bites to the effect that in academia, never have so many fought for so few over so little. This book is an effort to work toward breaking down the walls between sociology and neuroscience to the benefit of both.

While studying for my undergraduate and graduate degree I was exposed to symbolic interaction and at the University of Minnesota I had the good fortune to study with Arnold Rose and Gregory Stone. There I met a group of colleagues who have provided me with intellectual stimulation and challenges for all these many years. But this does not mean that I could only think within the confines of that perspective, and later on I especially took issue with the postmodern solipsism and the extremes of social constructionism that ignored Mead's insistence on maintaining an epistemology which had retained the value of possible error. Without this possibility words could define anything in any way and one narrative was as good as another. My concern about this has been eloquently voiced by Carl Sagan as quoted by the neuroscientist, Gazzaniga (1985):

> It's a foreboding I have – maybe ill placed – of an America in my children's generation. . . when clutching our horoscopes, our critical functions in steep decline, unable to distinguish between what's true and what feels good, we slide, almost without noticing, into superstition and darkness."

If Carl Sagan were alive today he might not be so concerned about horoscopes. He might be more concerned about some things covered in this book like the frailty of the self that makes us defensive and prone to violence and the unconscious forces that power structures use to blind us into becoming uncritical believers with the same resulting idiocy.

This book represents a long path for me, much longer than I, and my editors expected. Hopefully, this work will make this path sizably shorter for my readers.

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Contents

Chapter 1
Introduction

This volume presents selected issues in neuroscience which can be helpful to social scientists interested in this new and exciting field. At the same time it summarizes ways that social processes enter into, and impact on, brain processes and therefore may be of interest to neuroscientists as well. The potential for cross-fertilization in the two fields clearly is enormous.

Many sociologists think that neuroscience is incompatible with sociology in general but I think most of this is based on superficial understandings of a field that is still a foreign land to many social scientists. Because I have been involved with symbolic interaction during most of my career, a great deal of my interests are related to this perspective although certainly not exclusively. During the 1980s many influential figures in symbolic interaction moved away from George Herbert Mead to develop new methodologies and styles like ethnographies and to embrace the notion of narratives. This pushed them further away from Mead's exclusive adherence to science and from the brief, but consistent references he made to what he called the "central nervous system," i.e., the brain. In the notes on his lectures in *Mind, Self and Society* (1934:1) Mead does not waste time addressing this connection. He says

> While the minds and selves are essentially social products or phenomena of the social side of human experience, the physiological mechanism underlying experience is far from irrelevant- indeed is indispensable- to their genesis and existence; for individual experience and behavior is, of course, physiologically basic to social experience and behavior.

Later he adds

> This experienced world does not appear except when the various excitements reach certain points in the central nervous system; it is also true that if you cut off any of these channels you wipe out much of the world. What the behaviorist ... ought to do is to take the account. In doing that he has to take into account organism for the entire system (1934:111).

There are further indications in his lectures on the biologic individual that would imply that current neuroscience would be critical in forwarding his social interests. While symbolic interaction's interest in going in new directions can justifiably be seen as a healthy impulse to go beyond its past, a familiarity with Mead's writings

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on the priority of manipulative action may have saved the field from the extremes of recent postmodernism. Mead and his brief comments on what we now call the brain do imply some bridges between neuroscience and traditional symbolic interaction which have not always been recognized.

Regardless of current symbolic interaction's departures from much in Mead's works, the broader field of sociological social psychology including early symbolic interaction was created and developed in opposition to essentialist views which were most often rooted in biological reductionism. These views saw human behavior as the inevitable and immutable result of the "the nature of things" which in scientific circles was attributed to instincts developed in our evolutionary past.

In the middle of the last century the largest battle sociology waged in that regard was against the reductionism of sociobiology, but recently we have encountered a new type of biology – that of neuroscience which has captured the attention of both the public and academia, particularly the field of cognitive psychology. It would be hard to overstate the influence of a new socially oriented neuroscience on cognitive psychology. Not so, however, in sociology where we have been reluctant to overcome our historic tendency to associate all biology with reductionism.[1] Ironically this has left many sociologists in the position of being the last to know about how our very biological brain is simultaneously social in nature.

This book is written because of my conviction that there is good enough reason for cognitive psychology's openness to a social neuroscience and that this field can help sociology as well; as a matter of fact, as Douglas Massey, former president of the American Sociological Association stated in his 2002 presidential address to the society; neuroscience may be essential for a contemporary sociology.

Another reason why sociology may be more reluctant than cognitive psychology to accept the relevance of neuroscience is the difference in our overall unit of analysis. Our field focuses on interaction or "joint effects" while brains traditionally are considered organisms lodged inside of peoples' heads. However, the neurologist Leslie Brothers (2001) is critical of this isolated image and refers to it as "neuroism." This is not to say that neuroscience and sociology are partners – far from it. As a matter of fact, it would be hard to imagine two fields so different in terms of method, theory, tradition, and practice. But herein could lie an advantage and that is to break us out of our comfortable sociological "assumptive order" and develop insights which may have otherwise been impossible, or at least very difficult to develop. In hypothesis testing, construct and convergent validity are the most highly regarded methods of privileging a thesis. If different methods and different theoretical positions converge on the same findings their validity is enhanced.

[1] Granted, however, that "neurosociology" as it is called, is attracting more and more interest as well as being strongly endorsed by many of our leaning theorists and the past presidents of the ASA.

Split-Brain Research and Symbolic Interaction's Theory of Accounts: An Example of Convergence

Michael Gazzaniga's findings in his split-brain research confirm a core notion in the theory of "accounts" by Scott and Lyman (1968); their work posits that our explanations for our behavior are seldom accurate reflections of our motivations seen as an individual wellspring of action. Gazzaniga's results come from working with patients who have extreme epilepsy. As a treatment for such cases the corpus callosum, which allows communication between the right and left-brain hemispheres, is severed. The corpus callosum is a massive cable of 200 million fibers which enables the fully linguistic left-brain (in right-handed people) to know what the characteristically nonlinguistic right brain is doing. The mute right brain communicates only with electrochemical means. Sensory information from the patient's left side is processed by the right side of the brain and vice versa. The severed right side can no longer tell the conscious left side what it is doing. Thus, a patient can be given a written message flashed to the left side of his face instructing him to draw something. The patient is not aware of the message, as it cannot be communicated to the left hemisphere because of the severed corpus callosum. This leaves one person with two brains, one of which is ignorant of the other (Fig. 1.1).[2]

In one typical study, the researchers told the mute right brain to draw a picture of a dog. Patients had no clue about what they were drawing until its form becomes obvious during the sketching. Only then will they realize they are drawing a cat or dog, etc. When the right brain is asked why the patient drew what he or she did, the left, usually "linguistic brain" contrives an answer that makes some sense to the patient (who is the only one deceived). The "explanations" are frequently quick and convincing. In another situation when a patient was sitting in a room, a message was sent by similar means to a patient's right brain. When asked why she was leaving the patient said "I'm getting a Coke." No doubt she continued to do just that because she was convinced that was what she wanted. In another case, patients' right brains were asked to laugh and then they were asked what was so funny. The patients never said they did not know why they were laughing. A reason was always forthcoming that only the patients themselves could believe since the researchers knew they were actually only following their directives for the research.[3]

To the sociologist the explanations are rationalizations or accounts if they are based on socially acceptable statements of intent. To the neuroscientist they are "confabulations." Scott and Lyman being sociologists go on to connect these ad hoc "vocabularies of motive" to identity-concerns and to specify the situational aspects dictating when actors are challenged to make such accounts in everyday

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[2]Gazzaniga (1985) notes that some communication between the split hemispheres remains. Though the different capacities of the two have been exaggerated in the past, they are needed to balance each other. For example, the left-brain excels in cognitive interpretations and the right brain, lacking such abilities, is accurate, precise, and literalistic.

[3]Other classic experiments on split-brain research can be found in Franks and Smith (eds.) (1999:163).

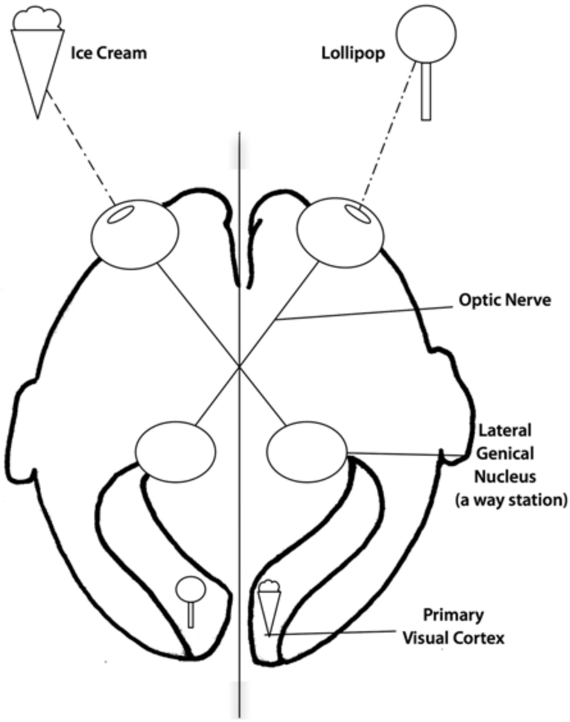

Fig. 1.1 Reversal of sight in two hemispheres of the brain

life. The human tendency to contrive such explanations independent of any actual intentions and then to believe them wholeheartedly is clearly established by the split-brain studies as well as in normal populations by Gazzaniga (1985:81–84). Getting beyond the account to the real reason – at-least in the narrow case of the split-brain research above – is something that sociologists could not do.

Neurosociology and the Self

Social psychology has taken on the daunting task of challenging one of our deepest and most compelling cultural images – that of the tightly bounded heroic individual whose ties to others are secondary to those of the self and whose powers come from within. This challenge is daunting because the very character of our country and indeed that of the western world is premised on a kind of individualism that separates self from others and making us uncomfortable with intimate connections between self and others. We cling tightly and lovingly to the belief that "we are the captains of our ships and the masters of our souls." It would be hard to overstate the power of this image on the western imagination. Our students shrink from the idea that we are strongly and unconsciously influenced by others. Intimate relations are indeed sought, but are seen as threats to one's autonomy and "self-actualization." Witness the incomparable popularity of John Wayne along with other film heroes and the never tiring versions in movie after movie of the woman futilely pleading to go with him on his perilous journeys.

We have a long history of courting this asocial image of the person. Indeed the tautological ideology of "self-interest" has long been a cornerstone of our economy as well as an uncontested academic theory of motivation beginning with the enlightenment thinkers.

Compared to many other cultures and historical epochs, individualism is a part of our "assumptive order" and, no doubt, we have little perspective on its hold on us even as we cast doubt on its veracity. Nonetheless, a host of social psychologists has challenged this essentially asocial image of the person. See, for example, Geertz (1974), Sampson (1981,1988), Elias (1982), Tuan (1982), Westen (1985), Baumeister (1986), Franks and Heffernan (1998), and Scheff (1990). More recently Marková (2003: 9) has put it starkly:

> The concept of self is a construct. It is not a "natural kind" sited somewhere in the human brain. The western concept of self emphasizes individualism and autonomy but this view is cultural and no more scientific or truthful or advanced than the . . . collective view of self developed in other cultures and which revolves around family or clan rather than the individual.

The image of the encapsulated self feels right to us, Elias says, because it correctly describes the emotional tone of life in a civilization whose valuation of the self and the metaphor of the "private realm within" forces attention on our separation.

One might think that taking on the Goliath of the westernized image of the asocial self was not of interest to those who study the singular brain, but there are signs that this is not the case. Certainly the majority of neuroscientists do not see this challenge as a priority, but a growing number do. Among these are, in varying degrees, Gazzaniga (1985), Brothers (1997, 2001), Cacioppo and Berntson (1992), Cacioppo (2002), Cozolino (2006), Edelman (1992), Damasio (2003), and lately Iacoboni's work on mirror neurons (2008).

Neuroscience and a Sociological Unit of Analysis

According to Cozolino, neither individual functioning human brains nor isolated neurons actually exist in nature. This is a profound statement. Infants whose individual bodies are well nourished may wither and die from normally benign diseases when they lack social stimulation. We shall see in Chapter 3 how neuroscience has documented the brain processes involved in this physical collapse which is known generally as separation disorder. Similarly the neurons of our brains wither and die in a process known as apoptosis unless they are connected to other neurons. On both levels we must learn to see things in interaction. Our basic unit of causation in social psychology and in studies of the brain is not a single event, but a jointly created one emerging from the connections made by at least two factors and including at least two people in relation with each other.

Sociologists can find various areas of creditable neuroscience that on closer analysis are compatible with their interests and expand the range of their field's own explanations. The field of neuroscience is not as monolithic as many presume. Also, for all the issues above, neuroscience has pushed the level of dialogue in matters such as agency and determinism into decidedly higher levels of sophistication which transcend simple either/or contrasts.

This variation applies even to our unit of analysis. For example, Leslie Brothers (1997: xii), armed with her experiences in the lab, her clinical practice and an in-depth knowledge of symbolic interaction, writes in a voice familiar to sociologists:

> To bridge the gap between minds and brains, we must grasp the significance of observations already available to us. We take the first step by acknowledging that the network of meanings we call culture arises from the joint activities of human brains. This network forms the living content of the mind, so that the mind is communal in its very nature: It cannot derive from any single brain in isolation.

Examples of Mutual Interests

Many areas of neuroscience inform sociological understanding and deepen our knowledge of our essential social natures. For illustrative purposes, two areas will be briefly described in this Introduction.

Self and others. There is a robust neuroscience of the reflexive self and how it is implicated so closely with others. Much of social psychology is based on the fact that our "primary adaptive mechanism"– human selfhood – derives from our interactional capacity for symbolic communication and self-conscious "mindedness." This implies a focus on consciousness and agency since our immediate awareness of what we are doing, or what we are about to do, is the basis for the flexible self-control of our own behavior. Because we think to ourselves with other people's linguistic symbols and are capable of seeing ourselves much as they do, self-control is inherently social control (Shibutani 1961). We shall see that neuroscience also has much to say about self-monitoring and related issues in self and other, volunteerism, and agency.

Determinism and Agency. At first glance, this interest in agency contrasts with the image so many of us have of neuroscience as being deterministic, reductionist, and generally more interested in the unconscious workings of the brain's "limbic" system than in conscious endeavors. But I have found much in the neuroscience literature which has been quite the contrary. Although there are strains of a reductionist view in some works, the larger part of the literature has been considerations of issues which go well beyond our usual sociological understandings and are often based on empirical findings rather than musings, however sophisticated these musings may be.

For example, Libet et al. (1983) found that our brains gear up for action before a conscious decision has been made to take action. This finding has produced a vigorous literature on issues of "free-will" and determinism which are certainly relevant to the sociology of rational decision-making and notions of agency. Even if our impulses are automatic, the short time frame between the brain's preliminary actions can offer time to control them. A world totally free of determinant processes would render impossible any attempt at purposive action and the predictive capability it requires. This pushes the level of dialogue beyond simplistic contrasts and incorporates empirical evidence at a neurological level into the area of agency previously argued by speculation and assertion. These are just two of the many issues that can be explored to the benefit of members of both disciplines.

Early Recognitions of Emergents

Mead was among the early American scholars who discussed the concept of emergence. He rejected the idea found in an exclusive emphasis on conditioning where all causation was traced to the past which then pushed persons toward certain behaviors. For symbolic humans, the nature of the act was tautological and the anticipation of the consummation of an act pulled the person toward action. Reality for Mead was reserved for the "immediacy" of the moment. Adjustments to unexpected situations characterize the present. Novel events are the outcome of social interaction because different people draw out different sides of others. These outcomes become true emergents because the adjustments require participation by two people and cannot be predicted by observing any one person. This allowed Mead and his colleagues to avoid making choices between determinism and voluntarism, once more breaking down what had been seen as antithetical opposites. For Mead, mind was a true emergent from the structures of the brain, language, and social interaction.

The work of Schwartz and Begley (2002) on the mind's capacity to cause neuronal changes in the brain is a rare empirical example of emergence to be discussed in Chapter 10. It also provides evidence for recognizing mind as a causal force in the brain without falling into dualisms.

As early as the 1960s, Roger Sperry, Nobel Prize winner and the father of split-brain research, argued if mind were not more than the brain which gave it birth it could be reduced to epiphenomena and would not be necessary. This would be a terminal blow to Mead's whole perspective. Sperry's approach to emergence was different from Mead's since Sperry's work was based on a much more sophisticated knowledge of the brain compared to what was available to Mead. Nonetheless Mead's approach, though necessarily different, is still enlightening and will also be described in Chapter 10.

The reductionist view was prevalent in biology during Sperry's lifetime, and his thesis was only seriously considered secured in 1964. Before Sperry, the allegedly airtight and irrefutable assumption was that mind does not move matter; that no physical action awaits on anything but another physical action (Sperry 1993). However, he argued that mind was a true emergent arising from the neuronal functioning of brain cells and containing new characteristics that were fundamentally different from the parts giving it birth. What Sperry considered "mental forces" could direct electrochemical traffic between neurons at the cellular level. He insisted that the causal potency of an idea becomes just as real as that of a neuron (Sperry 1993). In emergence, the whole is more than the parts taken separately. The important implication of what Sperry is saying is that the emergent whole can work back to exert influence on the parts that give it life. Like Mead, Sperry questioned the purely materialistic boundaries of science. However, this volume will demonstrate how recent findings and applications have supported his earlier findings and applications.

Given the imposing difference between the real and the mental, it was inevitable that Sperry would be charged with splitting mentality up into an irreconcilable dualism; however, this is not the case. His "emergent mentalism" as he called it, conceived of conscious experience as a non-reductive dynamic emergent of brain activity that cannot exist apart from the brain. It had no room for disembodied consciousness, mind, or spirit (Sperry 1993:16).

We are all familiar with the notion that the whole is more than the sum of its parts. The routine criticism of this notion is that it implies a mysterious "something" that exists between the parts and the whole. If you think of the parts as separate individuals who are mutually influencing each other the mystery disappears. This is what happens in "group think" where each person is privately against a position which is strongly desired by an authority. But they feel pressured to let their own positions rest and find themselves saying what they think the boss wants to hear. Being unaware that everyone else is feeling the same pressure and thinking just as they are, the individuals make a mutual decision which no one taken separately would have made. Nor would they have reached that decision had they voted by a secret ballot. In this way you can have unanimity in the group and yet have no one agreeing if the persons were taken separately. As common as it is to hear "that the whole is more than the sum of its parts" one needs to know if this means parts taken separately or taken in interaction. Sociological emergents imply the later.

Mind as Exerting a True Mental Force Over Its Parts

Sperry released science from its purely materialistic boundaries by showing that the emergent mind, now so different from the body from which it came, exerted a truly causal effect on its parts. If something causes changes in something else, it is real in any sense of the word. In this context we can seriously talk about mind over matter while staying within the bounds of naturalism. "The emergent character of mind does not mean that it is absolutely free of its parts, but that it overrides the physical and chemical elements giving it birth, and in turn can exert downward control over neural activity" (Sperry 1993). The causal chains in the brain are twofold and cybernetic. First we have the upward chain of causation going from the parts to the emergent mind. Second, we have the downward control by the mind to the parts from which it originally arose.

At first sight this seems to collide with the old directive that "nature takes no leaps." In a way it does and in a way it does not. Although the novelty of the emergent is indeed such a leap, it is a leap that carries with it the dynamics of the past and simply overrides it in power. According to Sperry, to override something does not mean that what is overridden has absolutely no influence on the emergent. "The old simple laws. . .never get lost or canceled in the process of compounding the compounds. They do, however, get superseded, overwhelmed, and outclassed by the higher level forces as these successively appear. . ." Sperry (1965). Thus, the continuity of the emergent with its past is preserved.

Sperry was far ahead of his time, however, as we shall discover, he has been vindicated by new findings and applications of his ideas in this century. In short we have seen a re-emergence of emergence.

Emotion's Involvement in Rational Choice

Moving away from Meadian theory, another example of neuroscience's contribution to sociology comes from Antonio Damasio (1994). He has shown one critical aspect of the relationship between emotion and thought, namely the actual necessity for emotion in rational decision-making. This was one of the most important discoveries of "The Decade of the Brain," and is succinctly summarized in Gazzaniga (2008). Thought gives us options but affective preferences – likes and dislikes – hold the key to the actual choice. Damasio used intellectually capable patients who had damages to the prefrontal lobes where emotions are integrated with thought. They showed some emotions like anger, but not the emotions of guilt, embarrassment, and shame which are important to maintaining social relationships. We will describe this in detail in Chapter 6. None of this means we should gloss over the distortions to reason which are made possible by emotion.

Damasio's (1994) finding that rational choice depended on certain kinds of emotional input has validated sociology's stress on the importance of emotion and refined our theories of rational decision-making. Damasio (1994: 178) goes further to discuss how social factors interact with biological ones to increase the condition he calls acquired sociopathology. He fears that sizable sectors of western society gradually are coming to be comparable to his patients. Damasio's concern reminds us of Max Weber's description of rational efficiency wherein the only criterion for decision-making is the quickest, least expense, and most guaranteed means to the ends, and the only emotional concern is profit.

Science's Rediscovery of Chicago Pragmatism and Curbs on the Excesses of the Linguistic Turn

Closely associated with this issue is the current stress on embodiment as we shall see in Damasio's patients. Embodiment has a critical place in his somatic-marker hypothesis on the importance of bodily feelings to making reasonable choices.

Some might wonder what this has to do with a social framework, but the social behaviorism of Mead was premised on the "transactional" framework developed by Dewey and Bentley (1949) which insisted that mind subserved practical, manipulative motor action on the world as well as social communication. Recently Lakoff and Johnson (1999) have shown that the metaphorical nature of mind has its roots in this same embodied action. Other currents in neuroscience, especially the work being done by those studying mirror neurons, has also illustrated how the principles and priorities developed by the Chicago pragmatists of Mead's day have been rediscovered in brain science.

Transcending Exclusive Reductionism

Another broad issue involves reductionism proper, which is assumed to explain away the social and to frame behavior in more "basic," non-social terms. Such a perspective denies sociology its reason for being. While there is disagreement in neuroscience circles, almost all of its current leading writers aiming for the educated public are distrustful of any position that reduces human experience to the mere motion of electrochemical synaptic impulses between neurons. Some writers are overt adherents to the general notion of emergence arising from the interaction of brain parts (Sperry 1965). To many of them, interaction is the irreducible force of lived experience and its emotions which drive and organize the brain. But we shall also see that another major force in organizing the brain is the motor cortex. It has its own heavy influence on minded behavior.

The concept of consciousness has long played a significant role in symbolic interaction. Neuroscientific considerations of consciousness are largely focused on the general issue of how tangible brain processes can enable intangible subjective experience and vice versa; whatever inhibitions neuroscience may have once had about studying consciousness in general and self-consciousness in particular have lessened considerably.

For example, Damasio (1994) clearly rejects the kind of reductionism that minimizes the importance of social processes:

> I am not attempting to reduce social phenomena to biological phenomena, but rather to discuss the powerful connection between them. It should be clear that although culture and civilization arise from the behavior of biological individuals, the behavior was generated in collectivities of individuals interacting in social environments. Culture and civilization could not have arisen from single individuals and thus cannot be reduced to biological mechanisms, and even less, can they be reduced to a subset of genetic specifications. Their comprehension demands not just general biology and neurobiology but the methodologies of the social sciences as well.

Edelman (1992:166), like Sperry, a Nobel Prize winner, uses more direct language about the matter:

> To reduce a theory of an individual's behavior to a theory of molecular reactions is simply silly, a point made clear when one considers how many different levels of physical,

biological and social interactions must be put in place before higher-order consciousness emerges.

The prominent neuroscientist V.S. Ramachandran has presented an interesting discussion on what the Nobel prize-winning Francis Crick referred to as the "astonishing hypothesis" (Crick 1994). This was the idea that our conscious experience and sense of self is merely the activity of a hundred billion bits of jelly (i.e., a functioning brain) with only the brain being real. This leaves our grandest thoughts and noblest intentions as but the epiphenomenal product of a pack of neurons.

Murphy (2003: 61–62) calls Crick's position "ontological reductionism." This means that ultimately entities, including us, are *nothing* but their parts. Crick takes the strongest possible view that only entities at the lowest levels are "*really* real." Murphy refers to this as "atomistic reduction" – an extreme type of ontological reductionism that Edelman calls "silly." Murphy notes that the phrase "really real" is more of an "attitude" or a preobjective intuition than an explicit philosophy and therefore Crick is hard to refute since his meaning is not clear.

A belief that this extreme meaning is prevalent among neuroscientists has been common among my colleagues and others who are apprehensive about the reductionism and determinism they associate with neuroscience. By referring to this "nothing but" reduction as a neuroscience revolution, Ramachandran suggests that there is a consensus about it in neuroscience which, given the quotations above (and his own position), is obviously not the case.

In conclusion, sociologist Franks and Smith:5 2005) suggest that reductionism and the doctrine of emergence are not necessarily opposed perspectives. Certainly, we should trace the "top-down" paths from emergence to the processes that give rise to them. There is no reason to reject the full picture of bottom-up and top-down causation, especially given the complexity and the cybernetic quality of the brain. Hopefully this can cleanse our field of what some have called our myopia against any type of reductionism.

Some Generalizations About the Emotional Brain

Use It or Lose It. The brain is highly reactive and needs to engage in actions on an environment to maintain itself and to develop. Brain cells die if they are not used. An interesting example occurs in temper tantrums. Children who are allowed to indulge freely in temper tantrums do not develop the neuronal pathways to control the robust circuits already existing in the structures involved in early emotion (Carter 1999:91). This leaves them without normal controls in their mature years. "Use it or lose it" is as true in childhood as it is in older age.

The Brain as Tinkerer. The brain's most recently developed structures did not come out of the blue as perfect solutions to new tasks. The brain is a "tinkerer." It can only build on what the past has made possible. This is why Wentworth and Yardley (1994) have to caution that we make a common mistake when we see the youthfulness of the neocortex and its large prefrontal lobes as reigning over other brain parts in queenly fashion. We must realize that the older structures of the brain co-evolved with the cortext. The new constrains the old but the old also constrains the new and the brain has to make do with what its structures allow. The clearest example of the consequence of this "making do" is how the size of an infant's head is constrained by the mother's pelvis, making childbirth a hard and risky business. Nothing remains static. The developments of human emotional capacities developed at a faster rate than the neocortex which is why the neocortex is causally favored over the cortex. The old so-called limbic system of the brain was once considered the distinctive seat of the emotions, but the concept has been significantly modernized. The limbic system is a full partner in what is now seen as distinctive and currently human.

Plasticity. Contrary to older assumptions, we now believe the brain has immense flexibility. Alternative structures do what they can to perform the function of traumatized structures. Lateralization of the brain is especially important in this flexibility. Every structure in the brain is located on each hemisphere with the exception of the pituitary gland and the corpus callosum. If a baby lost half of its brain, the other hemisphere would rewire itself to perform the tasks usually seen as the exclusive prerogative of the left side. This capacity for flexibility declines with age and myelinisation – the hardening of the cover on nerve cells. The left and right brains have different, but often complimentary, styles, and capacities which will be explored later. As we shall see, with the proper tutelage and applying very hard work, mind, focus, and patients can regenerate synaptic structures of the brain destroyed, for example, by strokes. The material for such restoration comes from other places in the brain; spare parts can be in diverse parts of the brain and fashioned to meet other needs.

Synapses. Internal communication makes the brain work. This communication is both electrical and chemical. Microscopic fibers stretch out of cell neural bodies at both ends called axons. Those which send messages away from the cell body to other neurons are called output channels and those receiving input from other fibers are called dendrites. On their branches are many terminals allowing the cell body to communicate with the receiving dendrites of as many as 1,000 other neurons. The same neuron can receive up to 10,000 messages. Gaps thinner than the ink on these pages separate axons and dendrites. When the axon fires, chemicals called neurotransmitters from this synaptic space are released. At this point the communication between neurons become chemical. They release ion channels making the cell body likely to fire and become output cells. According to LeDoux (2003), the electrical output from the axons is like a pulse. Since the storage places for the neurotransmitters are only in the output terminal of the axon, transmission only works one way and becomes chemical. Numerous electrical pulses from axons are needed to make a dendrite receive them and these impulses must occur within milliseconds of each other.

The Brain as a Projector. Next, neuroscience has driven a final stake into the heart of Locke's "tabula rasa" theory wherein mind is conceived as an empty slate "writ" on by experience and passively mirroring "what is." As Lakoff and Johnson (1999) argue, "correspondence theory" is dead in the water. The brain consistently sees patterns where there are none, and much of it is designed to get to the "gist of things" rather than precise details. Emotion, for example, is a pure, brain-given projection onto the world. This projection plays a significant role in what we remember and it is now well accepted that human memory is highly edited and has a heavily revisionist capacity. We do not remember the actual past. What we remember is our last memory of it.

Despite the dictionary meaning of "objective" as that which is independent of the observer, the observer's brain determines what we will observe as much as does the object being perceived. This conclusion is discovered over and over again in neuroscience. The environment may trigger its own responses in the brain but the brain selects, interprets, edits, and changes the very quality of incoming information to fit its own requirements. I will discuss this more in further chapters. Our senses are *transducers* (Franks and Heffernan 2003). The brain and its senses must reconstruct incoming information, changing it to be "accommodatable" to the brain's capacities to process it. This is why brain science challenges any theory of knowledge (including correspondence theory) which assumes we can know the world in – and – of itself, "as it really is." In no way do we copy the world as it really is. Our projections are the very real result of the organism/environment *relation*. As Arendt (1958: 237) puts it

> The modern astrophysical world which began with its challenge to the adequacy of the senses to reveal reality has left us with a universe of whose qualities we know no more that the way they affect our measuring instruments and in the words of Eddington "the former have as much to do with the latter as a telephone number has to a subscriber.

Thinking that we can perceive all the important sensations external to us is an exercise in abject naiveté and egocentricity. But even if we could sense the world in its totality we would only experience the result of what our brains could change into something which it could accommodate on its terms. It is in this sense that sound waves are as different from the human experience of sound as a telephone number is to its subscriber. Each animal's brain abstracts out different experiential worlds for that animal. Mead called this the "objective reality of perspectives." The perspective is given by the biological make-up of the animal. The German term "umwelt" captures the same meaning and refers to the different "lived experience" of animals with different sensory capacities.

Despite the high status we accord to cognition and the large size of its home in the prefrontal cortex, cognition is not the most powerful organizing force in the brain. Emotional and motor concerns give more priority to the limbic system and motor cortex. While it would be foolish to downplay the importance of cognition, brain science gives us an understanding of how dependent cognition is on interaction with emotional and motor processes (see Damasio 1994, LeDoux 1996 and Gibbs 2006 on these points).

Complexity. The complexity of the human brain cannot be emphasized too strongly. Edelman (2004: 15–16) states that the cerebral cortex alone, covering two-thirds of the brain's mass, contains at least 30 billion neurons with one million billion connections or synapses. How much is one million billion? He says, "If you started counting these synapses right now at a rate of one per second, you would just finish counting them 32 million years from now." This leaves out the subcortical regions including the so-called limbic system, cerebellum, and the brain stem. The brain is often seen as a three-pound universe. It contains several thousand miles of interconnected neurons with ten thousand varieties of neurons as well as trillions of supportive cells and over a hundred chemical agents regulating miles of miniscule blood vessels cells – all working together in holistic fashion almost flawlessly. If there is an infinite cosmos above, there is also an infinite micro-cosmos within each of us. As space and time merge at the speed of light, their character also changes in the brain microcosm.

It should go without saying that such a brain is more than the paltry 35,000 or so genes which it utilizes in the human genome (Schwartz and Begley 2002: 366). Neuroplasticity and experience have firmly replaced genetic determinism. A gene without experience and an environment is not a working gene. As current geneticists have repeated, the genetic–environment relation is just that – a relation; the truth is now sought in their dance. This dance also characterizes the relationship between mind and matter as Schwartz and others have shown. We must recognize that it is necessary to hold a tenuous balance the distinction between mind and brain while avoiding any ultimate separation of the two. Either/or arguments that exclude one side in favor of the other are far too simplistic for dealing with the brain's complexity. This principle holds all of the dualisms inherited from the enlightenment thinkers such as that between self and society, knower and the known, subjectivity and objectivity, emotion and cognition. In order to go beyond these irreconcilable contrasts, we must show how both sides are implicated with, or ultimately dependent on each other, while simultaneously keeping their separation enough to show how they can be in tension (Lyng and Franks 2002).

Examples of Neurosociology

This Introduction is not the place to list all of the findings of neuroscience that can be of interest to sociologists. Suffice it to mention at this point some of the beginnings of a genre of work conducted by sociologists at the end of the last century which created what is known as neurosociology (see Franks 2007: 3185–3189).

Warren TenHouten. TenHouten was the first sociologist to coin the phrase neurosociology. As early as 1972 he presented a paper with a noted neuroscientist named Joseph Bojene. A year later he and Charles Kaplan (1973) published the first book in neurosociology. In it they presented a theory on how culture works down to impact the neuronal circuits of the brain. Ecological pressures of cultures select various brain capacities as particularly important for that society. Different areas of the brain have different capacities which are used and developed by cultural demand. Australian aborigines use the gestalt/synthetic tendencies of the right brain while westerners more often use the more intellectual capacities of the left-brain. The aborigines have impressive skills in tracking and route finding that are so useful in the immense desert. For them time is experienced cyclically. Fundamental differences in the experienced of time underlie and change many aspects of the human experience.

Four forms of society are identified by TenHouten (2005) to represent different ecological problems and each has its own time consciousness. They are market pricing, communal sharing, authority ranking, and equality matching. Types of time consciousness fostered by these societies are directed to certain brain areas, namely the front and back of the brain. Thus, cultural pressure on different brain areas causes different forms of time consciousness. Four perspectives on time result from this; for example, western society fosters a lineal notion of time appropriate to “market pricing.” This in turn enables logical and analytic capacities of the left hemisphere to develop more for westerners than Australian aborigines.

Stanford Gregory on Politician’s Unconscious Cues of Dominance. Professor Gregory and his co-workers stress the unconscious or subliminal reaction to voices in communicating subordination and power to audiences in a political context. Early in their research they found that pairs of people adapted the frequencies of their vocal patterns to others. For example, persons of lower social status accommodate their non-verbal vocal patterns to persons of higher status. What is perceived as pitch in the vocal spectrum is a sign of dominance or submission. Gregory runs a sample of speech through equipment that forms a kind of wave analysis detecting these patterns. These patterns allow the researchers to analyze accurate metrics of the relative dominance or submission in political debates. Persons of higher status adjust their vocal patterns very little. This was illustrated in April 1992 and July 1993 by analyzing the voices of Larry King, the T.V. talk show host, and his quests. King’s voice changed much more with President George H. Bush and Mike Wallace than it did with Spike Lee and Dan Quale.

This technique has allowed Gregory and his colleagues to predict the popular vote percentages for eight recent presidential elections. This illustrates how much important information is conveyed beyond our awareness.

A recent preliminary study of the McCain/Obama debates suggested that Obama adopted the strategy of the famous boxer Mohammad Ali who danced around until his opponent wore himself out and at the end thoroughly defeated him (Kalkhoff and Gregory 2008). Ali called this the “rope-a-dope strategy” and it describes very well what Obama did in his debates. His voice unconsciously communicated accommodation until the end when he showed significant dominance over his opponent.

Qualifications of Theories and Methods

Theories. In the Decade of the Brain we have learned more about the brain in those 10 years than during the century which preceded them. But one should not be deceived into believing that the flurry of neuroscience research has made us understand the workings of the brain. Brothers (2001:68) among others remind us of the well-known principle that facts only have meaning when they are placed in an organized network. Without a broad theory tailored to the unique needs of the particular subject, “facts are like a set of hieroglyphics for which there is no key.” She continues to compare current neuroscience with early astronomers collecting data on the movements of heavenly bodies. It took them a relatively short time to observe the many changes in the stars and their paths. The facts collected were unexplainable without a theory. The Ptolemaic theory held sway for over 1,500 years and only changed when a central scheme for ordering the data was developed by Copernicus who changed his perspective from the stars revolving around the earth to the earth revolving around the sun. Other examples can be found in the germ theory of disease and in Darwin’s theory of evolution. In short, we are still at the stage of science called “natural history,” where observations are collected and the grand theory that unites and makes sense out of them must be deferred until later (Brothers 2001: 68.) On the brighter side, Brothers notes that the recent use of brain imaging techniques has lead to some proposals regarding how the mind works as a whole.

Methods. We need also to be aware that although our scanning methods are impressive, they are not perfect. The functional magnetic resonance image (fMRI) is a noninvasive scanner that allows us to observe the functional processes of the brain in action. It directly measures the oxygen level in the different parts of the brain at a given moment. Although oxygen level is correlated with neuronal activity, it is an indirect measure and only taps into areas of the brain. The measurement of single neurons will be necessary before we secure our knowledge about mirror neurons in humans. Once areas fire, they take up oxygen. This causes a decrease in the oxygen levels around the neuron; this is the final, but unsatisfactory indicant of our measures.

The MRI (magnetic resonance imaging) takes pictures of the *structure* of the brain rather than scanning functional processes. It also measures blood flow or blood activation. It is used to portray small images of brain areas resulting from relatively slow moving disease or trauma which cannot be measured by other means such as CAT scanners. Since MRI takes images of structure and fMRI takes images of functioning, they have different purposes and there is little advantage of one over the other.

Another scanning device called transcranial magnetic stimulation (TMS) helps us transcend the usual limitations of correlations where we are never sure of the causal factor. By looking at what happens when an area is disabled for a time we see if it is essential to some brain activity. It works by creating a magnetic field under a copper coil placed on the head of the subject. This magnetic field introduces an electric pulse called a TMS pulse. With a rapid series of these pulses, the activity of that brain area is disrupted. This tells us in effect if this area is a necessary or sufficient cause of what is being studied.

An older approach acting in a similar way to the TMS is the Wada test (Gazzaniga 1985: 81–84). This is a local anesthetic injected into brain arteries which allows one hemisphere to be put to sleep temporarily while the other hemisphere is active. The preliminary processes before using the TMS are more complex than the actual brain scans. Once the brain area in which we are interested is identified, the patient is studied with an MRI. These images are then transferred to the TMS lab which uses an infrared camera to read objects with certain paint. These objects are then placed in certain areas of the patient's head. The infrared camera reads the location in three-dimensional space and software aligns them with MRI images. Suffice it to say that this is as technical as it gets and the actual process of disengaging, or putting, the "independent variable" to sleep has yet to be done.

Of course there are difficulties in brain scans as described in *Scientific American* (2004) as about 20% of MRI patients develop claustrophobia and cannot last the full time in their narrow and confining scanners. Also we must remember that the magnets used are extremely powerful and flying metal propelled by the magnetic forces have been known to kill people. This strength varies along the length of the scanner. It takes time for the energy which the brain gives off to get back in sync with the image it creates by this changing energy.

The MRI takes pictures of the brain that are strongly colored suggesting a modular organization of the brain wherein it is broken down into separate parts responsible for certain actions. The contrasting view of brain organization holds that neural activity may be distributed in a more loosely defined network. Finally, brain areas light up for a wide variety of reasons and are active in many tasks. For example, the prefrontal cortex is active when one does any difficult task. As we shall see, the amygdala is especially sensitive to fear, but that doesn't mean that every time it lights up it is responding to fear. It also processes positive emotion. While neuroscientists are aware of these methodological issues, the reader needs to be as well.

Looking Ahead

Chapter 2 is a brief introduction to the evolution of the hominid brain and a description of how intelligence was honed. This developed not only for tool-making and the motor behavior involved, but more importantly for the evolutionary advantage intelligence added to the social cooperation needed for coordinated group life. The importance of evolution for an understanding of the brain is also noted as are some preconditions for the development of language.

It is for these evolutionary reasons that the brain is basically a social organ in the way it functions; so Chapter 3 deals with the deeply social nature of the functioning brain and the importance of the other brains united by culture for the development of one individual brain. The visual interpretation of another person's gaze is an important factor in the social development of the brain. Effects of the withdrawal of social interactions are analyzed from a neurological point of view. Chapter 4 discusses the new notion of the unconscious and the assertion made by Gazzaniga and others that 95–97% of what the brain does is unconscious. This does not negate the importance of conscious behaviors because the total numbers are so enormous. Chapter 5 deals with mirror neurons and important parallels of their findings to the Chicago pragmatists' priority on action. Chapter 6 discusses the emotional brain and the difference between unconscious emotion and the conscious experience of embodied feeling. It explores issues around the limbic system and the critical importance of emotion to effective reasoning. Chapter 7 focuses on the self and the reasons why neuroscientists have recently considered it essential to the development of their field. The fusion of self and other as an issue in neuroscience and the neurological supports for certain types of self are described. Some neuroscientists have been very sensitive about avoiding the assumption of the isolated, asocial western self. Chapter 8 presents perspectives taken by selected neuroscientist and philosophers on consciousness, subjectivity as well snowing a major limitation of traditional science, and Chapter 9 discusses imitation and intersubjectivity as another "social glue." This chapter also contains a critique of Stephen Turner's position that sociology be brought into line with cognitive psychology and their findings on imitation. The difficult and profound issues surrounding agency, free-will, and determinism are spelled out in Chapter 10 and brings us back full circle to the importance emergence as a causative force in changing brain structures described above.

Chapter 11 identifies what I have learned in writing this book that I did not know before, and the enormous potential of neuroscience to contribute to all fields of the liberal arts.

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Chapter 2
The Evolution of the Human Brain

Any of us would be hard pressed to fully realize just how long a time span of six million years actually is. That is the approximate length of time it took for the *Homo sapiens* brain to develop once our ancestral line diverged from the line which developed into modern chimpanzees and other apes.

The narrative of our ancient heritage is a story of challenge, survival, and frequent early death over millions of years of hardship. The fossil record from which we get our data gives hints of only a minute portion of actual biological history and the interpretation of these remains is always open to question and change. Any specific fossil remain cannot reveal how many species existed before and after that particular find. Nonetheless there are discernable patterns that can be explored.

One pattern is the frequency of premature death especially of the young and of females who were significantly smaller than the males and also burdened with the care of the young.

Individuals who could not cooperate with their peers or made serious mistakes which caused them to be expelled from their groups were not rewarded by huge golden parachute clauses. Most frequently they were slashed and eaten by animals much bigger, much stronger, and much faster than they. The major protection for our predecessors was within the group and cooperation was at a premium.

Although it is a fascinating story, it is not a pleasant one and those who assume we have finally arrived at some everlasting plateau of perfection (or even some final adequacy) cannot justify such a whimsical belief by anything that our evolutionary past teaches us of the process. Our futures are still in question just as are all other animal forms on earth and evolution moves on even for us. It is reasonable to recognize that we have been in existence an infinitesimally brief period relative to our ancestors and that we could disappear just as quickly (Fig. 2.1).

Several attributes of our ancestors have taken the spotlight as though they were the prime movers in the development of our modern form, divorced from anything social. Considering the ratio of body weight to brain weight, the human brain is the largest in the animal kingdom. However, Richardson (1999: 17) warns that we make too much of this. Until recently, neuroscientists were remarkably vague about

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Fig. 2.1 An endangered Australopithecine infant. Photo used by permission. Sawer and Deak (2007)

the relationship between brain size and intelligence.[1] In order to grasp the complex nature of human thought we need to go beyond the depths of the individual

[1]Neuroscientists are currently confronted with difficulties at this point. Neuroism is still popular and MRIs are not without problems. Investigators often focus on a specific area with some delineated aspect of intelligence. This causes misinterpretations and the illusion that intelligence is the product of an individual brain alone, or some parts of it.

brain and seek the origins of human intelligence in external conditions of social life. Perhaps the climate-given necessity to move from the lush forest to the savannah was the major contributor to the conditions evoking a kind of practical intelligence and emotional control. Defense, hunting, and foraging became vastly more effective when based in an organized group. A collection of separate individuals with large brains and no cooperative skills were far more vulnerable (Richardson 1999: 178). The other social factor that is important in influencing the general intelligence of a species is group size, or the shear number of like individuals with whom an animal deals on a routine basis.

To make sense out of the development of the human brain we also need to look at other factors such as what the natural environment had to offer in terms of food and the tools and technologies of the animal that enabled it to survive and maintain its way of life. It was by the use of tools that our hominid ancestors began the slow process of forging a separation from the harsh and dangerous environment whose demands previously had sapped all the of the hominids' time and energy dictating the terms of their lives. The current consensus is that social intelligence came first and made tool production possible. Ultimately this is a story of human agency. A great deal of this agency had to do with the development of self-conscious control of our biological impulses, a process which is quintessentially social. The evolution of *Homo sapiens* brain is integrally tied to a pressing need to communicate which developed over millions of years into spoken language. Derek Bickerton (2009: 10–11) has moved us away from the traditional abstract notion of adaptation which has always been construed as an asymmetrical one-way street wherein the environment is separated from the organism and acts upon it in old dualistic terms. Bickerton's approach is more transactional. The environment does not just select from our random mutations as is suggested with Richard Dawkins' selfish genes. In Dawkins' picture our forefathers would have kept recombining their genes until some odd mutation made language possible for those who, for some unexplained reason, took advantage of the mutation while so many others did not. But it is unlikely that genes are the whole story of how language occurred. Recently it has come to our attention that at least one species of parrot has as much or more language potential as apes with whom we share so much genetic structure. Language development is certainly based on more than genes.

Organisms do not just adapt to an abstract, independent environment; they respond to their particular niche. This niche is often worked over thoroughly by the species that dwell in it. Sometimes the species substantially change the environment. Bickerton gives numerous examples of this, from beavers who flood valleys to worms that enrich the soil. The actions of these organisms on the environment will then select for new traits in those organisms which will enable them to modify their niche still further, setting up a constant feedback process between organism and environment (Bickerton 2009: 10–11).

We shall now turn to those of our forefathers who prepared the way for *Homo sapiens* and a crude spoken language which eventually produced human culture as our niche.

The *Homo Sapiens* Family Tree

Australopithecines. Our first forefathers were small, slender apelike creatures between three-and-a-half and four feet tall. Females were significantly smaller. Australopithecine's first fossils are dated about 4.4 million years ago, which only means that they existed at least by then and the same uncertainty surrounds their disappearance.

This hominid's pelvis and thighbone, as well as center of gravity imply that they walked up right and they had a brain capacity of about 450 cc which is only a little more than the 400 cc for the average ape and less than one-third the size of *Homo sapiens*. The most important feature they share with us is bipedalism and the fact that their brains were rounder than those of chimpanzees. The face was apelike. In the roughly 2 million years of their existence they branched into at least five different species only one of which, africanus with a brain size of 500 cc, is generally believed to have contributed directly to our hereditary line. There are reservations about this, but there is general agreement that Australopithecine was our earliest direct ancestor.

The fossil remains of Australopithecine africanus were discovered first in Kenya, in an area which was in a transitional stage of forests giving way slowly to the tall grasses of the African savanna. It was in this environmental context that is our earliest direct ancestor. The fossil remains of Australopithecine africanus eventually left the trees for life on the ground except when chased back sporadically by the big cats which dominated the area. Because of their massive jaws and teeth, Australopithecines were believed to be foragers who ate fibrous roots and/or tubers, seeds, and vegetation. According to Novembre et al. (2007), hominid saliva gets more useable calories out of the starchy tubers and vegetable foods than do tree – dwelling chimpanzees. Natural selection could have favored the genes responsible for this enzyme (amylase) for "grounded" hominids because this savanna diet is much more readily available than the ape's diet in the trees. Occasionally, some of these early hominids may have hunted small prey and broke open bones left by other animals with small pebbles from riverbeds. But they were definitely not efficient or frequent hunters even of small animals. Most likely they were scavengers who fed off the leftovers from lions and larger cats. They also used bones for digging their roots and fibers. Tool use was not that different from contemporary chimpanzees. Some have estimated the average life span to be 30 years but children and females were particularly vulnerable to the many larger carnivores. It was still not a safe environment. Being upright meant that some of them could wield clubs for protection and carry food and other objects in their hands.

Eventually they left the forest altogether for the savanna where their upright posture helped to see longer distances for scavenging food and watching for predators. Slowly hominid legs became longer and they developed arches in their feet allowing them to cover more ground than many of their four-legged cohabitants.

According to Massey (2002), Australopithecines carried with them the basic social organization of chimpanzees today with strong ties between babies and mothers which lasted after maturity. Between the adult males, however, ties were weak although they kept their relationships with their mothers. On the group level, ties with other communities were also weak even though female children transferred out joining other groups which kept some loose connections between communities.

Chimpanzee's kinship ties and autonomous relationships are expressed and supported by emotional bonds and mutual grooming while rank is established by threat displays (Massey 2002). Massey points out that grooming releases opiates in the brain which are rewarding and increases group cohesion. Since maximum cohesion means that everyone else must groom everyone, group size is limited by the time which can be spent on grooming. On the other hand, the larger the number of a primate's routine relationships, the more the pressure exists to manage these relationships and a premium is placed on the development of the kind of social intelligence needed for creating and maintaining alignments. Massey underlines the importance of social skills for an animal whose slight frame and size leaves him dependent on forming alliances and coalitions within the group in order to supervise his survival inside his society as well as outside of it.

Early Australopithecines lived in groups a little larger than modern chimps but this size increased with later hominid species. We shall see that the current structure of the human brain was built on this early social foundation. LeDoux (1996) points out that we have a brain which is largely emotional and that emotion is a part of our early sociality which leads to the capacity for anticipating what the other is about to do (Turner 2000a). LeDoux may have just as accurately said that we have a social brain bequeathed to us by these otherwise vulnerable ancestors. Without stone tools his only survival kit was his group. Turner's hypothesis, supported by Greenspan and Shanker (2004), is that most Australopithecine communication was emotional. But on the savanna, negative emotional outbreaks could disrupt the group as well as making noises that attract predators. This created adaptive pressure both for cortical control of emotion and for the so-called basic social emotions of sympathy, guilt, and shame which promote cohesiveness. Australopithecine brain increase was mostly in the neocortex which added an extra layer to the whole brain and made room for more neurons, the cells that make brains work. The actual lobes, or key areas of the brain, remained the same and were not a part of this expansion. Whatever social intelligence Australopithecine possessed did not spill over to tool use and hunting strategies. Communication was confined to physical gestures and vocalization.

In terms of culture or the lack thereof, it is safe to assume that Australopithecines, like modern chimps, paid attention largely to the here and now with faint conscious recognition of the past and very short-term future anticipations. This "episodic" existence characterized Australopithecine life for some 3.5 million years. Despite their long legs and ability to cover long distances, they never ventured outside of the ecological niche of the African savannahs. Recently it has been found that one Australopithecine species, Garhi, also made primitive tools. Nonetheless, in general the little hominids existed for a longtime living contemporaneously with *Homo habilis*, *Homo erectus,* and even Neanderthal.

Homo habilis. Homo habilis lived 2.4–1.5 million years ago. He made the first stone tools and for this reason is referred to as the "handy man." These tools were rocks sharpened on one side to make crude choppers and scrapers. They were not refined instruments and can hardly be recognized as tools. Since they are found in butchering sites, we can infer that *Homo habilis* was more of a scavenger than a hunter. Skeletons were more robust with an average male size of 100 lbs, but they were not much taller than their forefathers. Brain capacity averaged about 550 cc some 100 cc more than Australopithecine. This increased to 800 cc, toward the end of his existence. According to Massey (2000), group size, with its increased demands on social intelligence, increased to 70 or 80 individuals; this number pushed them beyond the 20% of the time available for grooming and interfered with getting on with the rest of life. The importance of emotion as a mechanism for group cohesion was increased once again, as was the need for social intelligence.

Homo habilis existed for 1 million years, but despite this initial advancement in stone choppers the species did not go on to create further refinements in efficiency in his lifetime. For an amazingly long period of time – almost a million years – they made these same tools with monotonous regularity and little change. They never ranged outside of Africa and we find no indication of language capacity. Culture must have remained episodic – confined to the moment with little concern for past or future. Aside from his first use of stone, he neither innovated nor explored.

Some paleoanthropologists think that *Homo habilis* was not that different physically from Australopithecine and could be better seen as a later Australopithecine or an early *Homo erectus* when they became mostly scavengers in the savannas. Brains stabilized during Australopithecine time because a diet of scavenged meat could barely keep up with a fruit enriched forest diet. The equalizer was bone marrow, an extremely efficient food source, which existed in abundance and had no other animal competing for it. Australopithecine Garhi's tools may not have been as sophisticated as those of habilis but they were sufficient to break bones and expose the marrow which could remain eatable for a long time. Bickerton says this set in motion a tripling of our ancestor's brains. He warns, however, against thinking that the increase in brain size caused language. For language, he says, "What you needed wasn't brains or even intelligence so much as the right kind of niche." (Bickerton 2009: 34). Brain size does not drive innovation – innovation drives increase in brain size. Bickerton is convinced that language started 2,000,000 years ago and developed slowly over long periods of time. This is in significant contrast to Chomsky's deterministic Big Bang Theory. His theory posits an explosion in language only 60,000 years ago supposedly caused by a monster genetic mutation.

The more current "high-end niche" theory begins with describing a number of characteristics of the niche that Australopithecines, or at least Garhis and *Homo habilis* inhabited. These species did not have the technology or language skill to be effective hunters but they thrived nonetheless on the meat of large carcasses killed either by other animals or less often by natural causes. The difficulty was that these prey were protected not only by size but also by very thick hides which teeth could not puncture or tear. The usual process of rendering the meat was to wait until the natural gases expanded and ruptured the body exposing raw flesh. The trouble was that by this time many other competitors were anxious to start their long awaited dinner. Many of these competitors were large and lethal. At first it was found that primitive stone flakes could cut through the thick hides with surprising efficiency but the problem remained that these brave scavengers were not alone. What they needed was numbers – numbers larger than their small bands. They had to find a way to recruit new members and convince them that it was in their own interest to join them in mounting an army which could hold the other would-be diners at bay with rocks and stones. This "recruitment" process had to be accomplished with gestures mimicking the animal or even making noises that the animal makes. This is referred to rather esoterically as "displacement" because it uses a smaller number of iconic gestures to refer to a reality which is different from the gestures. These gestures will become important as intermediate phases in the rise of language. Bickerton concludes that the real breakthrough into language had to be displacement rather than the arbitrariness of the symbols which make up fully developed languages. Displacement is critical therefore to his argument that the origins of human language began so long ago. The scenario above is speculative by any criteria. However, a number of paleontologists have independently described parts of Bickerton's story, especially his emphasis on "recruitment." One can say it is logical given what we know about the ecological situations of the times and it fits the conditions that any theory of the origins of language would have to satisfy.[2]

Homo erectus. Things picked up somewhat with the arrival of *Homo erectus* 1.8–1.5 million years ago. But while skill at making stone edges advanced and the use of fire emerged, the new species was still prelinguistic. Without the brainpower or vocal structure for talk, its cranial capacity nonetheless doubled from 550 to 1,100 cc. *Homo erectus* had a wider inventory of tools than earlier hominids and his communicative capacities and general sociality greatly increased. The front of the head expanded and the face flattened to accept the increase in the frontal, temporal, and parietal lobes. This coincided with an increase in female size to accommodate the birth of such large heads. However, children now were even more helpless with longer infancies and they needed more attention and care through adolescence. Women were continually receptive sexually and breasts were enlarged. Massey (2002) suggests that this may have encouraged pair bonding and discouraged continual conflict between males. In sum, social connectivity increased. Cognitive functioning was concentrated on imitation and mimicry involving vocalizations, facial expression, eye movements, and emotional expression. Such attention may have been the beginning of the often-observed tendency of *Homo sapiens* infants to attend to a person's eyes and also to any pictures which resemble the human face. This is an important brain specialization for the development of a truly social brain. Turner (2000b) suggests that primary emotions were rewired via the cortex to produce the social emotions of shame and guilt which gave individuals a personal stake in controlling their own behavior in ways that led to further group cohesion. Some would see this as implying the dawning of a self, but there is

[2]See Bickerton 2009:165) (1) Selective pressures had to be strong. (2) Selective pressures had to be unique. (3) The very first language *had* to be fully functional. (4) The theory must explain why signals should be believed. (5) The theory must overcome primate selfishness. Bickerton insists that no other theory of language satisfies all these conditions.

certainly no archeological evidence that *Homo erectus* had the capacity for symbolically constructed self-consciousness. Nonetheless, after one quarter of his existence, his capacities enabled *Homo erectus* to migrate out of Africa to southern Asia and Europe about one million years ago (Fig. 2.2).

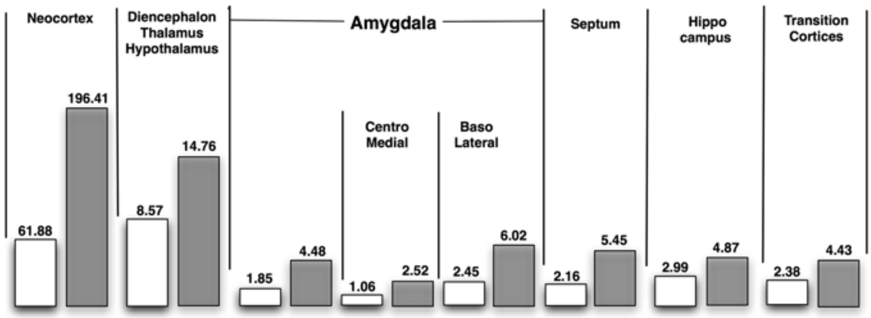

Fig. 2.2 Relative size of brain components of apes and humans (humans – *shaded*)

The brain of *Homo erectus* was also lateralized to create two different hemispheres. The right side of the brain allowed emotional communication. Tools were more refined, symmetrical, and sharper, and his inventory of tools increased to include hand axes, cleavers, and knives. This gave him the capacity to free himself from the dictates of his warm environment and survive in the harsher climates to which he traveled. He used water to migrate to his summer homes in southern France, even to Southeast Asia, and to return to North Africa in the winter and to create mental maps of the regions he covered. With all these strengths *Homo erectus* had an enormous gift for withstanding boredom. After developing his expertise in making tools, he lived with them for one million years without further development (Gazzaniga 1985).

Neanderthal and Homo heidelbergensis. Around 300,000 years ago two other species – *Homo heidelbergensis* and Neanderthal – competed with *Homo erectus* before the latter became extinct. Neanderthal's body was more robust with thicker bones and more muscle. His brain increased to 1,400 cc (which is greater than the size of a sapiens brain (Gazzaniga 1985: 149), but its organization was different with small and constricted frontal lobes. We know that Neanderthal was preverbal because of this and he had a skull structure that could not support vocalization. However, he introduced the first composite tools that were made from at least three different materials conducive to hunting big game. His skill at making sharp stone edges was remarkable and, like *Homo erectus*, he somehow achieved the feat of passing this capacity on through generations despite the absence of speech. He used flint and deer antlers to make tools which were designed to make other tools. It would take years of practice for us to learn how to make the numerous judgments about positions and angles involved in this activity. He also created stone hearths and potholes suggesting the construction of permanent shelters and his social organization of kin-based clans allowed large collectivities. Gazzaniga emphasizes Neanderthal's sense of aesthetics. Certain tools had a nonutilitarian, embellished aspect that went beyond that which was needed for practical use. Burial sites have been found which imply some form of belief in life after death. Despite all these advances Neanderthal lasted only 90,000 years

Homo sapiens. Approximately 150,000 years ago, the first fully modern *Homo sapiens* emerged in Africa. This was one hundred and fifty thousand years after Neanderthal first came on the European scene although some believe that for a short time they both existed in Europe. Around 50,000 years ago, sapiens migrated to Europe and Asia, eventually to inhabit all corners of the earth. By 20,000 years ago they had reached the Arctic. They were in the Americas by 10,000 years ago and in Polynesia by 2,000 years ago. In contrast to *Homo erectus* who lived over a span of a million and a half years and Neanderthal, each of whom spread only to Europe and southern Asia, *Homo sapiens* had populated all the earth in only 50,000 years.

Suggestions About the Origins of Speech

It should surprise no one that the origins of speech are unknown. What we can know in the grossest terms is when the brain developed an anatomical capacity for speech because this is in the fossil record of our skulls. *Homo sapiens*' brain had reached its present size of 1,450 cc, fully expanding the frontal lobes making symbolic thought and deliberate inference possible. The larger left hemisphere allowed more space for the requirements of speech production – namely Broca's area (in the temporal lobes on the left side) which houses the capacity to produce grammatical speech and Wernike's area (behind the temporal lobes) which makes possible the semantic understanding of words and/or the reception of speech. These areas are usually on the left hemisphere of the brain. The left hemisphere contains what Gazzaniga (1985) calls the interpreter of the impulses from the right brain. Rather than living only in the present, the use of verbal symbols allowed *Homo sapiens* to fully transcend the immediate experience given by the senses and to live in an abstract, extra-sensory, and hypothetical world. In turn this provided a basis for what many have referred to as the great leap forward. Rapid cultural change and/or technical innovations are no longer connected with brain size or biological changes. In contrast to tool use which had remained stagnant for a million years with *Homo habilis*, contemporary technological innovation is no longer constrained and can develop dramatically.

According to Gazzaniga (1985), only with *Homo sapiens* did the part of the brain crucial to language become vascularized enough to allow the needed blood supplies. This was especially true in Wernicke's area. This process had indeed been developing in earlier hominids but had not reached the critical stage where it could provide a base for language development. Analyzing the fossil skulls allowed archeologists to trace the distribution of blood supplies for the lateral surfaces of the skull where indentations were made by the blood vessels. Gazzaniga makes the important point that no amount of environmental pressure can push the brain beyond what its physical limits would allow. To free one's self from the dictates of the environment, cognitive ability must be strong enough to allow a distanced perspective and to transcend immediate sensory experience.

Of course, the right brain received the same increase in blood as the left. This meant an important increase in aesthetic sensitivity which is a specialty of the right hemisphere. Like cognition, aesthetic abilities impose something distinctively human which is projected onto the world. Art takes it's meaning from pleasure rather than practical necessities.

One should not assume that brain organization and language were developed for the purpose of rational decision-making. Most scholars now argue that language evolved for social reasons and to enhance human connectivity (see Maryansky 1996 and Brothers 2002). From an evolutionary point of view, language functions primarily as a far more efficient alternative to grooming to achieve the resulting social cohesion. In the past, group size was dictated by how much time could be spent in grooming. When language and/or emotion took the place of physical grooming, the size of a community was no longer constrained by this factor. This is critical to the development of cognitive capacity because as community size goes up, so does the intelligence and social sensitivity needed to deal with the larger number of others which this creates (Massey 2002). The large human brain evolved allowing individuals to negotiate with each other. Small (2008: 113) puts it succinctly: "As we have seen current theories suggest that our large brain did not evolve to solve the relatively simple problem associated with tool use much less the complexities posed by the problems posed by social living." This is still what we use the brain for today – most of the time at least. Intelligence as an offshoot of increased sociality matured only when hunting and gathering gave way to stable settlements. The development of a food surplus made possible by animal and plant domestication led to city life around 10,000–12,000 years ago. Whereas chimps spend 20% of their time grooming each other, humans spend 20% of their time in social interaction, mostly in conversation, much of which is about each other. Two-thirds of human conversation pertains not to technological problems or rational decision-making, but to gossip about other people.

However this may be, the conceptual underpinnings for rationality have existed for less than 3% of hominid's life span at the most. Rationality only developed when some people were released from the constant pressures to feed themselves and from the responsibility of rearing children. As we know from the experience of Socrates, rationality was not always appreciated; nor is it unanimously appreciated today as the recent attacks on evolutionary theory demonstrate.

An important capacity that the neocortex gave Australopithecine was social sensitivity. Social coordination was a paramount strategy for early near-man. *Homo sapiens* reached our current brain size only 150,000 years ago. In the 6 million years before that, from the time when our lineage broke away from the chimps, the human brain almost tripled in size from the chimp's average of 450–1,250 cc for humans.

We need to ask if this growth was slow and continuous or if it occurred in spurts. If the growth was uneven, what spurts correlate with in the environment did this correlated with and was the growth uniform or partial and specialized? Some evolutionary psychologists think that the human cognitive capacities appearing in *Homo sapiens* emerged from our own lineage instead of that of chimps. However, many disagree because this goes against the general character of the evolutionary process reflected in the fossil record as well as critical similarities we share with chimpanzees. These include Chimpanzees use of Machiavellian tactics to gain desired goals which more powerful others would block and capacities for social bargaining. Following the approach of continuity and emergence rather than separating human development from the corpus of evolution, primatologists have been able to go beyond the original Darwinian identification of the environmental selectors that encouraged intelligence.

Traditionally, the advancement of intelligence was thought to subserve tool use. A positive feedback loop emerged where bipedalism freed the hands, which put a premium on tool use that subsequently put a further premium on instrumental thinking. The advancement of fossil dating techniques has put a crimp in this commonsense story since they show that these events occurred millions of years apart. Bipedalism was evident more than 5 million years ago while tool use emerged 2.5 million years ago and the rapid expansion of brain size occurred as recently as 200,000 thousand years ago. End of story!

Current thinking is that the pressure to select for intelligence came from the demands of the social organization. Especially important was the advantage given to those who could anticipate the reactions of others and foresee the consequences of their social actions. These capacities can be seen writ somewhat smaller in today's chimpanzees and especially bonobo which are now being closely studied showing psychological similarities to us that are strong enough to be unsettling (see Greenspan and Shanker 2004: 177–78).[3] They see living in larger, more stable communities as providing more time for early humans to be creative which may have been a factor in our lightening-fast technological ascent. They would reverse the view that technological advances provided a basis for large communities. The real "engine in our evolution," they say, was the signaling of affect which underpins a sense of shared reality – what sociologists see as "intersubjectivity." Considering that humans had tools and shelter long before they could speak gives

[3] In making a case for primate social intelligence the author present a case of a bonobo chimpanzee who could use a computerized board to communicate with his handlers. The important part of the story is bonobo Kanzi's reasoning. The handler (Sue) had been exhausted by many difficulties she had solved the previous day and only had time for 2 h sleep. She arrived at her office out of sorts and looking like it. When Kanzi came up to play as usual, Sue did not have time. Kanzi's mood changed immediately and he began to stare at her prodding her very gently. Then, using the "language computers," he asked if she was mad at him or another bonobo in the facility. Then he offered Sue some cereal he had been eating when she had come in and tried in other ways to do things that seemed like helping. The authors say they had never before seen Kanzi try to solve a problem by trial and error, but he is often quiet before he acts and then adjusts his actions as necessary.

further evidence that thought came before language. After all, without a thought there is not much to say. Anyone who has had a word on the tip of his tongue but failed to dredge it up from memory knows that it is possible to think of a concept without having an accessible word for it. Home sapiens and earlier hominids would not have survived for long without non-verbal logical thinking.

This evidence that thought precedes language is so full of implications that it is worth surveying the evidence cited by Greenspan and Shanker (2004).[4] They point to the hearths and pits around Moscow dated from 20,000 to 25,000 years ago where stone and bone items were manufactured and impressive burial paraphernalia including clothing, tools, and jewelry were found in abundance. The tomb contained remnants of males who were covered with outer cloaks and footwear. One of the male's garments had 3,000 ivory beads and a fox-skin hat covered his head. This suggests a highly complex social structure.

More evidence that logical thinking occurred before language is provided by the fact that early *Homo sapiens* had the wherewithal to build vessels capable of transporting people across the high seas to Australia 60,000 years ago. Greenspan and Shanker say that this endeavor would have demanded a significant advance in the capacity to think logically. According to Rilling (2006), human brain specializations include an overall larger proportion of the neocortex compared to the development of other apes with significant enlargement of the prefrontal and temporal association cortices. The prefrontal lobes enable instrumental behavior, concentration, and emotional control as well as the integration of cognition and emotion necessary for decision-making. Also there is an apparent increase in cerebral connections with cerebral cortical association areas involved in cognition and a probable augmentation of intracortical connectivity in the prefrontal cortex. The increase in the neocortex would increase the association areas. These areas function to produce the experience of a coherent and meaningful world. Association areas allow the different parts of the brain to relate to each other producing the blending of diverse sensory messages into a unified whole.

Hobbs (2006: 81) warns that the first *Homo sapiens* had language readiness as early as 150,000 years ago, but readiness does not suffice to produce speech. To think so would be a clear case of neuroism. The most commonly cited date for the so-called origin of language is about 70,000–35,000 years ago, but this does not mean that all *Homo sapiens* had speech at that time. The origin of speech depends on cultural, symbolic, and anatomical readiness. Artifacts are the best indication for the capacity for symbolism and no solid evidence for such artifacts appears until about 70,000 years ago in Africa and 40,000 years ago elsewhere. Surprisingly, an important anatomical change allowing speech is the reduction of the gastrointestinal tract. This developed with a change of diet from meat to cooked fibers and made

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[4]Evidence from contexts comes from at least two other perspectives. First are animal studies including those of Bonobos Greenspan and Shanker (2004). Another recent study is Pepperberg's (2008) work on parrots who seem to understand concepts such as smaller and more just as infants seem to do. The second perspective is that of Lakoff and Johnson (1999) whose work on non-linguistic concepts, produced by the brain, will be addressed in the conclusions of this book.

possible the expanded brain and the enlargement of the channel necessary in the throat which is necessary for speech (Bickerton (2009).

The expanded temporal lobes house Broca's area which is associated with the *production* of speech in front of the left temporal lobe and Wernecke's area further back in the same lobe allowing the understanding of speech. Non-human primates lack a direct path from the motor cortex and the nucleus ambiguous where motor neurons for the larynx are located. This is the seat for learning vocalization and talk. The most significant limitation for apes in learning language, however, comes from capacities enabled by the Broca's center rather than Wernicke's area. Whether these areas are true evolutionary novelties is debatable, but the development of Broca's area responsible for making speech seems likely unique for humans. Chimps understand speech better than they can produce it using computers. This development in *Homo sapiens* includes the evolutionary reorganization of the frontal–prefrontal cortex such that facial and oral motor cortices and their related subcortical speech centers came under cognitive control.

Another evolutionary anatomical change necessary for the production of speech is the capacity of the throat and tongue to make a vast number of sounds. This capacity depends on the "descent of the larynx" which is necessary to facilitate these speech movements and may have started with the genus Homo. The key to this descent is the very small hyoid bone within the larynx. Because the hyoid is so small the fossil evidence for it is scarce. We do have evidence that it was a part of the Neanderthal remains unearthed in Israel.

The weight ratio of brain to body weight is complicated, but can be overemphasized. The number of cortical neurons and the speed of these neurons may be more important within the boundaries of the average brain sizes for *Homo sapiens*. To complicate matters further, the plasticity of the brain means that its structure can actually change with the learning of new tasks and ways of thinking.

Furthermore, the size of the *Homo sapiens* brain comes at a significant cost. Most familiar is the large head that makes birth so difficult and physically dangerous to the female. In order to make birth possible at all, the infant must be born 2 months prematurely, basically unprepared for life outside of the womb; this condition makes the infant very vulnerable and puts enormous demands on the mother for constant life-sustaining attention. The human infant is born with relatively few innate mechanisms of sustaining life and the demands of socialization are also costly. The drastically prolonged period of human brain development constitutes the basis for an increased ability in learning and memory formation.

The brain is as costly to the individual owner's body as it is to the group. It takes up only one-half of 1% of its cell count but consumes 20% of its calories, 25% of its electrochemical energy, and 15% of its oxygen (Miller 2007: 288). Edelman (1992) tells us "the human brain is the most complicated material object in the known universe." The downside of this awesome complexity is that the large human brain is prone to mental disorder at a much higher rate than are those of the great apes.

If these costs are so significant on so many different levels one is compelled to ask why the increase in brain size persisted so incessantly through the six million years of hominid and human development. There had to be a payoff which significantly counterbalanced these costs. This payoff came in human group life which is essential to human survival with the intellectual capacity for tool use seen merely as a consequence of evolutionary pressures for the development of the social skills needed for social interaction.

Conclusion: Thoughts About Evolution and the Brain and the Function of Beliefs

Evolution as Necessary for Understanding the Human Brain. We know from the split-brain research that the left-brain interpreter is continually at work searching for meaning and trying to make sense of things. Furthermore, the left-brain is especially unreliable about its reconstruction of our past in self-serving ways. What is convenient for us tends to carry with it the "ring of truth." According to Gazzaniga (1985: 136) one of the interpreter's favorite techniques is to over-generalize. In order to show the necessity of evolution for understanding the brain, he tells of George Wolford's work on even more of the left-brain shenanigans. In one of Wolford's projects the participant has to predict whether a light will flash on the top or bottom of a computer screen. The light, however, is manipulated by the experimenter to turn on at the top of the screen 80% of the time in a random sequence. People catch on quickly that the top button is turning on more than the bottom but that does not satisfy the left-brain. It wants to know the whole pattern unhindered by the possibility that the random selection eliminates any realistic possibility of a pattern. Because of this bias, the subjects are only right 68% of the time whereas if they pressed the top button only they would be right 80% of the time.

What makes this even more interesting is that the "lowly" rat and other animals who lack such a left-brain interpreter do not make this mistake and rapidly learn to push the top button all the time. Despite all the problems inherent in conceptualizing intelligence, *Homo sapiens* is surely more gifted in that department than a rat. Rather than searching for deeper meaning, the rat lives in the moment.

Gazzaniga sees this as just one example of why we cannot understand the brain without an evolutionary approach. According to him (1999: 137) "the human brain, like any brain, is a collection of evolutionary adaptations established through natural selection." Animals' brains tend not to lateralize their capacities to one side of the brain or the other but tend to distribute them equally to both sides. In the past, neuroscientists believed that lateralization in humans was an "evolutionary add-on." Boca's and Wernicke's areas were good examples. The new finding only made sense if the development of the human brain had to give up some capacities in order to grow others. An important characteristic of the brain is that it is an ingenious space-saving device. Some approaches to brain anatomy focus only on the structure of brain parts; however, if an understanding of how the brain came to be is the goal, evolution is a necessary part of the story of the brain as an imperfect tinkerer.

The Functions of Beliefs. Surprisingly, prelinguistic infants seem to look for causes in the external world. When experimenters create something unexplainable or capricious for them to watch, they stare more intensely as if they are trying to figure it out. They become bored with the expected event and repeat their scanning when the expected one does not appear. This suggests that the search for cause may well be hardwired in the human brain.

From their beginning, *Homo sapiens*, like infants, searched for causes and asked practical questions like "what if I do this?" They also made inferences like "Well, if that rock rolled all the way down the slope without breaking into pieces it must be good material to use as a tool cutter." Very early in *Homo sapiens*' history, adornments and beads become greatly valued as a signs of status which are socially constructed instead of nature-given. Beads especially were valued for this purpose and traveled long distances in trade routes.

There was some apprehension about death even with Neanderthals as hinted at by their burial traditions, and *Homo sapiens* were probably more concerned about the future and what happens after death. Note that "nothing happens" is not a satisfactory answer for the vast majority. Once you have a concept of self, the past and the future become more dominant and one wants life to continue even after death. Practical questions like what kind of rock will make good tools, procuring help in a hunt for animals and how to keep warm could be verified and put to the test by all humans regardless of their societies. But explanations about why we are here, what will happen to us after we die, and how the earth developed are different and can't be verified by asking does it work? These questions about life's meaning cannot be tested. But they will be produced because of our left-brain's insistence on explanations. Of course, the narratives they created were going to vary from society to society because the human mind divorced from the practicalities of action can conceive of anything. Left with no such grounding, one story is as good as the other.

If others can challenge an accepted and cherished belief, this is perceived as a serious threat, encouraging societies to put pressure on what to believe and how to sanction unbelievers. People who voiced their skepticism were in one way or another considered heretics and had to be destroyed. Socrates and Jesus are obvious examples. Lacking practical proof, the consensus was artificially enforced and it was necessary to have enforcers who were shamans or priests. As long as humans think hypothetically they are going to search for comfort from the pain of anxiety about the future.

As people started traveling they were confronted with different beliefs and since they were taught that all "real" people accepted their particular explanations, it was only reasonable to look down on those who disagreed. The trouble was that their hosts also had the same problem.

Looking at it from this broad perspective, one's own status and ideas about oneself are hypotheticals that depend on these broader beliefs. Beliefs live on by faith in "things unseen," not by practical evidence. We can conjecture that the reason people in primitive societies believe is because everyone they know believes and each has a big stake in conforming. If your self-worth, status, and the meaning of your life are dependent on the validity of these symbolic constructions, it is understandable that you will fight for these hypotheticals. Ernest Becker, in his award winning *Denial of Death,* called these beliefs "hero systems"; a clear example of such a system can be seen today with the Jihadists. Former President Bush defined the wars in Afghanistan and Iraq as crusades – wars of religious beliefs. That, more than access to material oil, made them worth fighting for. Beliefs give us meaning and also give us rationalizations for war. They come out of the search for cause in an animal whose brains are made for practical questioning even when they cannot find consensus on the answers.

Important Developments in the Evolution of the Human Brain

6,000,000 years ago: Australopithecines left the trees and split from Chimps as the first upright hominid.

3,000,000: Rapid changes in climate

2,00,000: *Homo habilis* made crude stone tools, but they were not improved on with subsequent generations. Eventually left Africa and became extinct.

2,000,000: *Homo habilis* entered high-end scavenging. Brain tripled in size.

1,500,000: *Homo erectus* brought stones from highlands to make tools but there was no refinement. Evidence of controlled use of fire is found. Cranial capacity doubled. Communicated through emotional and other gestures. Taught each other by imitation and demonstration, but no generational advancements. He lasted for 500,000 years.

1,000,000: *Homo erectus* moved out of Africa during the Pleistocene Ice Age. Some say this produced a monster genetic mutation.

500,00–200,000: The human brain was greatly expanded.

600,000–100,000: Archaic *Homo sapiens* expanded parietal region. . .maybe an elaboration of the larynx. They began to act in ways specifically human. They made significant technological advances.

300,000: Archaic *Homo sapiens* started burial rites which implies an advanced belief system.

300,000: Several new species of hominids competed with *Homo erectus* but erectus disappeared. One was the Neanderthals whose skull structure prohibited speech, but they made the first composite tools and had permanent shelters. Neanderthal only lasted around 90,000 years.

150,000: *Homo sapiens* developed in Africa but left after 60,000 years to Europe and Asia. These consummate travelers populated the earth in 50,000 years.

130,000: Sapiens began to talk using not only vocabulary but syntax (grammatical rules).

100,000: Sapiens bones found in Israel (connected to Africa) were like ours but they did not talk or behave like us.

90,000: Big Bang! *Homo Sapiens* left Africa. They started a revolutionary way of life. Some say the Big Bang could only be mutation. Technology increased at a great pace independently of brain size. Much debate surrounds this decisive expansion.

50,000: The brain changed, not in size but in it's wiring to make possible an even more complex social life.

43,000: The oldest beads found. This is not trivial. Human decoration was an important sign of identity and status, something humanly constructed rather than given in nature. Tool use refined to arrows and bronze, replaced flint, etc.

38,000: Beads became mass produced and were the objects of long-distant trading.

34,000: More advanced cave art was produced which meant symbols and thinking beyond the immediately present. Cave paintings symbolized as another life. This also transformed the world in a blink of the eye.

1,000–13,000: Some of the greatest Paleolithic works of art were found. Evolutionary thinkers concluded that the artists who created these cave paintings had crossed some qualitative "cognitive divide."

10,000: The emergence of agriculture gave time for other developments transforming the environment in an evolutionary blink of the eye.

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Chapter 3
What Is Social About the Human Brain?

The first neuroscientist to focus exclusively on the social nature of the brain was Leslie Brothers. Her observation is worth repeating: "while our individual brains are singular and self-contained, the *processes* on which they depend for functioning are social ones. We have seen that there is no fully working human brain without the presences of other brains. The functioning brain is social in the sense that any given brain is completely dependent on other brains for its development. Without question, the synaptic brain is contained in our individual skulls but the intangible thought processes which these synapses make possible depend on a social environment with other actors who are engaged in everyday public discourse and interaction" (Brothers 1997 and 2001).

In Brother's words, "Just as chromatin proved to hold the key to the mystery of inheritance, human conversation holds the key to the mind" (Brothers 1997:xii). She suggests we take the first step in bridging the gap between minds and brains by acknowledging that cultures arise from the mutual influences which humans have on each other. "This linguistic framework forms the living content of mind, so that the mind is communal by its very nature: it cannot be derived from a single brain in isolation" (Brothers 1997: xii).

Therefore it is important to identify what is meant by the term "social." Certainly it means more than the presence of other similar bodies or gregariousness. Most young mammals are gregarious. We become socialized in the social psychological sense when the other person's anticipated response is incorporated into our own developing lines of action. Traditionally sociologists have referred to this process as role-taking and treated it as a part of a theory of self-awareness, but we now know that much of the social attunement and coordination which comprises social interaction is completely outside of our consciousness. Although this lack of consciousness does not challenge the critical part that self-awareness plays in the flexible self-control of human behavior, it does mean that the social aspect works on two levels, the conscious and the unconscious. In further chapters we shall see that major aspects of the unconscious are riddled with the cognitive and the symbolic and that to ignore this fact is to leave out at the least one-half of what is social about our brains.

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Intersubjectivity

Any discussion of our communal natures, and what we mean by the social must deal with the fact that while we are all different individuals, most of us must live in a world we see as common to all of us. The in-depth answer to this is the concept of intersubjectivity which Brothers uses adroitly.

Intersubjectivity is best understood by asking what a society would look like if we were all individualist empiricists. If pressed on the point, many of us might assume that knowledge is based on direct observation. Some theories of how we go about knowing the world are asocial and some are social. The traditional empirical epistemology is particularly congruent and supportive of individualistic societies with their asocial focus on the private. Originally empiricism relied on fact, seen as in opposition to theory, and fact was gathered by the individual's private senses.

But to one person standing on a hill, the shape of a tree may look very different from that observed by a person up close to it. The problem with this is if we rely purely on observation, there would have to be two trees. That would be what pure observation gives in this case. If the empirical "world of appearance" to the individual alone is all we accept, then the two persons are isolated from each other in their two different perceptual worlds.

Our Social Natures Win Out. Regardless of our empirical predilections, people of all ages and societies opt intuitively for the existence of a common world. The idea that there are two separate, objective trees offends our sensibilities regardless of how consistent this is with our culturally given commonsense epistemologies. Why this pervasive intuitive rejection of logical consistency? It is because the belief in a common world, regardless of our diverse subjective experiences of it, is the *sine non-quo* of human connection and society itself. Nonetheless, it took more than a few decades for the old empiricists to realize that the assumption of the isolated individual, relying on his biologically given senses alone, could never produce objective knowledge. It could never produce knowledge transcending the inherent differences among the subjective and/or *perceptual* worlds of diverse, private individuals.

Northrop (1948) reminds us that Heraclites had hinted at this during the dawn of Greek philosophy: "Those who are awake have a common world; those who are asleep turn in their private worlds." Northrop updates this more concretely:

> (A)s Albert Einstein and most expert scientists who have examined with care the methodological foundations of scientific knowledge clearly recognize, the belief in an objective, public world with scientific objects in it the same for all observers, is a theoretically inferred, not a purely empirically given knowledge (1948, 43).

O'Neil (1970, 94) states that this notion of an objective world is based on the "naïve and massive everyday assumption that there is a world which, despite the variety of view points and circumstances, we nevertheless think we hold in common." It is to this abstracted common world that we appeal even to settle our differences. While such a world gives a sense of consensus, it is also necessary for the existence of arguments. *Without the assumption of one common tree, discussants* *would have nothing to ague over.* There would be two trees and no problems. Except that society could not exist. Disagreement is only real if it is over the same subject matter. Otherwise we are talking past each other and not really talking to each other at all. This is what makes the intersubjective essential for human discourse and communication.

The conclusion to the above is that the assumption of the common world arises out of human talk. This in turn is the answer to Simmel's question of what makes society possible. We become part of each other through intersubjectivity and symbolic discourse. As Schultz (1967) suggests, intersubjectivity is the essence of social life, without it, social action is impossible. It is indeed ironic that the objective world as it "really" is – Kant's "thing in itself" – the scientific world is given through human talk. But the fact that it is necessary for human conversation cannot be seen as its cause. This would be teleological. A cause has to come before an event. Intersubjectivity is caused, if not guaranteed, through the human brain's mirror neurons and our tendencies for the imitation of others. Nature and nurture must work together.

Intersubjectivity and Neuroscience. The term intersubjectivity was coined in sociology by the noted phenomenologist Schultz (1967). For Schultz, intersubjectivity is the essence of social life without which social action is impossible. Not only do human beings with different actual experiences of the same things convince themselves that they nevertheless live in a common world, but part and parcel of this process is the awareness of the independent lifeworld of another. This leads us in the direction of role-taking from a sociological viewpoint and mind-reading from a cognitive neuroscientific viewpoint. Both perspectives understand that humans do not only respond to each other's bodies as much as they respond to each other's cognitively created persons or selves.

Cozolino (2006: 300) joins Brothers in warning against "neuroism," which encourages us to consider each individual as a given. But he also emphasizes that individuals cannot be separated from the group. We are always involved in a context of mutual cooperation. Since neurons are as social in regard to other neurons as individuals are to each other, the interconnectedness of neurons must be our unit of analysis just as surely as the interconnectedness of individuals is the focus for social psychology.

Our bodies guarantee a part of this sociality. Gregory (1999), for example, reminds us that neonates 3 weeks after birth adapt their brain waves to those of their mothers. Many of us will remember the study by McClintock (1971) of the synchrony of menstrual cycles of women sharing dorms. Gregory points to "rhythmic entrainment in dance and music and as well as with persons engaged in sawing and hammering in the presence of each other" (Bernstein 1967). Then there is the matter of imitation discussed in a later chapter. Imitation is significantly more complex than it sounds and has much to do with our human connectivity and what holds us together. Dijksterhuis (2005) summarizes these tendencies: "a process of behavioral adjustment ensues in which behavior or behavioral patterns are, often subtly, brought more in line with the behavior of another person." Gregory (1999: 254–256) summarizes studies of a variety of unconscious mutual adaptations and then shares studies of his own. Both on the conscious level of minded behavior and on the unconscious level on which most of our brain works, we are social to the core.[1]

The Construction of Persons and Their Subjectivities

Another way of revealing the social nature of the brain is to look at ways it contributes to interpersonal connections. On the social level this connection can be seen in the languages, and especially significant symbols, are prerequisites for intercommunications. On the face-to-face level it can be seen in the way we relate to each other as persons with inner lives. Cognitive social psychologists talk about "theory of mind" which overlaps closely with Brothers' "social editor," but the latter is more specifically involved in brain areas per se than is the case in the literature on "theory of mind." Theory of mind does not refer to the scientists' theory, but to the observation that all normal humans beings learn to invest each other with minds that are separate and distinct from their own.

We have seen that both socially minded neuroscientists and sociologists are fighting a battle against the ideologically distorted model of the self-contained person portrayed by so many psychologists, sociologists, and self-help writers. This model has been decried for some time by eminent representatives of all the social sciences. Now we can add to these social psychological reformers many prominent neuroscientists including Leslie Brothers and Michael Gazzaniga who authored *The Social Brain* in 1985. The social nature of the brain for Gazzaniga comes from his discovery that the conscious, linguistic side of the brain acted as a compulsive interpreter of events and as a coordinator of the brain's many mute, modular parts. Brothers' treatment locates many more social aspects of the brain and thus will be our focus here along with more recent contributions by Cozolino (2006). Probably the most influential cognitive psychologist stressing the social nature of the brain and its dependence on broader society is Cacioppo (2002).

Language, the Brain, and the Construction of One's Self and Others

We have already noted Brothers' position that it takes numerous brains to make one brain work and that these numerous brains do not work without language. She goes on to say that an observable external body becomes an intangible *person* when it is perceived by the actor to own a conscious subjective experience. Strange as it may appear to us, this perception is not an inevitable observation but has to be imputed by the active interpretations of special parts of the brain. Brothers goes to some effort

[1] You will remember here that most of this unconscious is in the service of functions in which we have no interest, like the working of the anatomical nervous system or the control of body temperature and breathing.

to present the process of constructing other persons as "problematic" rather than seeing it as so obvious that it needs no explanation. We are so used to perceiving "persons" that it is hard to imagine how it could be any different from the way it is. But we do not literally *see* other peoples' inner lives. Something else must be involved that is "read into the world" by the actor with the help of language, the brain, and the gestures of other persons which we then interpret.

Words as Mere Sounds and Words as Meanings. The difference between hearing the mere *sound* of a word and taking its linguistic meaning is obvious enough, but understanding the processes which combine these two is critical to understanding how we become compelled by our brains to construct other selves. We are so used to believing that we *hear* the meanings of words rather than *thinking* them that it is very hard to disentangle literal sounds from their cultural meanings. Nonetheless, if we think we hear words primarily with our ears we are quite mistaken. It is impossible for me now merely to "hear" the sound of the word "help" without reacting to its meaning. A young man hearing a beautiful woman say how much she adores and loves him is not going to be occupied with the different *sounds* of "love,", "adore," and "you." Even in the most mundane cases we are literally compelled to hear only the semantic or meaningful aspect of words. Some aphasics hear word sounds accurately enough, but fail to take the next step in conceiving meanings (Brothers 1997:4–5). It is hard for me now even to remember specific words whose actual sounds per se once came to my attention, although I can distinctly remember in my youth thinking how strange some words sounded. After a significant amount of effort I have just now remembered liking the sound of "Caledonia" because to me it had such an exotic ring. However, that is a matter of its personal sound as perceived by me and has not one thing to do with how the word is used publicly to refer to a place in Scotland. Our language deceives us once again by using a purely sensory term like "hearing" to describe understanding verbal communication. The term "hearing" leaves out the most important half of the story. The *sounds* of human discourse are of secondary importance. One could ask a partner "did you hear me?" and the other could answer with a literal "Yes," without knowing a thing about the *meanings* of what she actually said. Sounds are just publicly shared vehicles for linguistically formed, and thus socially relative meanings. The term "hearing" which attributes comprehension to the ears alone, leaves out the work that must be done unconsciously in the immensely complex part of the brain called Wernicke's area which enables us to render these sounds (or hand gestures) into meanings.

This area is usually located in the back top of the temporal lobe of the left-brain and is intimately involved in the comprehension of spoken language. It is connected by neural pathways to Broca's area which enables speech production and is more to the front of the brain above the temporal lobe. It is Wernicke's area in back of the temporal lobe that gives us a natural push to hear meanings rather than sounds. Likewise, we do not simply see mere bodies but we are compelled to perceive people who have them. Brothers (1997:4) refers to the philosophers Ayer and Strawson who argued that the connection between the concept of a person and an inner life is not a logical though it is absolutely taken as such to us.

Around the age of 6, bodies come to have this semantic aspect (though it takes several years more to become proficient role-takers). As with verbal meanings it becomes impossible just to sense appearance, bodily movement, voice, and face. Instead, we read the face's meaning as a "persona." Brothers' argument is that just as we are biologically prepared to learn a language (that is to "take meanings" and be unaware of mere sounds), we are also biologically prepared to subscribe to the concept of the person with an inner life. Note that a biological "preparedness" to construct persons does not rule out the equal importance of social interaction and especially an ongoing linguistic order which the person draws on to create semantic selves and intersubjectivity.

Misidentification Syndromes

Since the unconscious by definition works in silence, we often have to wait for its malfunctioning to appreciate its accomplishments. Patients suffering from the various "misidentification syndromes" are cases in point. The causes of these maladies are found in brain lesions, most of which are diffuse. A patient may feel that they are someone else or that someone else was taking over their brain. Brothers gives evidence that in contrast to the specialized and relatively delineated Wernicke's area, one's own mental life and that of others is encoded in widespread regions of the brain.

She makes a telling argument that our ancestors began with a brain system specialized for perceiving and responding to bodies and their gestures and that a slight modification of this system enabled us to generate the precepts of persons and their minds. This type of emergent change is quite common in evolution, and the brain has been aptly labeled one of the world's greatest tinkerers, taking pre-established structures and changing them for new structural adaptations.

The Brain as Social

Brothers (1997:13) starts her argument for the social nature of the brain by pointing to the finding that 40 newborn infants who were all of 9 min old were much more likely to follow a face-like picture with features in normal positions than one with features out of place or a blank shape of a head. The fixation on the mother's face is an obligatory brain stem reflex that ensures "imprinting" of this vital social information." In one study, 7–11-week-old babies looking at adult faces shifted their gaze to the eyes when the person was talking even though one might think that the more pronounced movements of the mouth would have been more interesting. The suggestion is that the expressive movements of the region around the eyes attracted this early attention. Within 36 h after birth, infants imitate adults as they open their mouths and stick out their tongues. According to Brothers (2001) even blind infants exhibit a social smile. Smiles imply the other side of the early connection equation.

A smiling baby with great big eyes is hard for many adults to resist. Studies like these imply an innate predisposition of infants to establish and maintain rapport. In the months following birth these motor reflexes decline because they have done their job and can leave things to the cortex's more flexible mode of operation. These findings strongly suggest a hypothesis that we have a brain which predisposes to the social.

While being cautious not to reify the different capacities of our two brain hemispheres, the left side seems usually given to linguistic functions and the right side tends toward to recognition and interpretation of emotional expression. These observations lead Brothers (1997:15) to suggest that;

> ...The child does not attach utterances to persons because of logical, abstract necessity. Instead utterances are intrinsically attached to persons because language perception (in Wernicke's area) shares the same neural ensembles that encode expressive faces and voices.

The brain's representations of facial and vocal expressiveness form the developmental core of the representations we call the "person." Brothers builds to a description of what she calls the social editor: a system of brain regions that serves powerful social interests and encourages the brain as a whole to report on features of the faces of others and the broad social environment.

The Brain as Social Editor. As Brothers (1997:61) summarizes;

> "The social editor" is a set of structures in the anterior temporal lobe and areas related to it that evolved to select certain neural ensembles in sensory cortices which encode social features and link them to action dispositions.[2] Brain areas which comprise the social editor are discussed as follows.

The Amygdala. The brain's social editor revolves around the amygdala and related structures such as the orbital frontal cortex, anterior cingulate cortex, fusiform facial area, and temporal lobe. The insular and somatosensory cortex[3] are somewhat involved also. The fusiform face area integrates information relating to the identification of faces and their expressions. As faces change so do the regions drawn on for their identification and analysis (Cozolino 2006: 58). When emotion is identified in faces, the amygdala starts the process of sending this and other facial information to the fusiform face area and integration region in the occipital lobe (Fig. 3.1).

The amygdala is best known for its function as a warning system but this characteristic is intertwined deeply with its function as the key actor in the social brain.

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[2] An action's potential or "impulse" is an explosion of an electrical charge that sends information down from its origin in the cell body to another neuronal cell. This is created when a stimulus moves a resting neuron to increase its charge enough to fire its message. All action potential are the same. There are no differences in the quality or speed of any neuronal cell. The resting potential of a neuron is about –70 mV. This is +70 mV more than on the outside. At rest there are more potassium ions inside the neuron than outside and more sodium ions outside the neurons than inside. This depolarizing current causes a neuron to fire when it reaches –55 mV.

[3] Perhaps Brothers does not talk about the insular because it is so deep inside the temporal lobe that exploring it has only recently been made possible.

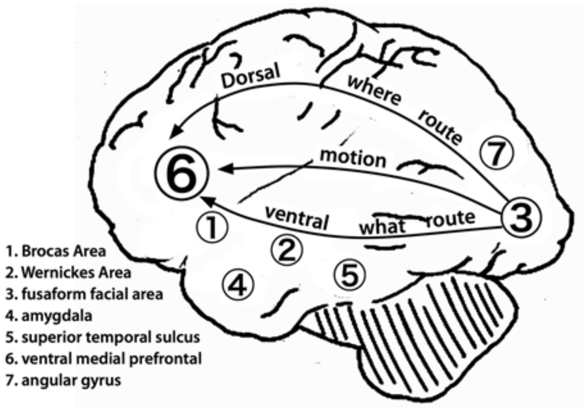

Fig. 3.1 Dominant parts of the social brain

As Brothers informs us, "One's brain must detect and report on social events – the more quickly and accurately, the better." It is a complex system of 12 interconnected nuclei with various sensitivities for attention, learning, and emotional memory. It's almond-sized structure sits on the end of the hippocampus of the limbic system on a plane with the front of the temporal lobe. It is activated in different parts by different aspects of faces. For example, the right hemisphere of the amygdala becomes activated when emotion is seen in another person's face. Unfamiliar faces activate the left hemisphere of the amygdala but it is important to see facial recognition as produced by a whole system involving the areas discussed below. The amygdala does nothing by itself. LeDoux warns us that, on its own, it is just a piece of meat.

Because of the amygdala's connection with other regions, it becomes a part of the neurosystem that can actually process information and control behavior. The amygdala begins working as early as 8 months into gestation and allows for startle and/or fear responses even prior to birth. It makes split-second assessments at speeds of less than 100 ms as to whether something is good, bad, or dangerous. Frequently it will be dead wrong, but because of its speed it can sometimes be life saving. At speeds like this the amygdala is too fast for consciousness. The direct connection of the amygdala to the autonomic nervous system serves to translate its appraisals into immediate survival reactions (Cozolino 2006: 164). It can evaluate something before our prefrontal lobes have determined what it is. Speed and vigilance characterizes the amygdala. But these are not its only functions.

The amygdala and the hippocampus are both heavily involved with enabling memory. This means both parts of the brain are involved in learning because a lesson forgotten is not a useful lesson. Learning implies memory (Fig. 3.2).

Cozolino points out that the amygdala is quick to learn and slow to forget. Traumatic experiences in warfare exemplify the lasting power of amygdala-driven memories. Many soldiers with post-traumatic stress disorder have found that once at home these memories never leave them and the war goes on in their memories, waking them with a start from their sleep. More than that, the amygdala has a strong

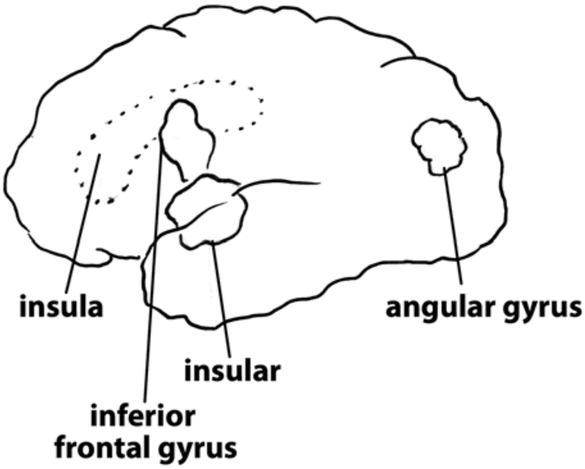

Fig. 3.2 Brain areas involved in autism

tendency to generalize to similar situations. As fearful situations subside, the more thought-based orbital prefrontal lobes take over.

Some patients who had amygdalas which were traumatized while other neighboring brain areas were left undisturbed had difficulties in recognizing fear in others' faces. One such patient had similar difficulties in understanding facial expressions and also in ascertaining the direction of gaze. Brothers (1997:49) describes a patient who was electrically stimulated in his left amygdala making him feel that he did not belong there – like being at a party where you are not welcomed.

Since the amygdala is the hub of the social brain, its evolutionary development is worth attention. It has evolved from an organ processing smell in those animals that depended on odor for purposes of communication. As primates became more dependent on social interaction, the amygdala became more and more specialized to vision. At the same time, the primate face increased its capacity for expression as dependency on group coordination increased. The lateral part of the amygdala in humans increased greatly in size during the same period in which the human cortex increased. As a result of these evolutionary developments, the amygdala became involved in transmitting and receiving messages from the face, which itself was developing into a complex area of 7,000 possible expressions. Since the amygdala is also involved in assessing sounds and touch, it remains a vital part of the social brain built to facilitate speedy and subtle social interactions (Brothers 1997 and Cozolinio 2006). The amygdala is a key component in neural networks associated with fear, attachment, unconscious learning, early emotional memory, and emotion across the life span. Damage to this area causes difficulties in visual memory, as well as in auditory recognition of fear and anger in others. Not surprisingly, this results in a loss of social judgment, loss of ability to communicate and the capacity to read faces. According to (Cozolinio 2006: 167) the primary role of the amygdala in the social brain is to modulate vigilance and attention in order to gather information, remember emotionally salient events and individuals, and prepare for action. While the amygdala is perhaps best known for its fear responses one must remember that this overlaps with its broad social functions.

The Prefrontal Cortex. When compared to total body size, our cortex occupies three times as much of the area in the brain compared to total body size as is true in other primates. The increase in cortex size is in the association areas of the brain and the prefrontal cortex, which integrates cognition and socially relevant emotions. The left hippocampus, specializing in memory, is involved in connecting a name to a face. Other functions like location and motion of the same person (which are not so intimately involved in social interaction) involve different brain areas (Cozolino 2006: 58). The amygdala triggers a neurotransmitter enhancing and amplifying patterns of neuron firing related to social events. The OMPFC (orbital medial prefrontal cortex) sits at the apex of the neural networks of the social brain and is as much an extension of the limbic system as it is a full citizen of the cerebral cortex. This is why any reified notion of the limbic system as a self-contained primitive brain is a misleading reification.

The OMPFC is associated with cognition and conscious deliberation as well as rational decision-making, but only in interaction with its surrounding structures. The OMPFC is thus a conversion zone or an association area integrating internal bodily sensation with external information. This makes it essential for conscious feeling and especially the regulation of signals from the often-overactive amygdala. However, this emotional control is hampered by the fact that the amygdala works much faster than the conscious awareness of the OMPFC. In addition, we have seen that the amygdala's supply of neuronal circuits working up on the cortex is much more robust than the neuronal circuits of the cortex working down and exerting control on the amygdala. In addition, high levels of amygdala activation and the hormones this produces inhibit the OMPFC and we lose our ability for detached reasoning.

In Brothers' view, the different areas involved in perceiving facial expressions are specialized enough to be seen as a subsystem for social processing and is biased to seek social information.

The Fusiform Facial Area

This is the association area of the occipital lobe dedicated to the identification of faces. According to Brothers (1997:xiii) "the primate brain evolved to send and receive facial gestures and now deploys these (gestures) as an essential part of discourse."

The loss of the ability to recognize faces is known as prosopagnosia and is the cause of intense grieving by its victims even though they may know through other senses that the person in front of them is someone close to them such as a parent. Information from this area is sent to the amygdala. As we have seen, if a face contains emotion, the fusiform face area (FFA) sends its representations to the amygdala's right hemisphere. Data from unknown faces that need to be evaluated are sent to the amygdala's left hemisphere and if we need to name a face, the FFA sends the message to the left hippocampus.

There are three tracks of visual processing involved in getting messages from the FFA to the conscious prefrontal cortex. The dorsal track deals with *where* the face is (i.e., its location in space). This track projects up and forward through the parietal lobe. The ventral (bottom) track deals with *who* the face is (recognition and identification). It goes to the temporal lobes and then to the prefrontal cortex. Finally, there is a middle track that goes to the frontal lobes and has to do with visual attention and *direction* of eye gaze.

The Temporal Lobe. In addition to the FFA, the superior temporal sulcus and the amygdala are the areas primarily responsible for face recognition although many other brain areas are involved as well. More generally, the temporal lobe houses areas specialized for the sound of the human voice but this is much less understood than is the way we process facial expression. The upper bank of the central superior temporal sulcus (STS) on the outside of the brain responds to voices but not to other auditory stimuli. This suggests an exclusive dedication to the sounds of human communication – thus language. The back of the upper temporal lobe is considered the site where perceptions of gestures normally accompanying speech are integrated with information from the eyes and mouth.

The temporal lobes have a distinctive place in the history of neuroscience and in the argument for the social brain. According to Brothers (1997), as early as 1930 neuroscientists found that lesions in the front temporal lobes of aggressive macaque monkeys made them very docile. At that time no one saw this as particularly relevant since there was no significant interest in neurological social processes. In 1976 Arthur Kling imposed similar lesions, but kept the monkeys in social groups rather than in isolated cages. In this more natural context it became obvious that the monkeys were normal in general behavior with the exception of having significant trouble dealing with social cues. By that time the significance of this difficulty was appreciated and the first steps toward the social brain hypothesis were initiated. Similar observations were still lost on some researchers who in one situation reported by Brothers (1997) were only interested in visualization. They found that some neurons in the temporal cortex fired selectively and exclusively in response to hands and faces. These findings by scientists with interests other than the social brain were instructive because researchers from very different perspectives were finding the same results.

By 1999 social brain researchers were finding more evidence for their hypotheses that in humans the amygdala, the cingulated gyrus, the temporal lobes, and the prefrontal lobes (all of which are highly interconnected into a modular system) contained socially dedicated circuits. They discovered that gaze directions and facial expressions were processed in dedicated neural units and ultimately were combined to yield a perception of the person. Later the superior temporal sulcus (STS) was found to be the home for mirror neurons which allow us to literally feel what others are feeling. This establishes the critical part that the prefrontal cortex and especially the STS play in the social brain. If one is impressed with the complexity of brain areas involved in the social brain, there is even more to come.

The Insular. The insular is a new kid on the block in three senses. It is a relatively recent evolutionary development. It does not exist in non-social animals. It is another part of the human brain that has undergone a huge expansion as apes and humans developed to their present form (Fig. 3.3).

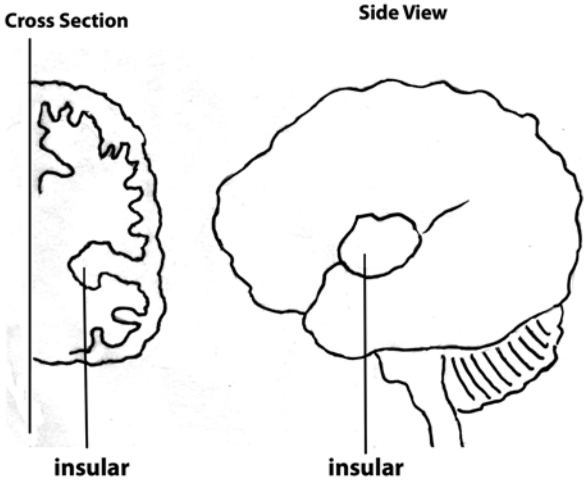

Fig. 3.3 Placement of insular

It is also new to neuroscience because until the fMRIs came on the scene there was no way to get at it. Until recently it was mistakenly thought to be restricted to eating and sex, primitive parts of the brain that few self-respecting neuroscientists, biased as they were toward the cognitive, wanted to study. Thus, interest of researchers in the area is a new development.

In infants, the insular is on the surface of the temporal lobe, but soon the frontal and temporal lobes grow over the insular so that electrodes are ineffective in reaching it. This meant that until Damasio's work in 1994, a large part of the brain puzzle was missing. The insular brought the entire body underneath the brain into the picture. The insular puts the body into emotion. If you were looking downward close to the edge of the Grand Canyon you might have a very uncomfortable feeling run through your body – some may feel it in their stomach and others in their thighs. No doubt after the tragic shootings by a student at Virginia Tech, the compelling speech by Professor Nikki Giovanni to fellow mourners sent chills through the bodies of many in her audience. We can distinguish these responses from the activities of mirror neurons because here we have individuals responding separately to an external event and their perceptions of it, rather than reacting to another person and his experiences.

According to Blakeslee (2007), the insular is a receiving zone that reads the physiological state of the entire body in social and non-social situations and then generates subjective feelings. It is the insular that changes raw body states into social emotions and according to Cozolino (2006), this is what makes it a part of the social brain. A bad taste or smell is recast in the frontal insular as disgust. A sensual touch from a loved one is transformed into delight (Blakeslee 2007). The bottom line is that mind and body are integrated in the insular.

The second modification that the insular represents is not in circuitry, but in the type of cell it uses which is found only in humans, whales, apes, and possibly elephants. These are called VEN neurons named after Von Economo who first described them in 1925. They are large cigar-shaped cells tapered at the ends and found exclusively in the frontal insular and the ACC. This system has to do with self-monitoring. It warns us when our behavior may lead to a negative outcome. It is a part of the anterior cingulate cortex and works subconsciously.

The insular and VEN neurons are also important in putting the body into expectations. When you get ready to go outside on a cold day the insular lets you feel cold before it happens. When I was doing my physical therapy after a broken leg I would say, "ouch" before the bending which I was doing actually hurt. My therapist and I laughed about what we called my "anticipatory ouch," but if you are going down a hill way too fast on your bike, that anticipatory shudder is no laughing matter; it may activate your amygdala and save your life. The same thing may make you very careful around your kitchen disposal. This is also relevant for drugs, dependencies on alcohol, and tobacco because it is the anticipatory sensual satisfaction that drives their use.

The Cingulate Cortex. The cingulated cortex is another brain area absent in non-social amphibians and reptiles. It is a central part of the social brain because it is responsible for care-taking and resonance behaviors. It is also critical in attention, which helps caretakers focus on the babies instead of themselves. It provides the neural infrastructure for social cooperation and empathy. Without the cingulate cortex (CC) there simply is no maternal response. Like the insular and the somatosensory cortices, it is organized like a map of the body. Along with the insular, it is involved in the whole gamut of emotions from gratitude to lust. Damage to the CC decreases empathy, emotional expressiveness, and motivation to communicate. One of Damasio's patients who had been severely injured in this area became mute. After her recovery, she again was able to talk and said that during her incapacity, nothing seemed to matter and she had nothing worthwhile to discuss (Brothers 1997: 53).[4]

The Importance of Eye Gaze in Social Life

In popular culture the presumed "location" of the self gives it an elusive character. We have seen that we infer other peoples' selves from their facial expressions and what they say, but we never literally "see" them directly and we can always be wrong about our inferences.

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[4]Cozolino (2006: 57) includes the hypothalamus in his description of the social brain, but it is not clear to me from his description that it is a critical part of this system.

On the other hand we quickly come to believe that human beings are not things but *persons*, and persons are not to be treated as mere things. Most of us just assume that people are their bodies but you can lose a lot of your body and still be a person, and if "eyes are the windows to the soul" it is not much of a window – not if all you see its the reflection of yourself!

As we have seen it is an observation of great importance to understanding the social nature of the brain that we consider eye contact a very intimate act and thus it can be a pleasant "turn on" between two consenting people. Usually when we stare at someone straight in the eyes we are either flirting with them or doing just the opposite – "staring them down," which is seen as an invasion. We are so sensitive to others gazes that the phenomenon of looking at people is riddled with norms to protect the social comfort of all of us. People can get into a lot of trouble in bars and such places by looking the wrong "macho" in the eyes. A man in a bar with a chip on his shoulder might show real or pretended outrage at someone looking at him, at which point he may say, "You see something you like over here buddy?" We are very guarded about who we "let in" like this and those that come in "uninvited" may have to pay a price for it. Undesirable men that keep staring at women make them rightfully uncomfortable because it is a disregard for their persons and too much regard for their bodies. On the other hand, adults scolding children will often react with a stern "Look at me when I talk to you!" In different cultures and subcultures the norms are different. Here the expectation is that a person being reprimanded keeps the gaze downward as a sign of respect.

The timing and length of looking at others therefore is an important skill. We learn to look at people with a noncommittal glance off to the side as if we are looking at some one else. To make matters more complex, if this fails and they look back, it can produce embarrassment unless we can quickly think of something to say. Suffice it to say that we have elaborate procedures arming us from the sensitivity we have to others.

When a person looks at us for even a short length of time, it is not surprising that all five brain areas described above come into play as well as the three paths evaluating the "where," "what," and direction of eye gaze.

Two important features of the human eye are the colored iris and the white sclera surrounding the iris. The sclera only exists in humans and its contrast to the iris allows us to ascertain precisely the direction of another's gaze. In short, we can definitely say that the brain takes note and that it considers the gaze of vital importance.

Pupil size is also important. Greater pupil size conveys greater positive emotions and interest in what we are seeing. If we look at pictures of the same woman with smaller and larger pupils, the larger pupils will generally make her be seen as more attractive.[5]

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[5]This section was aided by Cozolino (2006, 159–163).

Autism as a Partial Loss of Social Connection

An important opportunity for medical research occurs when specifiable areas of the brain are destroyed or rendered nonfunctional. We can then see if the functions which are lost can be related to the damaged structure thereby providing a lead to refine our knowledge of areas of brain functions. (Of course, we also have to make sure that the lost function is not really the result of a correlate of the damaged structure.)

Interestingly, the incapacities which suggest autism reflect just those capacities needed for embodied simulation and the human connectedness which it makes possible. This is the function of mirror neurons. Surely autistic deficits are due to more than mirror neurons, but it is equally certain that they include them. Autism is not a unitary condition with one definable symptom. There are many kinds and gradations of autism. Nonetheless, the most general deficit seems to be the inability on the part of autistic of autistic people to construct a "theory of other minds." Because the syndrome takes many different forms, workers with such individuals prefer the phrase "autistic spectrum disorder."

Characteristics which suggest autism include detachment, lack of social skills, and absence of eye contact with others, lack of interest in or understanding of people's subjective worlds including their moods, emotions, and intentions, and the lack of role-taking abilities. Among other things, this results in difficulty in using pronouns correctly. Autistic individuals tend to refer to themselves in the third person. (It is important to recognize that children cannot learn the proper use of the word "I" by rote imitation because everyone refers to the child as "you.") While human beings are the most capable of all primates in mimicking others of their kind, autistic people lack this ability. Ironically, the most gifted primates in "aping" others are not apes but humans.

Other symptoms include an absence of empathy and difficulty with language comprehension even though autistic people can be highly intelligent in other areas. They tend to interpret others very literally, but in normal discourse meanings are often not literally expressed. Language is largely metaphorical. Thus, a subset of autistic children told to "get a hold of themselves" or to "get a grip" might start grasping at their own bodies. Much of language learning consists of "taking a person's meaning" rather than taking them literally. Autistic children are often just not interested. Voices on the phone which ask, "Are your parents in?" may be answered with a simple "yes" or "no" by an autistic child who would then hang up.

All of these deficits are just what one would expect to see if mirror neurons were disabled or non-existent. The initial evidence that such is the case came from the lab at USC-San Diego run by Ramachandran and Oberman (2006). EEGs were used to measure brain waves in normal people. One component of such waves is the mu wave. This wave is blocked or suppressed anytime a person makes a voluntary muscle movement. It is also blocked when a person watches someone else make the same voluntary action. Thus, mu wave suppression became the non-intrusive equivalent of the electronic probes of mirror neuron activity in monkeys. It is not really the equivalent because all human measures so far only reflect the areas of activity rather than specific, discrete neurons. The San Diego researchers found that with a sample of 10 autistic children who had only lower impairments, their own voluntary movements blocked the mu waves just as it did in normal children. However, the suppression did not occur when the autistic children watched others perform the same action. In a normal comparison group, mu wave suppression existed for watching as well as for acting, indicating intact mirror neuron activity. This meant that the autistic child's motor system was intact but that his mirror neuron system was not. Such findings have been replicated using other techniques as well, especially those used in the study of mirror neurons.

While these findings showed reductions of neuronal activity in the prefrontal cortices, the problem autistics have with metaphors occurs in the angular gyrus, which sits at the crossroads between the vision, hearing, and touch centers.

Metaphors add greatly to our quests for intersubjectivity because all of us have common experiences with our bodies and its motor actions on the world. We use this common experience to make sense to each other. All of us know what the verb "hit" means because we all hit and get hit. We automatically know what is meant when somebody says, "I hit them hard with the message that they had to work harder." But nonetheless, seeing the commonality between the motor action of "hitting" with the highly abstract notion of impacting the minds of others to work harder has very little to do with literalness. Few actions could be more different. It has a lot to do, however, with the concrete experience of our bodies which gives sense to metaphors and contributes to intersubjectivity.

Ramachandran and Oberman describe an old technique to illustrate this point. Two shapes are drawn, one jaggy and one curvy and the audience is asked which shape is "bouba" and which is "kiki." Regardless of their native tongue, audiences will pick bouba for the curvy picture and tiki for the jagged one. Thus, they are automatically able to recognize the commonality between a jagged visualization and a harsh sound as well as the smooth quality of both the curved visualization and a softened sound. Since this response transcends language, and is quite reliable, we can safely attribute it to automatic tendencies of the human brain. The use of metaphor in sense-making seems to be a universal characteristic of language.

The capacity for metaphor is most probably housed in the angular gyrus, sitting at the junction between the centers for hearing, touch, and vision. This is hypothesized because of its strategic location and because indirect evidence of mirror neurons has been located there. The functional capacity of this structure is referred to as cross-domain mapping, a feature which exists in other areas of the brain also. It comes as no surprise then that a large subset of autistics do not perform well on the test for understanding metaphors. Many otherwise normal children with brain damage in the angular gyrus fail the bouba/kiki test and have trouble with metaphors just as autistics do, so there is good reason to focus on this structure and its suspected mirror neurons as at least one source of the ability to cross domains and fully understand language.

Throughout her volume, Brothers (1997) compiles evidence strongly suggesting that dysfunction occurring during infancy in the amygdala and/or the social editor that can produce autistic behavior. Autistic children pay scant attention to faces. This was dramatized in a study which gave autistic and non-autistic children the task of sorting pictures of different facial expressions with some of the depicted faces wearing hats. The basis for sorting the pictures was left up to the children. The autistic children sorted the pictures according to whether or not hats were worn. Normal children sorted according to the different facial expression of emotions. It was not because the autistic children were not capable of recognizing facial expressions, but they were not interested in the same way normal children were.

While most people analyze faces automatically, doing this takes significant effort for many autistics. Even with this effort, their images of faces can be mechanical and raw. Despite their deficiencies, autistic individuals are systematic, objective, and logical in their thought processes. They can pick up minute details but cannot put them together as a whole. As noted earlier, the facial region around the eyes is a particularly expressive part of the face and in comparison to normal children, autistic children give this scant attention. They apparently lack a brain editor drawing attention to the eye region which allows us to attribute mental states to others and to participate fully in conversations.

The four most common characteristics of autism are (1) impaired social relationships, (2) impaired communication, (3) trouble with make-believe play, and (4) repetition of rituals (Frith 1989:173–174). Others add resistance to change, purposeless movement, and self-injury.

When the Social Environment Fails Our Social Brains: an Ugly Story

We have seen from the beginning that our brains are organized for sociality. Our brain's socially dedicated systems are relational and responsive; they are not self-sufficient structures even though they are genetically hardwired. Hardwired does not mean guaranteed. For the social nature of the brain to materialize, it needs a responsive social environment. A social environment which supplies food and shelter is necessary, but it is not sufficient. What is needed is an interactional environment of mutual responsiveness which involves the active participation of both the baby and the caregiver. Without the environmental supports for this sociality (most of which is emotional), we do not develop the foundations for anything else. Contrary to the prejudices of our "hyper-cognized" and distanced culture, human intellectual capacities are based on a firm emotional foundation. It is emotion that must first be secured in cognitive development and it is emotion which organizes the brain.

Given the above, we should expect to find that infants who are born into society but denied mutual responsiveness would have a very difficult time. As it turns out this is an understatement. Such infants do not develop an interest in, or even the capacity for, social connectedness. In its place are fear, anxiety, depression, and in many cases physical deficits leading to death. The story of infants coming into the world ready for social interaction but nonetheless being deprived of it provides telling evidence for the social nature of our functioning brains. The destructive consequences which occur when infants are deprived of the environmental supports of this nature document the interactive nature of human development.

The sources of such evidence are numerous. Probably most revealing are the early studies conducted by René Spitz and the more recent neuroscientific re-evaluation of his work by Tredway et al. (1999). For a 2-year period during the 1940s, Spitz observed 90–100 children in each of two very different types of social environments. In addition, 34 children were observed in private homes as a comparison group. The caregivers in the first two facilities could not have been more different, although there were some superficial similarities.

The "foundling home" babies were treated according to the medically approved child-rearing practices of the time. Conditions were sanitized and babies were fed with bottles on strict regimes at the same time every day. Infants were kept in cribs with sheets draped over the sides, isolating them from other babies and adults. The spread of germs was effectively minimized along with an absence of human interaction. The ratio of nurses to babies was the same as in a typical modern hospital – between 1:8 and 1:10. Anyone who has spent time in a hospital either as a nurse or as a patient knows that this is not very intensive. The babies were left alone in their cribs most of the time for 15–18 months.

The nursery was very different. Although mothers in both groups were similar demographically, the nursery caregivers were mothers caring for their own or other mothers' babies. Some mothers had been labeled as feebleminded, psychopathic, and/or criminal. But the mother to caretaker ratio was 1:2. Mothers competed among themselves to see who had the most capable and attractive baby, and although conditions were not quite as sanitary as in the foundling home, the infants received ample attention. After 6 months the babies were transferred to rooms shared with five others.

All babies were tested on three dimensions: physical health, psychological activity, and emotional responsiveness. Even though only "rudimentary" efforts were made in the nursery to ensure physical health, the infants developed normally with a summary score of the three dimensions of 101.5 and 105 during the last 4 months.

The fate of the infants in the more sanitized and regimented foundling home was very different. Basically, the children showed behaviors similar to Harlow's monkeys "reared" by wire mother "surrogates" with bottles of formula stuck in them: after 1 year the foundling home babies stopped responding to others completely while vehemently resisting new people, toys, or other items. Their time was spent in swaying, head knocking, or pinching themselves until ulcers developed. Most were psychiatrically disabled to an impairable degree in spite of the sanitary conditions. Physical health was a similar disaster. By 3 months every baby had some health condition and there was an epidemic of measles. Spitz divided the children into younger and older groups. The younger group had a death rate of 23% and the older group, which should have been more robust, had a 40% mortality rate. Apparently their immune system, which should have grown stronger over time, became weaker as they aged in that environment. With increasing age (1.5–3.5 years) the children also became worse on the other dimensions. Only two could speak two words, hardly any could feed alone, all were incontinent and all but one were seriously underweight in spite of their rigid eating routine. The average combined scores (which were over 100 in the nursery home babies) progressively dropped to 45 for the foundling home babies, which Spitz associated with that of a low-grade moron (Tredway et al. 1999).

Generally the infants started out with normal reflexes such as smiling at the approach of strangers. By 6.5 months the smile was no longer there. In one typical case, by the 7th and 8th month when the observers appeared the infant lay still and looked at them with profound suffering. Talking to the infants made them weep and more talking only intensified the weeping. Those children who did survive demonstrated low intellectual functioning, attentional deficiencies, rampant shyness, psychosis, and outlandish social behaviors.

For these children biology had done its job and the babies started life with normal social reflexes. But the social environment did not do its job with catastrophic consequences. Clearly, genetics and environment must work hand in hand in the critical context of early human socialization. Other examples of children born in society but socially isolated in the interpersonal sense that really matters also are readily available. None, however, have been described and compared with other similar groups as completely as those provided by Spitz. More recently we have the sad story of Romanian babies who were raised in similar circumstances in understaffed state institutions who suffered similar outcomes (Cozolino 2006).

A Neurosociological Interpretation of Isolation

Tredway et al. analyzed the Spitz results in terms of the consequences of social isolation for the developing infant brains; here we find the real contribution to neurosociology. We have seen that emotion organizes the brain and that the brain's early development sets the building blocks for later cognitive development. The beckoning smile of the baby is obviously emotional just as are the responses from the adults which the smile evokes. In short, early socialization is largely an emotional enterprise. If Brothers' position on the brain as a dedicated social system is correct, then in those instances where the system is not fostered environmentally, the whole brain and its development would be disrupted. "Human nature" should not materialize. We have seen that this is only too true. The next step then is to show more specifically how the brain is affected in neuroscientific terms.

The consequence of social isolation is referred to as "separation distress syndrome" – an appropriately emotionally toned label. The normally strong attachment to the mother begins in the womb and produces the chemicals that nourish the healthy limbic system – opioids, oxytocin, vasopressins, norepinephrine, and other neuroactive agents. Prolonged isolation produces a deregulation of these chemical substrates. This deregulation is thought to be a primary factor in producing depression over time. It comes from the lack of environmental support for a number of interacting brain areas which puts them on high alert and makes them produce an excessive amount of cortisol. These interconnected areas are referred to as the HPAH axis, comprising the hypothalamus, the pituitary, and the adrenal-hippocampal axis. These are particularly important brain areas for human beings.[6]

With the separation of an attached infant from its mother, the pituitary is induced by the hypothalamus to release a hormone into the blood that ends up in the adrenal cortex and produces cortisol. As part of this process, the amygdala is also activated, increasing its arousal state. Thus, an increase in stress produces an increase in sensitivity to fear. Moreover, the amygdala can activate itself which only increases sensitivity to stress making it difficult for the infant to calm down on his own. Usually external caretakers can sooth the infant with physical contact and calming noises associated with positive comforting episodes of the past. These activate the infant's opioids with a calming effect. There is a high density of receptors in the amygdala which receive other calming chemicals (benzodiazepines). An important part of socialization takes place when infants or children learn to downregulate these negative processes for themselves and produce their own opioids. Thumb sucking may be an illustration of this because it can be associated with feeding and the warmth of the caretaker. But with little or no experience of such warmth, learning these techniques is not possible for the infant.

We can already see how prolonged exposure to isolation produces an accumulation of corticoid levels that can alter both brain and body physiology (Tredway et al. 1999: 126). But there is more. According to LeDoux (1996: 248–249) the medial prefrontal cortex, an essential part of the social brain and attachment, can also be damaged by consistently high levels of glucocorticoids (GCs). If the prefrontal cortex is damaged, it can no longer control the amygdala and the cycle described above is made even worse. Normal levels of GC in the hippocampus strengthens the memories which are formed in new learning. Pathological levels of GCs can reactivate previously forgotten fears and make them worse than they originally were. Memories of fears can be repeatedly reactivated regardless of external fear-inducing stimuli in cases of isolation. LeDoux (1996:250) has shown that this "preservation" of anxiety-producing memories also results from lesions to the lateral and medial areas of the prefrontal cortex.

Damage to the brain areas described above would normally produce eventual disorders relating to impulse control and antisocial behaviors such as sociopathic and character disorders. This type of damage, especially to the ventromedial prefrontal lobes, prevents the development of just those life skills that allow for social effectiveness, as Damasio's patients who have damage to this area have shown.

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[6]The hypothalamus is the head of HPAH system with extensive connections to what Cozolino (2006:57) calls the social brain. It controls the autonomic nervous system and the hormonal secretions from the pituitary gland including those involved in emotion. The hippocampus stores long-term explicit memories and is underdeveloped in infants. The adrenal gland is the source of cortisol, our primary stress hormone which, in over-abundance, destroys hippocampal neurons in adults. Suffice it to say this is a very powerful system with broad effects on the brain as a whole.

Harlow's monkeys reared with a surrogate "mother" made of a metal net showed extreme fear of anything new that was put in front of them. Monkeys reared with a cloth surrogate mother would inch toward the new object, run back to the cloth mother and eventually feel safe enough to explore the object. Not so with Spitz's foundling home children. They reacted with extreme fear when strangers approached and responded fearfully to Spitz himself. This behavior is known as "approach-withdrawal." In infants the front and back regions of the temporal lobes on each hemisphere mediate the response. The left anterior region is believed to be involved in approach and the right anterior region is involved in withdrawal (Davidson et al. 1990). Since the foundling home infants could not withdraw, they were forced to experience stranger fear over and over again. Repeated panic lowers the fear response threshold, intensifies negative emotional memory, and reactivates memory usually inhibited by the frontal lobes. It is well known that the right hemisphere houses negative emotions which are regulated and controlled by the left hemisphere; when people suffer stokes in the right hemisphere they often have to deal with depressed moods and emotions. Tredway et al. suggest that withdrawal and depression may share similar brain circuits and may have produced the depression in the foundling home infants. Also linked to depression is the fact that norepinephrine levels as well as serotonin levels decreases as prolonged stress continues.

Conclusion

During the last two decades, increasing evidence from neuroscience has mounted regarding our social natures. The core of this finding is that the brain plays an essential part in assuring we will recognize that others have selves like our own as well as generating the linguistically created intersubjectivities which make societies possible.

Brothers (1997:64) notes that the consequences of having a social brain are not all positive ones. The electrical stimulation of the amygdala produces mostly emotions of discomfort in social settings. She mentions that the few anecdotal cases where the amygdala is missing altogether tend to be happier and less anxious. The amygdala may save us in moments of danger but it leaves us generally anxious and defensive. Ervin Goffman (1967: 235) described it passionately:

> Whether the character that is being presented is sober or carefree, of high station or low, the individual who performs the character will be seen for what he is a man behind many masks and many characters, each performer tends to ware a single look, a naked unsocialized look, a look of concentration, a look of one who is privately engaged in a difficult treacherous task.

In terms of causation, our brain-given tendency to construct persons as opposed to mindless bodies can be reconciled with the social aspect by attending to the equally important fact that societies must provide the brain with specific beliefs about the nature of these persons and their minds. For example, many would argue that Goffman spoke for those in alienated and competitive societies. On the other hand, the fact that autism develops in spite of supportive environments means that a social field is not sufficient either. As is so often the case in such issues, the truth is in the dance.

Certainly, the fact that our brains are social to the core does not fit easily with the central assumptions of western individualism and the intellectual history of capitalism. As we shall see, a consequence of our "mirror neurons" is that altruism (not exactly center stage in profit-driven theories of self-interest) is as central to our natures as other sentiments. We have learned from the biochemistry of belonging and the effect of isolation on developing infants that there are serious challenges to the tabula rasa assumptions of the enlightenment and the "normalcy" of the growing isolation experienced by individuals in our society (see Smith-Lovin et al. 2006).

For most of my academic career, it was considered an irresponsible value judgment to argue that a whole society could be abnormal and could operate against our natural tendencies.[7] Humans, being blank tablets whose behavior were completely dictated by their societies, "had no natures."

The social arrangements which comprise society may have been developed by human beings, all of whom come as individual forms. But their interaction with each other produces emergent institutional arrangements which have no individual authorship and whose forms can be opposed to things human, or, more accurately, humane. Because humans generate social structures does not mean that these structures will be humane any more than intelligence should be confused with wisdom. Hopefully, the above may prepare reasonable grounds for reflecting not just on ourselves, but also on our society.

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[7] A recent argument for a theory of emotions that allows for such a political evaluation of society can be found in the introduction to Redding's (2001) *Navigation of Feeling*.

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Chapter 4
The New Unconscious: Agency and Awareness

> *There is a merciful mechanism in the human mind that prevents one from knowing how unhappy one is. One only realizes it if the unhappiness passes, and then one wonders how on earth one was ever able to stand it. If the factory workers once got out of factory life for six months there would be a revolution such as the world has never seen.*
>
> [The poet W.H. Auden (1939)].

The quote above is dated: as I write this, factory workers are likely to feel lucky to be working at all. It well could be, as the country emerges from its current financial distress, factory workers may feel dissatisfied again. But the fact remains that our current states of satisfaction are often creatures of past conditions utterly unbeknownst to us and therefore unconscious.

In the early 1960s symbolic interactionists rejected the Freudian unconscious for sound reasons.[1] However, two things compel me to make the case that we should attend to what cognitive scientists and neuroscientists refer to as the "*new* unconscious." One is that the unconscious is, in fact, compatible with Meadian theory. In his lectures gathered together in *Mind, Self and Society* (1934: 68–69) he states that

> We are more or less unconsciously seeing ourselves as others see us. We are unconsciously addressing ourselves as others see us. Like a Canary we pick up the dialects about us. . .We are unconsciously putting ourselves in the place of others and acting as others act.

As the social phenomenologist Polanyi (1958) observes, "We know more than we can say: We know more than we can tell and we can tell nothing without relying on our awareness of things we may not be able to tell."

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[1]Rather than being pushed by determinant past forces of external conditioning or driven by the unconscious tensions between the psychoanalytic "superego" and "id," voluntaristc behavior for symbolic interactionists was seated in the self-consciousness involved in taking the role of the other toward one's own actions. This had a strong teleological character wherein actors' present behavior is "pulled into being" by their own desired future – that is his or her positive anticipation of the future consummation of the act. In contrast to more prevalent deterministic approaches, the self was no longer rendered epiphenomenal it was in conditioning and earlier psychoanalytic formulations, but is placed on center stage as the key to a model of agency.

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The old reasons for rejecting the Freudian version of the unconscious no longer hold because the new unconscious is purged of the fanciful and largely asocial notions of the id and super-ego, infantile omnipotence, and universal oedipal, Electra, or castration complexes. The new unconscious was given birth by numerous cognitive scientists and neuroscientists entering the academic scene in the 1970s. Unlike Freud, these researchers had, and still have, a strong empirical orientation which has produced a mass of evidence that can no longer be legitimately ignored.

This is not to imply that the current researchers threw the entire Freudian baby away with the bath water. For example, we still find Freud's concepts about defense mechanisms and transference vital to an understanding of human affairs and he was the first to make so many aware of the unconscious.

Of course the unconscious, new or old, could be ignored if it had asocial implications and was irrelevant to social interaction; which brings us to the second reason for attending to it. It *is* relevant to symbolic interaction. As Lakoff and Johnson (1999: 10) insist, unconscious processes are involved in making semantic sense out of sentences as a whole, framing what is said in terms relevant to the discussion, making inferences relevant to what is said, filling in gaps in discourse as well as anticipating where the conversation is going and planning responses. If there is anything of relevance to a field such as symbolic interaction, it is language, thought, and emotion. A wealth of evidence is presented throughout this volume demonstrating that all of these symbolic processes are firmly dependent on brain processes, of which we have not the slightest awareness at their moment of use.

It would be unfortunate if symbolic interaction's strategic focus on "lived experience" meant that we have to reject those unconscious but symbolic processes that affect such lived experience. Some of these processes are unconscious definitions of situations and other convictions that make us vulnerable to political manipulation against our interests. This topic will be visited in more detail at the end of this chapter. It appears from many creditable sources that the American political and consumer unconscious has been deliberately and systematically manipulated throughout almost the entirety of the past century reaching a peak during the current decade of political deception. If we chose to ignore the unconscious, those who manipulate us by using the unconscious do not. (see www. Informationliberation – The Century of the Self).

Balancing Awareness and Unawareness

Like so many of us, I was drawn to our field by its emphasis on self-awareness and a voluntaristic theory of behavior stressing *self*-control that was nonetheless based on social control. In my opinion this voluntaristic framework is still critical in my opinion because it presents the only teleological theory of self-control that embraces what is distinctively human. At the same time it does not separate self from society.

Nor does it deny that conditioning can be a part of our lives, but conditioning is not the primary focus to those interested in what makes us human.

But Mead, who first outlined this viewpoint, was not deceived into thinking that we were self-conscious all the time or even most of the time. Action usually proceeds primarily in habitual ways until ongoing action is blocked. It is only then that we characteristically use self-conscious reasoning to deliberate on how to proceed and to self-consciously evaluate our capacities.[2]

On the first page of Gazzaniga's *The Mind's Past* (1998) he tells us that, "The mind is the last to know things." By the time it dawns on us that we know something. . .the brain has done its work. It is old news to the brain, but new to us. The brain finishes its work half a second before the information it processes reaches our consciousness. Gazzaniga goes on to say that, " the primate brain also prepares cells for decisive action long before we are even thinking of making a decision" and that our "motor system, which makes operational our brain's decisions about the world, is independent of our conscious perceptions." He then concludes that 98% of what the brain does is outside of our conscious awareness. LeDoux and Damasio would insist that emotions and the conscious feelings they produce need to be seen as separate processes with emotions proper being largely unconscious. Others may dispute this tidy separation, but there is little question that a great deal goes on which escapes our awareness.

In *Philosophy and the Flesh* (1999) Lakoff and Johnson write more specifically about the "cognitive unconscious." Conscious thought, they say, is the tip of an enormous iceberg and represents only a minute part of the processes involved in the brain, including those in the prefrontal cortex from which it emerges. They assert that at least 95% or more of all brain processes are below the level of human consciousness and shape and structure all conscious thought. If the hidden hand of the cognitive unconscious were not there doing this shaping, there would be no conscious thought (Lakoff and Johnson 1999:13). LeDoux (1996:29) quoting Lashley (1950) strikes a similar note: "We are never consciously aware of the processing itself but only of the outcome." Unknown to most of us, but not surprising to the American pragmatists, our very sense of the "real" depends on our sensorimotor cortices and other structures involved in bodily movements which are totally out of our awareness. (The next chapter presents an in depth treatment of this.)

As will become evident, there is much more to say about the ubiquitous presence of the unconscious which enables reflective thought and rationality. Given the complexity of the one million billion synaptic connections in the human brain (Edelman 2004:16) it may be that Gazzaniga's 3% of consciousness is all that one person can reasonably handle.

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[2] I am not saying that we should deny the importance of self-consciousness, far from it. I *am* saying that in 2010 it cannot be considered the whole ball of wax, and symbolic interaction could both enrich and expand itself by addressing the fact of unconscious symbolic and semiotic processes.

Consciousness as Center Stage in Symbolic Interaction

Mead fostered social behaviorism by arguing that the distinctive capacity for everything human was the mind, which was defined as self-conscious behavior – that is, reflexive behavior which is aware of its own self-awareness. The key to social interaction is the role-taking process. This process has nothing to do role-playing wherein a solitary actor playing out a fixed role or performance part. Role-taking involves actors responding self-consciously to their own emerging actions as they anticipate what relevant others would do. That is, they call out in themselves the same responses to their incipient behavior that others have. They then use these imagined responses of others to shape their ongoing lines of action, especially speech. Actors do not do this all the time and role-taking is built on top of conditioning, but it is nonetheless a central occurrence in human interaction.

The concept of role-taking allows symbolic interaction to offer a unique theory of voluntaristic self-control of behavior which is at the same time thoroughly social. As we have seen, behavior is seated in the self-consciousness involved in decentering from one's own outlook and taking the perspective of the other into account in shaping one's further communications. In contrast to other approaches, this self is no longer rendered epiphenomenal, as in conditioning and early psychoanalytic formulations, but instead is placed on center stage as the key to a model of agency. (There will be much more about this later).

The Chicago pragmatists of Mead's time recognized that conscious, minded behavior was not a constant event. Habit and conditioning frequently were sufficient until the person met resistance and action had to pause for self-conscious considerations of alternative courses of action in the face of physical and social terms not of the actor's making. Blumer referred to this external trigger to consciousness as the "obdurate character of the world."

Additionally, symbolic interaction's focus on "lived experience" and the actor's definitions and interpretations keep it located inside the bounds of consciousness. Put succinctly, "We assume (and have observed) that human beings know what they are doing and why they are doing it. We have rejected the psychoanalytic emphasis on unconscious drives and the behaviorist emphasis on environmental stimuli in part because both of these competing perspectives assume (in different ways) that human beings are like marionettes at the mercy of their strings" (personal communication). This stance is not limited to symbolic interaction. Experimental psychology was forced into reluctant acceptance of the unconscious by a mass of evidence only in the 1980s.

In the 1960s when I was in graduate school, the Freudian unconscious was dismissed with the observation that "one person's unconscious was always in another's consciousness." This was more of a quip than a serious refutation and would currently be seen as embarrassingly inadequate in light of the more recent flood of findings to the contrary which have nothing to do with Freud. The remark's wide acceptance back then nonetheless may have been due more to the fact that other people deciding what you "really are thinking" can be extremely annoying.

Finally, Blumer's emphasis on "self-indications" reflects the central place of consciousness in symbolic interaction. But Mead and Blumer wrote long ago and had no knowledge of today's empirical science. The "new unconscious" has little or nothing to do with the psychoanalytic concept and a great deal to do with contemporary neuroscience and its empirical observations of patients as well as tightly controlled psychological experimentation.

The New Unconscious as Procedure and Content

The term "unconscious" is highly ambiguous and at times hints of unnecessary innuendos. Brothers (2001:14), for example, notes the fundamental difference between what is seen now as the somewhat more fanciful Freudian unconscious and the more mundane, but straightforward phrase, "out of awareness." There are at least two very different kinds of unawareness that are often not distinguished when talking about "the unconscious." One is the routine working of the material brain that supports our everyday biological functions of perception, breathing, and metabolic activities. This broad-ranging category involves the general processes enabling the brain to remember past events and to know on the "operant level" how to form the past tense in English even if a 2 year old may creatively produce "doded" rather than "did" as required by the King's English.

This "procedural" meaning of the unconscious focuses on how routine things are done in the brain rather than on the specific cognitive or emotional unconscious products of this process. Just because your brain can do something doesn't mean that there is a "you" who knew how it was done. (LeDoux 1996:31).

LeDoux refers to the next type of unawareness as the "dynamic unconscious" which he describes as a "darker" place. Here we focus on specific products of covert, procedural processes like specific hidden emotions, repressed memories, and defense mechanisms such as rationalizations, projections, and denials. Many, if not most racists vehemently deny that they have any such bias. They simply see as a "fact" what is really their belief that a certain minority group is inferior and must be controlled by some dominant group of which they are invariably members. Studies by Anderson and Phelps (2000) and Hart et al. (2000) have found that amygdala activation in white subjects exposed to unfamiliar black faces correlated highly with measures of racial biases. Subjects were not aware of these biases. LeDoux (2002:221) points out that negative emotions and biases have their strongest effects on behavior when they are unconscious. This is an important and common finding in the literature of unconscious affect.

Thus, the dynamic unconscious is all the more powerful just because it is out of our purview. We cannot control or evaluate that which we do not know. Zajonc (2001: 54) has concluded that unconscious affect, as opposed to the specificity of conscious cognition, is like moisture or odor. "It can disperse, displace, scatter, permeate, float, combine, fuse, blend, spill over, and become attached to any stimulus, even one totally unrelated to its origins." This is an important finding for all branches of social psychology since power structures often use fear and anxiety to control the mentality of their publics by directing its displacements and projections to minority groups or foreigners. If symbolic interaction is still unaware of the unconscious, those controlling political capital are not. Theories of power – especially in its hegemonic forms, cannot offer adequate scope without appreciation for the many techniques of mind control residing in the hands of the status quo and outside of the public's awareness. We will address this thesis in more detail below.

The Procedural Unconscious. There are two basic forms of unconscious. One has to do with routine brain processes and the other involves content. Wentworth and Ryan (1992) offer a good illustration of unconscious procedural, or operant processes of the brain. One can hardly be aware of the brain processes like the "refracturing" of visual data involving person-recognition. This process illustrates the complexity of the brain processes involved in the taken-for-granted fact that we experience things as holistic unities, rather than the separate features that comprises them. We see a friend, a wife, or a parent abstracted from their background and its shading rather than merely the separate shape of the head, nose, and mouth, or the color of their hair. In perception these features are seen as an integrated unity rather than as fractured pieces isolation. As Wentworth and Ryan describe it, this experience of the simple unity of objects is anything but a straightforward process. The image of a doll is focused on the retina which becomes a mosaic of approximately a million elements that become impulses in optic nerve fiber. Once in the brain, the image of the doll is shattered once again by the process of "feature extraction." This process sends separate attributes to the occipital lobe in the back of the head where they are further refined in localized clusters into dimensions like color, motion, form, and depth. These separate bits of information are then sent forward into far-flung regions of the temporal and parietal lobes before being constructed into a unified whole and made conscious in the prefrontal cortex. These advanced regions allow us to recognize the doll's hair as blond even though the light-waves reflected in the morning and evening very different. This complex unifying process takes 0.5 s with no time lag being experienced.

Most of the probably 97% of what goes on in the brain is of this order and has little to do with thought as its product, be it conscious or unconscious. Neuroscience has identified many important processes beyond our awareness which assure social coordination and interpersonal attunement (see Damasio (2003) and the chapter on imitation).

On the cognitive level, Lakoff and Johnson (1999:15) point to the unconscious, procedural metaphors that make linguistic sense-making possible. In their perspective, "Unless we know our cognitive unconscious fully and intimately, we can never know ourselves nor truly understand the base of our moral judgments, our conscious deliberations, and our philosophy." If they are correct, symbolic interaction would benefit from what the unconscious metaphors of our language can tell us about our consciousness and thus, our minded behavior.

Actually, the unconscious as process has a long and accepted history in sociology. As a matter of fact, it has been at the heart of social psychology and linguistics. This was expressed particularly well by Katz (1999:7) who asked, "What is it that, itself being invisible, is responsible for all that is visible?" It is axiomatic that covert social interaction is made possible by hidden background processes such as "assumptive orders," tacit knowledge, " or even Durkheim's classic "non-contractual element of contract." In describing Merleau-Ponty's understanding of the preobjective, Osrow (1990:28) notes that in the act of seeing we see objects, we do not usually perceive the eyes that enable us to see. "We do not in the first place 'know' our bodies; we have them, are them, and only when we turn to the body in awareness – such as when our eyes hurt while reading... does it take on the status of a perceived and known object."

In this same vein Dijksterhuis (2005: 82) alert us to the surprising fact that we are never aware of thought itself in the moment of thinking. If we are asked to think of a word that is associated with a particular noun like tree as quickly as we can, another word like root or limb "comes to mind." How it got there is beyond us. According to Scheff (1990) social conversation is as lightening-fast as any athletic event. The boxer Sugar Ray Robinson said that when he became aware of his opponents' openings, he knew he was too slow to stay in the ring. He did not need lessons in biophysics to tell him that motor action takes less time than 0.5 s of sight. Recent studies of batters hitting a baseball have shown that the experience some batters had of narrowing their focus down to the size of a quarter and hitting the third of the ball they decide on hitting is an illusion. The ball is coming far faster, and the batter's body must react more quickly than conscious sight. It is more plausible that they hit at where they anticipate the ball would be. In speech, speakers must certainly be aware of their final point, but normally specific words come out of our mouths much faster than conscious deliberation. The caution "think before you speak" is common because taken literally we so frequently do not, or cannot, take time to think before our utterance, given the pace of interaction and constraints on energy demanded by decisions. Playing the piano is analogous to this. "Performers report that they are not aware of the intention to activate each finger, instead they focus their attention on expressing their emotional feelings" (Burton 2008, Sudnow 1979).

On the other hand, the major structural concepts of sociology, like hegemonic power, culture, opportunity structures, ideology, etc., work unconsciously as well. Sociology's very task has been seen as the emancipation from such processes through gaining an awareness of them (Mills 1959, Hughes 1963).

Sociologists interested in agency have to confront the apparent challenge from Libet (1996). For every subject who intentionally initiated a particular motor movement, he found a prior electrophysiological neural potential causing the action 100 ms before the conscious decision to act. (This has provoked a robust discussion about "free-will," determinism and the importance of consciousness that will be considered in the following chapters.)

Damasio (2003) and LeDoux (1996) posit a similar situation for emotion: By the time it enters our conscious as emotional feelings, our brains and especially the amygdala have already done their work (see also Franks 2006: 52). LeDoux (1996: 69) tells us "the emotional meaning of a stimulus can begin to be appraised by the brain before the perceptual systems have fully processed the stimulus." We have already seen that it is indeed possible for your brain to know that something is good or bad before it knows exactly what it is.

Gregory (2002) whose work was discussed in the first chapter concludes that his findings on subliminal clues of dominance support the statement by the anthropologist Ray Birdwhistell (1974) that "65% of the social meaning in human interactions is conveyed by nonverbal clues." As Gregory and Gallegher (2002) implies, this is consistent with Polanyi's statement that "We know more than we can tell." His work also makes evident the importance of the unconscious in providing the micro-supports of macro-level status structures. Neuroscience has identified many important processes beyond our awareness which assure social coordination and interpersonal attunement (see Gregory 1999).

Perhaps the most dramatic cases reflecting how our brains can know things that our minds do not, involve "blind sight" (Frith 2007: 28–29) and Ramachandran and Blakeslee (1998: 73–79). Frith, for example, reports on a patient who had damaged the part of her visual system which recognized shapes. To those around her, however, it was obvious that she could walk around without bumping into things and pick items up far better than one would expect from a person who was nearly blind. This led her therapists to design a study that would focus on her complete loss of the ability to be aware of shapes. If the patient was asked to tell the angle of a rod held up in front of her she was at a complete loss to say whether it was horizontal, vertical, or in between. However, if you asked her to mail a letter in a slot that was at a 45-degree angle, she would rotate her hands, wrists, and fingers in such a way as to insert the letter on the first try. Obviously her brain knew something that her conscious mind did not. As uncanny as this may be, blind sight is commonly reported in the neuroscience literature. The boxer's ability to hit before he sees may be just another form of blindsight.

Another illustration of the unconscious as process involves the classic work of Gazzaniga (1985) among others on split-brain research discussed in Chapter 1. As is true for many rationalizations and other defense mechanisms, the only person deceived is the actor himself. The best way to convince others of one's innocence is to convince one's self first. Split-brain research supplied evidence that the ad hoc statement of intent was oriented to social sense making rather than describing authentic "well-springs of action."

In another study reported by LeDoux (1996) and by Nisbet and Wilson (1977) pairs of women's stockings were lined up on a table. The female subjects examined them carefully as they were asked to choose which they preferred. Later they were questioned about which stockings they liked the most and why. Their answers were full of detail and knowledge about texture and sheerness of the material that justified their choices. The stockings, however, were identical. Like Gazzaniga's patients, the subjects were convinced they had made their choices on the different quality of the stockings that their left-brain told them they recognized. LeDoux concludes that both normals and split-brain patients attributed explanations to situations as if they had introspective insight into the real cause of their behavior when in fact they did not. Because of brain systems that operate unconsciously, we frequently do things for reasons which we do not know. One of the main jobs of consciousness is to weave our lives together in a story that makes sense to us and is consistent with our self-conception. Introspection may be valid at times but it "is not going to be very useful as a window into the workings of the vast unconscious facets of the mind" (LeDoux 1996: 33). It may just be that one of the most dangerous things about *Homo sapiens* is that the statement which makes "logical sense" to us is the one which makes us most comfortable with the story.

Regarding the unconscious as process, if we were conscious of everything we were doing or thinking, we would be so overloaded that action and thought would grind to a halt. Awareness is a very slow process. While our visual system alone handles 11 million bits of information a second, our consciousness can deal with only 50 bits per second. All the rest is processed without awareness. Much of the 95 or 97% of the unconscious referred to above contains this processing and leaves time for consciousness to reflect on distinctively human matters and interests.

Other unconscious procedural processes like the "implicit learning" that allows children to use grammar long before they are aware of doing so or the automatic operation of mirror neurons, subliminal persuasion, and processes of imitation are important items in the conceptual toolbox for social psychologists.

The Unconscious as Dynamic Content: Emotion. We have seen that the procedural unconscious consists of automatic brain mechanisms allowing any thought, perception, emotion, or memory to occur. In contrast, *content* has to do with particular cognitions, beliefs, emotions, and memories. For example, Scheff (1990) discussed the negative effects of chronic unacknowledged shame. This is broken down into two types, both equally beyond the awareness of the patient. One is overt, undifferentiated shame and the other is bypassed shame. Both types of shame are both equally hidden because one is misnamed and the other avoided. He makes the case that shame can be ubiquitous yet usually escapes notice (Scheff 1990: 87).

Also, one can suffer so long from anxiety or guilt that it becomes a part of the person's taken-for-granted, emotional "assumptive order," recognized only on the occasion when it is lifted (Franks 2006: 51).

Remembering Happenings Without a Memory. The earliest illustrations of memory as unconscious content come from amnesiac patients who had lost their ability to remember from one day to the other. As early as 1889 physicians experimented by either pinpricking or shocking those suffering from amnesia; these patients later shied away from them accusingly when they met on later occasions even though they had no memory of the original harsh encounters. On one occasion, a day after being pricked a patient declined to shake the doctor's extended hand saying in effect that something about him just made her nervous (Carter 1999:94).

Damasio (1999:44–45) describes similar situations although he treated his patients with more consideration. His patient, David, had lost all conscious memory because of a trauma to his hippocampus and amygdala. He could not recognize individuals whom he saw every day because he could not remember them. Nonetheless, Damasio noticed that he did seem to gravitate to certain people and avoid others. To probe this further Damasio placed David in social situations with three different types of experimental accomplices. One accomplice was pleasant and rewarding and a second was neutral. The third was brusque and punishing. After exposure to situations involving these three confederates, David was shown four photos including the faces of the three accomplices and asked to whom he would go to for help and who was his friend. In spite of his inability to remember any of them, he immediately chose the pleasant accomplice as the one who would be most helpful.

Frith (2007: 27) also reports a similar case involving a patient with memory loss so severe that Frith had to be reintroduced to his patient every day. Nonetheless the patient was learning motor skills that he retained for a week; each day he would say that he had never met Frith and had never performed the task before although he performed it better every day.

Kihlstrom et al. (2000:39) note that the evidence for this type of unconscious emotion is not limited to anecdotal case studies; they describe other current experimental case studies like the one above by Damasio. For example, unconscious preferences for melodies were created in amnesic subjects who had no ability to remember the exposure.

Damasio's Research on Unconscious Emotion. Damasio's (2003) stronger argument for the unconscious nature of emotion came from a study he conducted incorporating a sophisticated construct-validity design. The hypothesis addressed the question of which brain structures would be activated by emotions of sadness, happiness, fear, and anger before they emerged into consciousness. Emotional activation was measured by blood flow in the regions implicated in these emotions as measured by PET scans. These brain areas included the cingulate cortex, two somatosensory cortices (including the insular), the hypothalamus, and several nuclei in the back of the brainstem (the tegmentum). PET scans reflect the amount of local activity of neurons and thus the engagement of these structures. Next subjects were coached in theatrical techniques of reliving memories of experiencing the four emotions. With this coaching they became able to experience these feelings to a surprising degree. Then they selected the emotion they could best experience for the final study. In this stage they were asked to raise their hand when their memories started to evoke their chosen emotions. Before and after the hands were raised, heart rate and skin conductance were measured. These are reliable indicants of emotional processing.

In terms of results, all the brain structures identified above became activated before the onset of emotional feeling. Furthermore, these patterns varied among the four emotions in expected ways. Most important for the purposes here, changes in skin conductance and heart rate always preceded the hand signal that the feeling was being felt – that is, these unconscious emotional processes occurred before the subjects were aware of their feelings and raised their hands. Damasio (2003:101) concludes that this is just one of many cases where emotional states come first and conscious feelings afterward. As counter intuitive as it may seem, it is possible for your brain to know that something is good or bad before we become aware of what it is. In LeDoux's opinion one reason for this is that perceptual representation, consciousness, and affective evaluations are processed separately in the brain (LeDoux 1996:69). Others disagree about the independence of emotional and cognitive processes. They feel that while this may be true for his pathological patients, it is contrary to what happens in healthy emotional development where these systems become fully integrated (Greenspan and Shanker 2004:7, 18 and 251). However, the observation that affective feelings about something may precede an identification of what it is remains valid namely because of the amygdala's ability at times to bypass the slower cognitive processes of the prefrontal cortex.

Effects of Subliminal Perception: Preferences Need No Inferences. In 1968 Robert Zajonc initiated an up-hill battle within experimental psychology to convince his colleagues of the existence and importance of the emotional unconscious. According to LeDoux (1996:58) his techniques and experiments were some of the first to make the unconscious seem undeniable. One of his major findings was that mere exposure to an innocuous picture created an affective preference for it. We seem comfortable with what we are used to and if a familiar message or even a familiar sound is presented in connection with some essentially neutral phenomenon we have a tendency to like it just because of its connection with the familiar. In Zajonc's case the familiar association was presented so quickly that his subjects were unaware of perceiving it. The technical language for presenting the experimentally created preference was "subliminal emotional priming." A prime is a word or image that is displayed too quickly for a subject's awareness. Nonetheless, it can have the effect of influencing later judgments. When the primes were allowed to be available to the subject's awareness the effect of the negative or positive prime diminished. This demonstrated the powerful effect that the unconscious manipulation can have. The finding was replicated on numerous neutral targets such as nonsense words, letter strings, and random sequences of tones.

The prime can also be an affectively charged picture like a smiling or angry face or a positive or negative word. It is subliminally presented at 5 ms or 1/200th of a second, which is almost below the threshold of consciousness. In a classic study, Chinese ideograms were used as the "target" of the experimentally created affect. Since the ideograms are unfamiliar and look similar to most Americans, there should be little disposition to have a preference for any given ideogram. However, when the ideograms were primed with subliminally perceived smiles or frowns, this also spilled over to affect how subjects liked or disliked the otherwise neutral "targets." One can justifiably suspect the influence of the socially sensitive amygdala at this point.

One well-known replication of Zajonc's thesis was conducted on subjects who had been briefly shown a number of faces. To insure that subjects had no awareness of the exposures, the first exposure was "masked" by presenting a second face at less than about 40 ms intervals. When asked at a later time to tell which of the faces they recognized, no one was surprised that the subjects were unable to identify any of them. However, when asked how they liked the faces, the pre-exposed faces received the most positive ratings (Bornstein 1992). In spite of the many replications of Zajonc's research and the consistent finding that our preferences were more easily influenced when we are not aware of what caused them, it was decades before his work became widely accepted (see Bornstein 1992 for a review and also Ekman and Davidson 1994).

Acceptance of the unconscious was no doubt aided by the introduction of brain scanners. This allowed clear evidence that an object or picture with negative affect would produce a change in brain activity, even when the perception of it was unconscious. Previous research had shown that activity in the amygdala increased when people were shown fearful faces. So the researchers masked the perception of fearful faces as well as that of neutral faces and showed that the amygdala activity increased when the faces primed with fearful ones were shown. Thus Frith concludes (2007:46), "Our brains respond to fearful things we are not aware of seeing." Once again, in Merleau-Ponty's terms the brain knows things that we do not.

Subliminal Persuasion. A closely related field of research into unconscious influences involves subliminal persuasion. Significantly, it was received with the same lack of enthusiasm as subliminal perception even though the evidence for such phenomena is massive (Dijksterhuis 2005). The idea that forces exist which affect us outside of our consciousness makes many scholars uncomfortable, not only symbolic interactionists. The idea that advertisers and politicians can manipulate these forces adds a new dimension to the discomfort. Many psychologists have insisted that subliminal persuasion is a myth unworthy of serious investigation.

This may be especially true since in 2000, presidential hopeful George W. Bush was accused of employing these tactics against Al Gore. (Dijksterhuis 2005; 88, 90 and 92). One of the television ads used by the Bush campaign flashed pieces of the words bureaucrats and democrats on the screen as an attempt to evoke "near-evaluative conditioning techniques." The word RATS was also presented covering the entire screen for one-thirtieth of a second. This could be detected by paying very close attention which very few watchers did. While "subliminal evaluative conditioning" as it is called can indeed affect attitudes and behaviors, it is dubious that it could influence very deliberate decisions like voting practices where previous attitudes have already been formed.

Nonetheless, in other contexts subliminal evaluative conditioning has been successful. Clearly some of these techniques could be refined for political purposes in the future. One simple technique commonly used today is simply repeating a fearful message over and over in regular speeds. What is unconscious is not the words, but their effects.

Debner and Jacoby (1994) also conducted a similar convincing study. Five letter words like "scalp" were subliminally placed on a computer screen and immediately afterward participants were presented with a word-stem composed of three of the letters in the subliminally presented words (e.g., sca-). Subjects in these groups were then asked to spell out the whole word which they did. A control group was asked to spell out the whole word when presented with the first three letters but without the subliminal prime. Another experimental group exposed to the words subliminally were then asked to try not to use the words shown previously. Despite themselves, this group ended up using the primed word more often. The study demonstrated the semantic processing of words while ensuring that the processing was unconscious (see also Marcel 1983; Merikle, Joordens and Stolz 1995). Numerous studies also demonstrate that subliminal perceptions can elicit more than semantic effects. They influence emotional responses, social judgments, and overt behavior in surprising ways.

These studies demonstrate how much is going on with us of which we are completely unaware. While these studies may not cause the concern that hidden persuasion in politics may engender, it is still difficult for westerners so steeped in the rhetoric of self-reliance and autonomy to admit we are so suggestible. In light of these findings and studies on mimicking and later ones on imitation, the better part of wisdom is to be careful of the company we keep.

Ohman (1999) made an important contribution to the new unconscious with his study of various fear responses. Students were recruited from a group which was very fearful of snakes and also from those who did not mind snakes but were very apprehensive about spiders. A control group was arranged which did not fear either one. Slides that consisted of snakes, spiders, flowers, and mushrooms were shown to all groups. All slides were shown at a speed faster than that which allowed conscious perception. When exposed to the imperceptible snake slides, those fearful of snakes had elevated skin conductance responses to the snakes, but they did not have an elevated response to the slides of the spiders. Participants fearful of spiders responded similarly to the spider slides but not to the snakes. Controls had no elevated responses to any of the slides. Thus, with no consciousness of the slide's contents, subjects showed enhanced sympathetic, unconscious responses. After citing similar studies, Ohman (1999) in accordance with LeDoux concluded that the cause of unconscious fear responses could be independent of conscious processes.

Defense Mechanisms as Windows to the Unconscious. For those of sane mind, the capacity of human beings for telling lies is beyond dispute. Less appreciated, however, is that the person whom we deceive the most is ourself. As Smith says in *Why We Lie*, (2004:1) "…The gradual changes in brain structure that eventually produce the modern mind did not endow us with much ability to understand ourselves. Self understanding does not come naturally to human beings."

This provocative contention comes from many different directions of the neuroscience literature and has to do with the practical human need for intellectual coherence and consistency as well as the more affective needs for self-acceptance. We have seen how Gazzaniga's split-brain patients produced clear evidence of the left-brain's talents for self-deception since the only persons in the dark about the validity of their "accounts" were the patients themselves. After all, as you will recall, it was the researcher who told the mute right brain what to draw or do; the only person who knew the reason for the action was the researcher. Neuroscience's convergence on the fictional aspect of self will be discussed below, but our concern here is how self-denial and other defense mechanisms provide windows to the unconscious. Granted, defense mechanisms subserve the self but the operation must be below the level of consciousness. A conscious defense mechanism is a failed exercise.

Few neuroscientists have given more convincing evidence for this than Ramachandran and Blakeslee (1998). His work with stroke patients exhibiting extreme denial about their consequent paralyses provided his window to the unconscious. Their markedly blatant denial of serious affliction was a defining feature of "anosognosia," which means the inability to acknowledge one's bodily disability. Ramachandran calls it an "unbridled willingness to accept absurd ideas." Patients not only deny that the limb is paralyzed, but when the paralyzed limb is pointed out, they often insist that it belongs to someone else! One patient said her arm belonged to her brother and when asked why, she said, "because it was big and hairy and that she did not have hairy arms." At the time her brother was many states away, as she knew. Ramachandran sees the less obvious everyday denials of all of us as writ large in these unusual cases.

The route he takes from the extreme to the more mundane, however, is necessarily circuitous. If anosognosia is basically self-deception in an exotic form, then it should be a function of the left-brain interpreter doing its normal work creating unity, coherence, and sensibility – at times when none of these are present. He notes also that this kind of extreme denial is almost always associated with damage to the right side of the brain resulting in paralysis of the body's left side. In contrast, stroke patients damaged on the left side of the brain (which paralyzes the right side) almost never deny their injury and talk about their useless limb constantly. From the split-brain research, which revealed the contrasting capacities of the two hemispheres, this asymmetry hints of neurological answers. If extreme denial were merely psychological, the side of the stroke would not make any difference. According to the split-brain findings, the left hemisphere is specialized for production and comprehension of language in the Broca's area and Wernicke's area, respectively. Ramachandran remarks that the left, so-called dominant, side of the brain does all the talking and the mute right side cannot protest. This right side slides over details to get the gist of things, seeing "the forest instead of the trees" and responding to the global emotional significance of events. Strokes on the right side hinder the emotional realization of events and therefore can leave patients blunted as to the full realization of their plight. Because the right brain is not so concerned with sense making and rationalizations, it is free to call attention to things that aren't necessarily congruent with these rationalizations and which can unwittingly "play the devil's advocate" or give "pause to thought" by bringing up discrepancies. Denials are based on intellectual rationalizations and the nonfunctioning right brain gives the left "executive" brain free reign to weave its intellectual monuments into rationalizations, denials, and assorted confabulations.

The next question Ramachandran asks is how deep does this denial go? I have said that a conscious denial is a failed defense mechanism and because we all have such mechanisms, this is an important question bearing on both human nature and the nature of the unconscious. Rather than fruitless attempts to confront the patient with rational strategies, Ramachandran presented them with motor tasks that involved both hands. These tasks were presented quickly before patients could think about them. A cocktail tray with six glasses partially filled with water was placed in front of his anosognostic patients. Normally one would take the tray with both hands to raise it in a stable manner, but with only one good hand it would be necessary to raise it from the middle of the tray. Normal stroke patients with only one good hand did just that. But, stroke patients with anosognosia went straight for one side of the tray with no thought given to their deficiency. When the glasses fell, they passed it off as clumsiness rather than because they only had one good hand. One patient insisted that she lifted the tray successfully even though her lap was full of water. At this point the patients' lack of knowledge about their limitations seemed to be all that was going on.

The next series of experiments went further. They included giving anosognostics the choice between a simple task that took one hand with a five-dollar award and an unrealistic task that took two good hands for ten dollars. When four patients in denial were presented with this option they all went for the unrealistic task (of tying shoelaces) to claim the higher amount as if they were normal. They spent minutes attempting the impossible without any trace of frustration and when they were given the same option 10 min later they went for the shoelaces again. One of the patients did this five times in a row with no recognition of frustration or failure. When asked the next day if she remembered Dr. Ramachandran, she said in effect, yes, he gave me a shoe and asked me to tie the shoelaces. Then she added that she did it successfully with both hands. Ramachandran recognized the oddity of going to the unnecessary trouble of explaining that she tied them with both hands. How else could one tie shoelaces? Other anosognostics exhibited the same overdone tendencies in similar situations. Ramachandran states that " it was almost as though inside (the patient) there lurked another human being – a phantom within – who knows perfectly well that she is paralyzed and her strange remark was an attempt to mask this knowledge" (Ramachandran and Blakeslee 1998:139 parenthesis added).

The Window to Repression. As Oliver Sacks has repeatedly shown, neuropathological behavior is often bizarre. Ramachandran found a way to look past his anosognostics conscious denials into that unconscious phantom inside who knew differently. This occurred when he read of an Italian neuroscientist who had irrigated a "denying" patient's left ear channel with ice water – an uncomfortable procedure that had been used to test vestibular nerve function, which relates to a sense of equilibrium. Both doctors discovered that the procedure also resulted in a temporary remission from anosognosia. When Ramachandran tested this on his patient who had been constantly denying her paralysis for weeks, she suddenly voiced obviously repressed memories that had existed below consciousness and were successfully denied. She matter of factly stated that she could not move her arm because it had been paralyzed since her stroke. This lasted at least half an hour; later that day she remembered numerous details of her visit by the doctor (including his query about the use of her bad arm) but her memory of admitting her paralysis failed her and she insisted that she had told the doctor that her arm was fine. Her "phantom within" had been successfully repressed once again. Ramachandran conjectures that the cold water activates circuits in the right hemisphere, which makes the patient, pay attention to the left side and temporarily recognize that she is paralyzed.

The unconscious repression and the overdone denial running through these experiments have been explained as a result of the left brain's attempt to preserve a coherent and emotionally acceptable worldview. In the case of anosognosia, this entails shutting out information from consciousness which threatens the stability of self. While these patients exercise denial in an extreme form, the same general tendency is common to all of us. What would happen to them if the threat to self-stability were taken away by offering them a non-threatening alternative explanation? Ramachandran did this by telling the patient that he was going to inject her arm (the one she was denying was paralyzed) with an anesthetic that would temporarily paralyze it. After the "injection" (actually a saline solution) he asked if she could move her arm. The denial was temporarily lifted as she admitted she could not. He then did the same with the good right arm and when he asked if she could lift it, of course, she said "yes." At that point he feigned surprise and asked how that could be since he injected it with the same anesthetic that paralyzed her left arm. Her immediate response was to the effect that she has always believed in mind over matter.

In the past 30 years scholars have rejected Freud's untestable ideas about infant sexuality. But many researchers have come to recognize the validity and importance of his list of defense mechanisms. Ramachandran argues for the power of unconscious defense mechanisms for apparent and sound reasons. He argues that his patients are microcosms of you and me (Ramachandran and Blakeslee 1998: 155). As he further argues – and as we shall find below – we are often more accurately deceivers than conscious liars, although humans are certainly liars too (Smith 2004). It is easier and more effective if we can make ourselves believe our fabrications and our brains seem geared to help this enterprise. But the human self – so important to our emotional well-being and practical adaptations – is a fragile, if flexible, process that must be protected at all costs including costs to self-knowledge. Once again, the unconscious becomes more powerful simply because it is unconscious and therefore out of our awareness and control.

The Unconscious and Political Manipulation

The possibility of political control of the public's unconscious has become one of the most interesting social psychological subjects in the last decade. Tavris and Aronson (2007) describe these processes. They show how the Bush administration first denied, and then rationalized the use of torture in the "War Against Terror" producing the cognitive dissonance which activates a "downward spiral" of defensive formations which produce a sense of "absolute certainty" of one's legitimacy. Obviously, this can be a very dangerous thing. Rational self-awareness is diminished by the original dissonance and the ensuing rationalizations. This closes off private experiences of the emotions of social control – guilt, shame, or embarrassment – and with it the psychological motivation for change. Behaviors which once were justified by extreme situations become routine, creating the downward spiral, more defense work, and an even deeper lack of awareness. The authors conclude that both governments and their publics can harden their hearts and minds by this process in ways which might never be undone. In the short time since these authors wrote of this process, more and more examples have come to the fore.

The Manipulation of Fear. Psychologists Pyszczynski, Soloman and Greenberg (2002) have conducted one of the broadest studies to date of the political use of fear and the manipulation of unconscious factors in controlling voting practices of the American public. In a well-quoted statement at the Nuremburg trials, Herman

Goering succinctly described the basic strategy for galvanizing public opinion behind preemptive military force by their government:

> Naturally, the common people don't want war, but after all it is the leaders of the country who determine the policy, and it is always a simple matter to drag people along whether it is a communist dictatorship. Voice or no voice, the people can always be brought to the bidding of leaders. This is easy. All you have to do is to tell them that they are being attacked, and denounce the pacifists for their lack of patriotism and exposing the country to danger. It works the same in every country (http.//www.rense.com).

While few students of history will quarrel with the gist of Goering's statement, it was greatly refined by Pyszczynski et al. (2002) whose work is premised on the late Ernest Becker's award winning book, *Denial of Death* (1973). Becker's thesis was that the fear of annihilation by death was a basic feature of the human condition. As an adaptation to this inherent anxiety, cultures offer either symbolic or literal immortality through what amounts to "hero systems" embedded in broader cosmic worldviews. These systems define ways that people can retain feelings of self-worth in the face of death. They are often religious in nature and offer immortality to those following the ideal. As players in these systems, we can at least symbolically deny death. The somewhat counterintuitive hypothesis tested by Pyszczynski et al. was that acute recognition of one's mortality evokes an embracement and defense of the worldview perpetuated by the status quo and its hero systems as well as the public leaders representing it to their publics. As a function of anxiety, adherence to such systems often takes on a compulsive rigidity and intolerance of other worldviews whose very existence challenges our own. As we have seen, unconscious, free-floating anxiety seizes on unrelated targets to explain such fear. Thus, in times of threat to the cultural system, defense mechanisms such as projection and displacement operate to increase scapegoating practices and general distrust of outsiders (see, for example, Kai Erickson's *Wayward Puritans* 1968).

In a pilot study of their larger project concerning this thesis, Pyszczyniski et al. asked 22 municipal court judges to fill out a personality inventory. Eleven of the inventories asked the judges to imagine their own deaths. Following this, they were asked to set bail in a hypothetical case of a prostitute whom the prosecutor claimed was a "flight risk." The bail set by those who had been sensitized to their mortality averaged $455.00 while those who had not been so sensitized averaged only $50.00. Findings like these were replicated consistently during a 10 year period, showing that sensitizing people to their mortality (referred to as "mortality salience") affected participants' negative views of other races, religions, and countries as well as an acceptance of a "my – country – right – or – wrong" brand of patriotism. To show that it was anxiety about one's mortality that was responsible for this uncritical attraction to the status quo, other studies evoked various other anxieties as possible independent variables, but only exposure to "mortality saliency" produced these uncritical effects.

At this point two other issues needed to be addressed. One was whether the mortality salience was more effective when it was conscious or, as Zajonc would suggest, if unconscious anxiety would have greater effect. The other issue was to show that the effects could, indeed, be attributed to "mortality salience" rather than to something else. Being embedded in the status quo definition of patriotism had to be the specific result of a fear of one's own death instead of something else. To pinpoint the importance of "mortality salience" per se, the three researchers created a diversionary interval after exposure to questions relating to mortality and the dependent variable which they referred to as "worldview defense." The latter was operationally defined as heightened religiosity, traditional patriotism, concern about increasing "homeland security," and support for government officials stressing the possibility of attack, especially before major elections. It also included measures of intolerance and concern for "law and order."

First, Pyszcznski et al. conducted experiments using subliminal clues showing that after the conscious anxiety about morality had time to subside from focused attention, the thought remained active unconsciously in a manner that could increase adherence to "worldview defense." Subjects were asked to complete the endings of two word stems. Between the presentations of these two stems the word "death" was flashed to one group faster than awareness allowed, while the word "field" was flashed subliminally to the control group. A word-stem test offered the possibility of completing the word fragment "coff" – as in "coffin" or "coffee" but those who were primed by "death" more frequently completed it as coffin while those in the control group tended to completed it by the word coffee. Participants were then asked to evaluate two essays one of which was critical and the other supportive of United States policies. Compared to the control group, those primed unconsciously by death were more rejecting of the critical essay and more accepting of the patriotic essay.

Based on these initial studies, and at the bequest of the American Psychological Association, the three researchers applied what they had learned to an explanation of how the events of 9/11 heightened religiosity, patriotism, and support for the invasion of Iraq and for President Bush generally during the 2004 election. The destruction of the twin towers was hypothesized to be the equivalent of unconscious "mortality salience" at least to many potential voters among university students. To explore this possibility, the researchers used the same subliminal word-stem completion test as described above, but words reminding the subjects of events of 9/11 were substituted for the word death. This study and later replications supported the conclusion that reminders of the terrorist attacks functioned as unconscious mortality reminders.

These reminders were then shown to enhance the appeal of a hypothetical candidate who told students "they were not just ordinary citizens, but parts of a special state and nation." These pilot studies led to a direct test of unconscious fear of terrorism and Bush's appeal. University students were given mortality salience exercises embedded in a personality test they were told was part of a study of personality and politics. (Remember that although they have similar consequences, mortality salience or fear of death is different from reminders of the attack on 9/11.) A control group took the same test without the mortality salience reminders. Afterward they were asked to evaluate an essay that endorsed President Bush and his policies on invading Iraq. For example, one sentence read: "Ever since the attack on our country on September 11, 2001, Mr. Bush has been a source of strength and inspiration to us all." The study was repeated in several months but they asked one group of students to write down the emotions that September 11 evoked at that time in order to establish once again if emotions about the attack per se functioned as a mortality reminder. Both of these questions increased the approval of Bush's policies among both liberal and conservative students.

A final study directly tested the effects of mortality exercises and the preference for the political candidate participants said they would prefer. The control group who were administered the personality test without the mortality reminders favored Kerry four to one. Those who took the personality test with the mortality reminders favored Bush by more than two to one. The authors conclude that the government's pre-election terror warnings, including Cheney's caution on election eve that: "If we make the wrong choice we'll get hit again," increased mortality salience and affected the results of the election.

Systems Justification Theory. Jost et al. (2004) conducted another broad study of the place of the unconscious in producing a general bias toward identification with current power structures. Their review of an expansive range of studies found that the weight of evidence throughout the social psychological literature supported "systems justification theory." This framework is comprised of four general hypotheses: (1) There is an unconscious ideological motive to justify the existing social order. (2) This motive is contrary to the conscious tendency to identify with in-groups like one's self. (3) Instead, the unconscious motive leads to an unconscious identification with dominant groups especially among members of minority groups. (4) This tendency is sometimes stronger among those who are most disadvantaged by the social order.[3]

While these findings stem from different research questions which are different from than those of Pyszcynski et al., they still emphasize the strong unconscious forces at work; these forces give robust power to the hold that the status quo and its rationalizations have on us regardless of our self-interest and regardless of whether or not we are conscious of its influences. The implications of these findings cause even more embarrassment to those supporting the unfalsifiable, but ideologically persuasive theory of self-interest as a ubiquitous and primary motive. As economic and social gaps in a population increase in a population, the unconscious identifications with the status quo and its justifications increase as well. These unconscious forces simply add to the overall contributions supporting the power structure in times of war that were identified by Pyszczynski et al.

My In-Group Right or Wrong

The instrument measuring unconscious identifications used in the system justification theory evaluation was the Implicit Association Test (IAT) developed by Greenwald and Banaji (1995). As with most instruments used in tapping the

[3]These findings are reminiscent of Marx's methodologically questionable "false consciousness."

unconscious, much revolves around the time taken to respond. Stimuli were presented too fast for anything but limbic impulses to operate. In the case of the IAT, a key assumption was that among consciously liberal white students it takes longer to fight an unconscious tendency to associate black faces with "bad" compared to the time it takes to associate white faces with "good." Fourteen white students where placed in a MRI scanner and asked to view photos of unfamiliar black and white male faces. If the picture were the same as the preceding one they were asked to press one button and if the pictures were different from the preceding ones, they were asked to press another button. The next step involved a measure of automatic association of positive and negative words to the black and white faces. If it took more time to associate black with good words or qualities, and whites with bad words or qualities, this was taken to indicate an implicit hesitancy to connect blacks with good words and whites with bad.

The MRI measured flow of blood through the amygdala while the participants made these quick judgments. As described above, the amygdala registers lightening-fast, unconscious evaluations of objects and faces. The strength of the amygdala activity when the students evaluated the unfamiliar black faces was then related to the degree to which students responded to a subliminal startle measurement. On the IAT proper, for most subjects it took longer to associate the "good" with unfamiliar black faces and the white with the "bad." When the subjects were administered a self-reported racism scale, no correlation was found between explicit self-reports and the Implicit Association Test showing once again that we are often the last to know about our own tendencies. Also when white students viewed well-liked and well-known famous black and white faces, there was no relation between preferences and amygdala activity.

Returning to the assessment of systems justifications theory, the IAT test as a methodological tool was used on very large samples. For example, 103,316 European Americans and 17,510 African-Americans contributed to their finding of implicit outgroup preferences by the latter (Jost et al. 2004:898). This was because the IAT lent itself to be administered online (see www.yale.edu/implicit.).

Conclusion

For sociologists, the new unconscious will always remain secondary to the symbolic interaction focus on awareness and agency, yet it is certainly pertinent to know how the unconscious affects consciousness and language. Processes which are below consciousness are all the more powerful simply because they are out of our purview. We cannot control or evaluate that which we do not know. Symbolic interaction has been a theory of conscious-minded behavior, and based on this awareness it has developed a theory of self-control that is nonetheless social. However, it is also a study of face-to-face interaction and self-presentation, much of this is beyond our awareness. If our field were really data driven, we would have to pay attention to the mass of data from social psychology, cognitive psychology, and neuroscience demonstrating the effect that we are so often completely unaware of the real causes for our behavior. One of the most established findings from all of these fields is that our emotional preferences determine how we will interpret such facts.

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Chapter 5
Mirror Neurons: A Return to Pragmatism and Implications for an Embodied Intersubjectivity

Mirror neurons came on the neuroscientific scene in 1991 when an Italian animal researcher named Giacomo Rizzolatti observed that the very same neurons fired when monkeys were watching an activity as occurred when the monkey's themselves performed that same activity. That is, the same neurons fired when the animals were *watching* something being grasped as fired when they actually *grasped* it themselves. Passively watching a behavior and actively doing that behavior where activated by the same neurons. In this way *watching* becomes intertwined with *doing* and thus is not that passive after all.

It soon became evident that the same thing happened with human beings (Rizzolatti and Sinigalia 2008: 115–123 and Iacoboni 2008: 52–57). As with the monkeys, watching human behavior did not end with mere looking but went on to be re-enacted or *simulated* by "templates," primarily in the brain's motor cortex, but in other areas as well. A further dimension to mirror neurons was added when these researchers found that neurons in the anterior cingulate, which normally fire when one is stuck with a pin, will also fire when the person merely *watches* another person being stuck. Thus, on some level, however superficial, we *literally experience in our selves* those actions that we see in others. Damasio (1994) would call this empathetic dimension the "as-if-loop." This expands from mere activities like making a fist or grasping an object to observing human feelings, gestures, and sensations and, as we shall see, even to listening to others talk.

Emotion-wise, when we see someone choke up and begin to cry, we experience some of that feeling ourselves. Sensation-wise, watching a spider crawl up a person's thigh would give most of us an intensely creepy feeling. We are so used to this that we miss the "mystery" involved in the fact that we feel the unwelcomed critter creeping up the inside of our own thigh even though it is not really happening to us. In such cases routine human experience hides the need of logical explanation.

A clear example of this mirrored simulation from everyday life is the groan that wells up in a stadium when a football player receives a crushing hit. We don't literally feel the recipient's full pain of course, but we find ourselves cringing nonetheless. Children being disciplined may not quite believe their parents when the latter say, "this hurts me as much as it hurts you," but there is some truth in it if you grant Damasio's "as if loops" and the fact that feelings can be felt on many

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levels of intensity. Joy and sadness have long been known to be contagious. According to Dijkersterhuis (2005:210), the original meaning of empathy was "objective motor mimicry." Ironically the original meaning was more accurate and specific than the current subjective meaning of empathy which developed in the second half of the past century.

The purpose of this chapter is two-fold: first, to show how the current findings regarding mirror neurons add embodiment and thus refinement to Mead's "theory of the act" as well as confirming the "priority of action" which is the key to Chicago pragmatism. The emphasis on action implies limits to remnants of the linguistic turn and its cousin, extreme social constructionism. This is not to deny the important insights of a *balanced* constructionism which should, indeed, remain almost synonymous with sociology. Second, I want to trace the path between our tendency to mirror gestures (both visual and audio) through our superior capacities for complex forms of imitation and finally to the contributions of mirror neurons' contributions to our capacities for spoken language. Along the way we shall see that this involves us in the embodiment of semiotics and intersubjectivity.

Mirror Neurons as Confirmation of Mead's Pragmatic Theory of the Act. The common sense notion of the motor cortex portrays it as a mechanism designed to carry out the commands of a higher, more conscious executive will. The person decides to make a movement and the motor cortex obeys. In this view, the motor cortex contributes little to perception or to the way we think. Motor behavior is viewed as a faithful servant at the command of the more privileged cognitive powers. Iacoboni (2008:13) warns that things are not so clear-cut nor modular on the more complex neuronal level. They find significant overlap in cognition and sensation, both of which make up perception and motor behavior. On the neuronal level the brain is more holistic than the common sense view would suggest and motor neurons can also switch to be perception neurons.

Another entrenched assumption made by the common sense view of motor behavior is that the temporal direction of causation goes from stimuli to perception and then to thought and finally to motor movement, each of these being separable, self-contained units. This sequence is being questioned by current research into mirror neurons, but actually it was challenged long ago by a group of philosophers before neuroscience was a commonly recognized field. Both new and old groups place behavior as prior in time sequence and theoretical importance. The human act more typically starts with a person's behavioral impulse, not a passive recognition of stimuli or an isolated thought.

The Pragmatic Priority Given to Action in Mead's Theory of the Act. The thinking of George Herbert Mead, Charles Saunders Peirce, William James, and John Dewey at the University of Chicago reversed the common sense stimulus–response picture at the turn of the twentieth century (see, for example, Dewey and Bentley 1949). Almost a century later neuroscience and evolutionary findings have rediscovered the quintessential starting point of these early American pragmatists. "Man is active," as Dewey put it, "that is all there is to say on that score." However, neuroscience and the evolutionary perspective guiding it would insist that there is much more to say on such a score as does Kilpinen (2002) and Shalin (1992). Dewey was insisting that behavior must be taken as a "given" and all analysis proceeded from it. Behavior just *is* and needs no further explanation. Every infant comes into the world as a squirming, kicking monument to motor behavior. To the pragmatists, much of adult behavior is habitual until blocked by some impartial force. It is then that we characteristically stop and think. The process starts with behavior, thought comes about when it becomes necessary for behavior to proceed. Thought is the servant of behavior, not the other way around.

The "something more to say" has to do with the type of behavior that is relatively distinctive of the human animal. The characteristic behavior of the hominids that preceded *Homo erectus* and finally *Homo sapiens* was defined by two activities: their dawning "handedness" along with their socially cooperative tendencies which made a relatively small and slow animal able to survive as a species. By the time *Homo sapiens* gained a lasting edge, this cooperative behavior created the conditions for a significant gain in intelligence. This intelligence did not come out of the blue, but was the result of the pressure environmental factors placed on cooperative, social behavior.

In short, early intelligence was focused on two kinds of action as Kilpinen (2002:19) notes: (1) corporal manipulations involving tool making and (2) communicative competence. While symbolic interaction has embraced the latter, it has been more reluctant to incorporate the significant implications of instrumental manipulation and motor behavior. We came from a line of *doers* not just thinkers, talkers, and feelers (Franks and Heffernan 1998).

In the common sense notion of the human act, the perception of some stimuli begins the process of action. By placing the *motor impulse* to act first instead of last, Dewey, Peirce, and Mead showed how the impulse became an integral part of the subsequent stages of perception, manipulation, and consummation of the act (Mead 1938).

According to Mead and Peirce, the anticipation of consummation reaches back teleologically to pull the different stages of the act into being: " [T] he later stages are present in the early stages. . . .In the sense that they (the images of consummations) serve to control the process itself" (as quoted in Swanson 1989:6). The impulse to act enters into perception because we tend to perceive most clearly those things that facilitate our impulses to act. A book on the shelf that has been unnoticed for years takes center stage in our awareness as it becomes needed for our task. To give equal attention to all the potential stimuli actually available to our senses would achieve nothing, but over-stimulation and paralyzing chaos (James 1884). In the transactional view of John Dewey, action was always primary and prior.

Perception becomes a selective assessment of *what action possibilities an object affords for our intentions.* All perception is selective and it is our actions that select the relevant from the irrelevant in any particular context. The world is not known by passive camera-like imprints or images or representations of how it "actually is." It is known by the *human actions which it makes possible*. In this context, the rigid contrast between the organism and the perceived environment breaks down. We do not simply see things "as they are in and of themselves," but as filtered through how they enable our actions. Self and environment are fused as our momentary intentions become critical in shaping what comes to our attention.

Mirror Neurons and the Priority Given to Action. For cognitive neuroscientists and researchers on mirror neurons, this relationship between our motor intentions and the way we perceive the world is conveyed by the term "affordance." "An affordance is a resource that the environment offers an animal, such as surfaces that provide support, objects that can be manipulated and substances that can be eaten, . . ." (Gibbs 2006: 21). See also, Rizzolatti and Sinigalia (2008:34), Gibson (1979), Dewey and Bentley (1949). Rizzolatti and Sinigaglia argued that the visual perception of an object implies the immediate and automatic selection of those properties which facilitate our interaction with it. Here, again, the boundary between self and environment breaks down: what we call the objective properties of objects do not exist by themselves unattached to human capacities and sensitivities. . . . "they incarnate the practical opportunities that the object offers to the organism which perceives it" (Rizzolatti and Sinigalia 2008: 34).

As with the earlier pragmatists who also used the term "affordances," these writers place perception as the result of *a relation* between the environment and our potential embodied actions on it. The environment becomes objectified only in relation to the animal's *motor* capacities, and the particular construction of its senses and brain. The findings from research on mirror neurons clearly support this view. The dog's elaborate nose and ears enable him to live in a world of smell and sounds that are foreign to us while our flat faces enable a world of sight and perspective that is likewise foreign to the dog and horse. It is difficult to appreciate the scene with a long protrusion dividing the view. We perceive and cognitively understand the world not so much as it "objectively" looks, but in terms *of how it answers to our intentional actions*. The German term *Umwelt* captures this organism/environment relation in describing the lifeworld of different species. It refers to *the world carved out for our attention by our capacities, sensitivities, and motor repertories* (Lyng and Franks 2002).

The capacities that mirror neurons give us go beyond sensation and add to our *Umwelt* an additional world of other person's minds and their intentions. According to Rizzolatti and Sinigalia (2008) working on the level of brain processes, these intentions – which are commonly seen as purely cognitive – are actually not separate from our motor impulses but become a part of their constitution.

In sum, while old notions assumed that motor impulse, perception, and cognition were separate processes; the Chicago pragmatists saw these separations as reified distinctions – artificial abstractions. In Mead's time such a view was developed in large part by philosophical avenues, with very minimal knowledge of the central nervous system, but it has been rediscovered in the 1990s by the highly technical findings of leading neuroscientists working in the area of mirror neurons.

Mirror Neurons as Confirming and Refining Mead and Cooley. According to Rizzolatti and Sinigalia (2008:xi):

> just involved with single movements but with actions. . .. We goal. . .these acts, insofar as they are *goal-directed* and *not* surroundings and endow objects with the immediate meaning cognitive processes is to a great extent artificial; not only does perception appear to be

> embedded in the dynamics of action, becoming much more composite than used to be *brain that understands*. As we shall see, this is a pragmatic, no less important for that, because it lies at the base of our celebrated cognitive abilities (Emphasis added).

Consistent with the above, the initial finding pertaining to mirror neurons was that observation was a not a passive process of registering corresponding images of objects but that it was inseparably infuse with action. We actually do what we watch in the sensory motor cortex. This simulation is automatic and instantaneous. What Rizzolatti did that the Chicago pragmatists could not do was to show how the pragmatic priority of action could be found deep in the unconscious, automatic workings of the brain. By matching the movements we observe to the movements we ourselves can perform, we immediately appreciate their meaning on a level distinct from the symbolic as important as that is. Rizzolatti and Sinigalia (2008) point out that without a mirror neuron system we could still make sensory depictions of other's behavior, but we would not quickly know their intentions and would not understand what they were *really doing* without time-consuming deliberations about their possible intentions, expectations, and motivations. It is through our own motor competencies that we can make such judgments immediately and accurately without deliberate cognition.

Mead's notion of role-taking and Cooley's notion of the "looking glass self" can be seen as early attempts that lead to the later concept of intersubjectivity. The work on mirror neurons modified this nascent idea of intersubjectivity by adding explanations of how we reach across space to understand and penetrate each other's extra-sensory minds as tangible persons rather than intangible things. Human society is made possible through this process. Rizzolatti and his colleagues have embodied this essentially cognitive activity and given it a tangible foundation. Mirror neurons enable us to go further than observation of movements into a realm of *understanding* these movements, namely because on a preobjective level they are our movements too, and are laced with similar intentions. This is different from Mead's solution to the problem of intersubjectivity and human connection. His role-taking was completely linguistic being focused on significant symbols and the self-conscious control of behavior. Mead's notion of role-taking includes the symbolic process of taking a perspective, namely the perspective of others in different roles from one's own, and using this to fashion effective lines of discourse. Sometimes the process of intersubjectivity necessitates talking to others in their terms rather than ours. Being abstract, this allows for a much broader range of understandings than the concrete embodied understandings of mirror neurons.

In contrast to Mead, Cooley's explanation of connectivity was more a matter of individual *projection* of our feelings onto another and while more compatible with mirror neurons was also similarly limited. Nonetheless, both models leave out an important part of our social nature written into the very biology of our brains through mirror neurons and other processes. Neither model – the linguistic nor the biological – has to exclude the other, nor should either one be reduced to the other.

Mirror neurons are prelinguistic in time and nature adding an important semiotic of the body to mindful talk and role-taking. It would seem that the evolutionary development of mirror neurons and social interaction were causally intertwined and inseparable. Once established by the evolutionary process, mirror neurons make possible similar meanings between individuals (embodied intersubjectivity) and provide the propensity for imitation which fosters the development of true language. After all, the primary role of the human mirror system – implicated as it is in the various cortices related to motor activity – is semiotic. Its purpose is to understand the actions of others (Rizzolatti and Sinigaglia 2008:124). In contrast, the *content* of language – its particular grammar and vocabulary – seems to be a true emergent from social groups based on the linguistic variety found in the world.

Rizzolatti and Sinigalia (2008:130) have no illusions that mirror neurons replace the linguistic formulations of G.H. Mead and Cooley and tell the whole story of intersubjectivity. Their contribution is limited to that preobjective immediacy as well as being limited to intentions. Their contributions to symbolic interaction lie in clearly specifying the role of embodiment in human semiotics and the limited but very specific empirical evidence for the priority of action in a complete understanding that leads to intersubjectivity. Since our motor cortices are actually doing what we watch others do, we share immediate and direct intersubjective understandings free from the ambiguity of symbolic interpretation.

Species Differences in "Vocabularies of Action" and the Pragmatic Behavioral Priority. If mirror neurons combine observing and doing and are tied to our own motor actions, what happens in the brain when we observe things that are not a part of our "umwelt," or in Rizzolatti and Sinigaglia's terms, are not within our "vocabulary of actions"? In order to explore this, the authors used fMRIs to investigate mirror neuronal activity as human subjects watched monkeys and dogs do things within their own human behavioral repertoires. This was then compared to the neuronal activity when watching the other animals do activities demanding behavioral capacities different from those of humans. The two activities were chewing food and communicating, the later using in different species. They showed subjects videos of humans, monkeys, and dogs ingesting food involving chewing. They then showed subjects humans talking, monkeys lip-smacking, and dogs barking (Rizzolatti and Sinigalia 2008: 131). Even though there are fundamental differences in how the species appeared *visually* when eating and communicating, there were nonetheless clear similarities in the motor areas that became active in the three cases. In terms of observing the different forms of communicating, mirror neuron circuits were strongest when subjects viewed a man talking. They were less strong when they viewed the monkey lip-smacking and non-existent when viewing the dog barking even though it was clear visually that the dog was moving his mouth in a somewhat expressive/communicative fashion. We have no parts of the motor cortex for barking. (Though we may delude ourselves otherwise, no dog actually goes arff, arff or woof, woof.) While all species moved their mouths in the process recorded, the brain activation picked up by the scanners was most strongly tied to the "vocabulary of acts" that regulate the organization of cortical movements rather than differences in visualization (Rizzolatti and Sinigaglia: 134).

This principle held *within* humans also. Scanning showed that the mirror neurons of dancers responded most strongly to observations of the dance steps they routinely used rather than those they had not actually learned. Once again, in all these studies, the activity of mirror neurons corresponded to observations within the observer's behavioral repertoire instead of the purely visual similarities and differences in activity. In conclusion the pragmatic priority of action in acts of perception seems alive and well in these studies.

Thinking as Internal Conversation and Motor Process

The extra-sensory nature of symbolic communication is often mistakenly seen to imply an antithetical divide between mind and body. Antonio Damasio called this divide "Descartes' error" and made it the title of his ground-breaking book (Damasio 1994). The Chicago pragmatist movement of which Mead was a part opposed the otherworldliness of reason, soul, and mind that created this unproductive dualism (Morris in Mead 1934). Their tactic was to view mind and reason as an emergent from earthly human conduct and activity. Make no mistake: the *products* of the human mind and language are indeed intangible and extra-sensory. We never actually see space or time. When we look down the hill what we see are trees and grass as well as our very concrete dog chasing squirrels, but we do not literally see *space* – not even when things seem far away. To ask to put time in front of us so we can see it, feel it, and hear it is either the request of an unrequited poet or that of a madman. Likewise, the human ability to think in terms of "redness" per se, unattached to any actual red object is known as the capacity to think in terms of "universals." Redness, being mentally abstracted from any concrete example of an object that possesses it, does not hover about independent of immediately perceived objects. It has no tangible existence of its own except to the human mind. On the other hand, it does allow us to creatively mix red and green to get brown. While particular material objects take up time and space and thus resist our push, intangible universals being ideas, do not. Noting this difference, the Greek philosophers placed the source of the universals in the heavenly spheres as perfect and unchanging "eternal forms" which created the hiatus between mind and body – given sensation that has obstructed thought since their time.

To the Chicago pragmatists the *products* of human thought and language were clearly universals – every word represents a general term subsuming all real instances. However, as we have seen, the *process* of linguistic thought was actually behavioral, i.e., human motor conduct. Indeed as Smith (1979) reminded us, "a number of experiments have documented Mead's claim that linguistic activities involve covert, oral responses." Mead's suggestion that we view mental activity as the behavior involved in internal conversation has received support from a number of studies showing that mathematical and verbal problem solving is accompanied with covert oral *movement* of the tongue and lips. As early as 1937, Max reported that problem solving among the deaf, who use American Sign Language to communicate with their hands, was likewise accompanied with subliminal movements of their fingers. These admittedly correlational findings from so long ago are not mentioned in the current mirror neuron literature, but they clearly presaged what was coming. At the time it was enough to the followers of Chicago Pragmatism that this confirmed the high *association* between thought and language seen as motor process and internal conversation. Very recently these conclusions from the 1930s have been confirmed and significantly refined by studies involving fMRIs and most importantly by Transcranial Magnetic Stimulation studies. The latter can deactivate the cortical area representing the "independent variable" by electric pulses from a coil put over the subject's head. This can help determine whether a specific cortical area is a necessary part of the process leading to the dependent variable – in this case language comprehension (see Iacoboni 2008: 54–55). These studies conclude that hearing or reading words associated with the movement of particular body parts such as lick, kick, or pick are simulated in those respective parts of the primary motor cortex that activate respective movement in the tongue, feet, or fingers (Fig. 5.1).

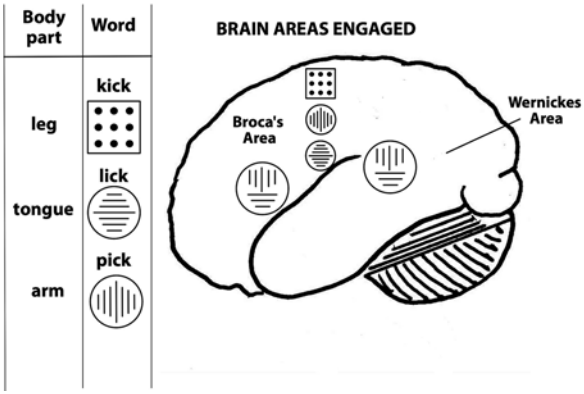

Fig. 5.1 Areas of motor cortex engaged by the meaning of words involving these actions

These findings mean that much more than Broca's and Wernicke's area are involved in processing words related to actions.[1] That is, the same brain area used to make a particular body movement is also involved in the process of *giving meaning* to words semantically related to that body part (see also Hauk and Pulvermuller 2004). de Lafuente and Romo (2004) also conclude that "The very same motor cortex that subjects used to move their feet and fingers is activated by reading words relating to their movement."

Even more recently there is evidence that watching hand movements activates the primary somatosensory cortex, and while this is different from reading, it at least hints at the involvement of the sensory cortex in the enablement of semantic

[1]Broca's area is to the rear of the prefrontal lobes and in front of the temporal lobes usually in the left hemisphere (see area 45 in Figure). It enables the production of speech and mirror neurons probably contain 20% of its total neurons. Wernicke's area is important for the understanding of speech and is also usually in the left hemisphere at the upper end of the temporal lobe. Patients with damage in this area can speak but only slowly and in meaningless "word salads." Both areas are connected to each other and to the motor cortex.

meaning. Both cortices face each other directly and have homunculi that are somatotopically organized. In the premotor cortex, the “mapping space” granted to a body part depends on the amount of *control* the cortex has over it (Fig. 5.2).

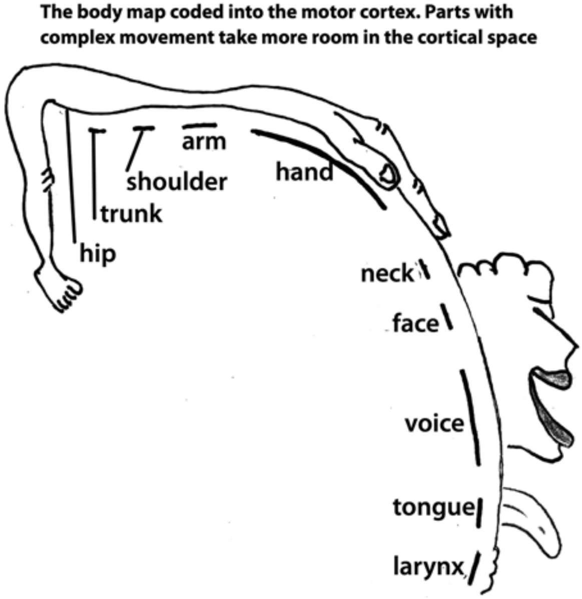

Fig. 5.2 Primary motor cortex

In the sensory cortex the amount of space given to a body part depends on its *sensitivity* to stimulation. In sum, these findings confirm the direct involvement of premotor cortical areas in speech perception. We now know that the premotor and motor cortices are associated in significant ways to Broca’s and Wernicke’s areas in language production and comprehension.[2]

Manual Gestures as Precursors to Language. We now have a link by which we can relate foundational symbolic interaction to the neuroscience work above on mirror neurons. Both frameworks view human language evolutionarily as arising from such communicative, essentially manual, gestures. To Mead, gestures referred to the beginnings of acts that imply their later stages. They evoke adjustments in the behavior of others, which are further adjusted to by the observer, and this goes on back and forth in what Mead called a “conversation of gestures.” Most animals are unself-consciously expressive and do not have the other’s response in mind when they make gestures. However, linguistic human beings can self-consciously incorporate the imagined responses of others into their further conduct to form and guide

[2]See//talking brains.blogspot.com/2008/09/right-motor-cortex-lesions-cause–verb.html for lesion studies about this issue and what kind of evidence is needed for satisfactory closure on the causal modeling of language comprehension and brain anatomy.

their lines of social action. As such, gestures play an anticipatory role in social interaction.[3] The advantage of this for coordinated social activity is obvious. The glance of an eye, our bodily posture, or a loving or disdainful glance can reveal more than words can convey.

NcNeill (1992), as mentioned in Iacoboni (2008), argues that gestures and language are a part of one system. He sees hand gestures as windows to our thought processes and views the movement of our hands as intimately associated with the mental manipulation of our worlds (see also Lambert 2008: 69 and 75). Gestures have an important dual function in aiding speakers in expressing their thoughts and aiding viewers in understanding what they are hearing. Congenitally blind persons, who have never seen human gestures, nonetheless make motor movements when they talk, suggesting how integral a part of language such gestures are. People gesture on the phone with no one to see.

Gestures as Precursors to Language. Gestures are as much a part of language as are words, phrases, and grammar according to Iacoboni who surveys the studies showing that gestures actually precede speech in language development and that mirror neurons are probably critical in this as well as in the evolution of language in *Homo sapiens* (Iacoboni 2008: 83–87).

There are two types of gestures. One type (beat gestures) has mostly to do with bodily rhythm which makes speaking easier to the speaker but does not aid in communicating any particular point. The second type (iconic gestures) reflects or embellishes some specific point being communicated like rolling your eyes in impatience or shaking a finger at someone to express disapproval. The latter is much more important to effective communication. According to fMRI data, mirror neurons activate more intensely during the observation of gestures that are iconic and are expressed in face-to-face communication.

We are so used to connecting speech with intangible symbols that it is hard for sociologists to see the connection of motor movements of the mouth and hands to such "airy" constructs. Again, it may be helpful to start with the correlation between internal symbolic conversation and motor movements of the mouth, tongue, and larynx. It will also help to remember that any physical gesture involves motor activity and thus, the motor cortex. How do motor neurons enter into this connection?

Anyone who has the slightest familiarity with infant behavior knows that as soon as the infant learns to grasp objects with their hands, these hands carry the objects straight into their mouths. Going unnoticed by most observers is that the mouth opens before the hand reaches it. This is clearly an act of anticipation and an indication of goal-directed behavior. Other systematic relations between hand and mouth given by Iacoboni (2008:85) include the extension of the infant's index finger occurring with the opening of the mouth and even vocalization. If one applies pressure

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[3]For Mead the advantages of rooting language in gestures were that they are by definition observable and reflected motor behavior. An even more profound advantage was that dualism could be avoided by using behavior to replace thought and sensation as the basic link between the knower and the known. In this way the difficulties which have been created by having to make an either/or decision between mind and sensation as linkages to known objects were no longer necessary

to a newborn's hand, the infant will open its mouth suggesting that these two body parts belong to a common functional system even if they are far apart.

In individual language development, pointing combined with words like "give" occur earlier than word combinations like "give apple." Gestures lead, Iacoboni says, speech follows. This sequence is also implied by the fact that the amount of communicative gestures used by infants predicts whether "late talkers" are simply "late bloomers" or truly delayed in development.

No discussion of the importance of gestures in language evolution would be complete without attention to the spontaneous development of language among two groups of deaf children in Nicaraguan schools. Before 1970 the groups had been largely isolated from other deaf children and used simple gestures and ad hoc signs to communicate in very limited fashions. Between 1970 and 1980 the two groups were brought together in schools where they could interact. As it turned out, this grouping produced a critical mass for the development of a true, indigenous sign language. Combining signs from their individual communication systems, they progressively created a shared language containing a rudimentary grammar. Later, younger children who were taught this gestural language by the older children developed a more sophisticated, full-blown sign language (Iacoboni 2008: 98). To some like Steven Pinker (1994) this is evidence for a specific language instinct. However, Iacoboni argues that it demonstrates how signs can assume specific meanings determined by tacit, mutual consensus aided by mirror neurons. Certainly this explanation gives more specificity than the general word instinct or the phrase "hard-wiring" which offers no further detail about the actual processes involved. Later we will return to describing how mirror neurons contribute to spoken language and detailing how mirror neurons help imitate and perceive sounds. Hopefully enough has been said at this point to show the power of manual gestures as worthy precursors to vocal language. Iacoboni feels that mirror neurons are probably the critical brain cells in language development and language evolution.

Cognition as Embodied. Evidence for the link between motor behavior, mirror neurons, and language development also comes from the work of Patricia Greenfield and Istvan Molnar-Szakacs (Iacoboni 2008: 278). In an experiment with Iacoboni, Greenfield observed children playing with various objects. Sometimes their motor manipulations involved patterned sequences like placing smaller objects in bigger objects following the hierarchical order of their sizes. At other times their handling of playthings followed no discernable sequence or structure. If mirror neurons respond to the manipulation of objects only and are neutral to the abstract organization of activities like patterned sequences, they should be indifferent to such structure. If mirror neurons link motor behavior to language in any significant way, they should respond with increased activity when structured motor play is involved. This is because language and syntax clearly reflects structure. As it turned out, Molnar-Szakacs found that mirror neurons responded more strongly to watching manipulations that followed a hierarchical structure implying that mirror neurons may also code the structure of activities in other domains like language and, significantly, imitation. What we imitate after all, is the syntactical structures of each other's conversations. Broca's area was found to be essential for the motor cortex activity in the above studies and thus by implication Broca's area could well be involved in imitation as well as language production.

These findings and others like them seriously challenged the popular notion that mind was like a computer manipulating abstract symbols on the basis of some purified logic and computations divorced from the body and motor behavior. The discovery of mirror neurons and the repeated contribution of the premotor cortex to understanding other's actions helped overcome this mind–body split and introduced the idea of embodied cognition and a view of language known as embodied semantics. Converging on this view is the work of Lakoff and Johnson culminating in their *Philosophy in the Flesh* (1999) with its seminal challenge to analytical philosophy. They see the source of cognition's link with the body in terms of metaphors taken from the human experience with motor behavior ("do you grasp what I'm saying," "am I talking over your head," etc.) These metaphors give intelligibility as well as intersubjectivity, much as mirror neurons do.

Mirror Neurons, Imitation, and Speech. Actions frequently produce sounds. TMS (transcranial magnetic stimulation)-aided imaging has found that human mirror neurons respond vigorously to sounds that are associated with actions such as those stemming from scratching, tearing paper, and typing on a keyboard as I am doing now. These sounds contrast with others such as the hum of the refrigerator or furnace. Human speech is a clear example of human intentional action and one would expect that the presence of mirror neuron activation would be strongly present here. While TMS-aided imaging has been found this to be true, there is more to it than that and this "more" points once again to the priority of motor behavior and the motor cortex. Clearly we listen with our ears but we *understand* with our mirror neurons, that is, by simulating what we hear in that part of the motor cortex which activates the tongue. We do not merely record sounds, but speak them to ourselves unconsciously in the motor cortex.

This conclusion resulted from work done on mechanical devices to transform printed texts to sound so war veterans who had lost their sight could nonetheless "read." While the machine was successful in creating the appropriate sounds, the problem was found to be in the perceptive mechanisms of the veterans specifically, it took them an unacceptably longtime to perceive the machine's sounds. The researchers were led by this to propose that we perceive speech not so much as sounds directly through our ears, but more indirectly through making the same speech movements ourselves in the motor cortex – that is, as "articulatory gestures – the intended motor plans necessary to speak." (Iacoboni 2008:103). Once again, as Damasio wrote in *Descarte's Error* (1994:225), "Perception is more involved in action than we think. Perceiving is as much about acting on the environment as it is about receiving signals from it."

In order to test this "motor theory of speech perception" Fadiga et al. (1995) had subjects listen to words through earphones; some words involved strong tongue movements and others required slight tongue movements. The prediction was that listening to the words with strong tongue movements would make the motor cortex produce stronger muscle movements in the listener's tongues than listening to the softer sounds in words. This is precisely what was found. Subjects in other studies spoke a series of syllables out loud and then listened to others speaking the same syllables. The same speech motor area of the motor cortex was activated during speaking as was activated during listening in every subject. Listening to talk involves doing the talk and this means the presence of mirror neurons. In short, perception of speech is enabled – at least in part – by a process that simulates speech.

The story does not stop here, however. Mirror neurons are closely associated with imitation (see Chapter 9). There are two major reasons for our superior imitation capacities. One is that our mirror neuron system is simply more robust than in other primates. The other is that we can enlist cognitive areas of the prefrontal lobe both to facilitate and to restrain our imitating capacities. This control area is very near Broca's area. This area enables us to produce speech and is tangential to major mirror neuron circuits. The importance of this control mechanism in humans is made clear by patients with extensive lesions in the frontal lobes who have difficulty stopping themselves from imitating the words and other acts of persons immediately in front of them. This disorder is referred to as "echopraxia" and testifies dramatically to the power of our mirror neural circuits and why they must be controlled. *From Sound to Meaning or Is It?* One challenge in relating mirror neurons to human language involves understanding the process of how we get from imitating what can be seen to automatically simulating and thus, imitating what can be heard, and finally from hearing to grasping the meaning of what is heard. We have discussed the neural circuits making possible simulating visual gestures of the hand, face, and body posture and enabling the simulation of the sounds of spoken language. We have described indirect evidence that gesture is intimately involved in language and could well have preceded its development. So far, however, the final step in how we get from simulating motor movement to more abstract, intangible human meaning has been harder even if there have been significant leads suggested by the findings of Greenfield, Iacoboni, and Molnar-Szakacs.

While visualization of gesturers is transparent and has to do with the observation of objects, the simulation of sounds and their meanings in the motor cortex of listeners is opaque. Thus, the links between linguistic sounds, mirror neurons in the motor cortex, imitation, and semiotics are more elusive. Yet these causal connections must be made if mirror neurons are an important part of the process of learning language and developing commonality in meaning between transmitter and receiver. In sum, it still boils down to how we get from imitating visual gestures to imitating the meaningful speech of others.

Understanding this critical transition is aided by noting that Broca's speech production area contains neurons that mirror hand gestures, facial gestures (especially the mouth), and motor neurons that simulate the movements of the throat. Whether this originates in Broca's area or the premotor cortex is not clear to me. However, we do know that the development of speech communication did not evolve from a single motor capacity but from the progressive integration of three modalities: facial, brachio-manual (arm – hand connection), and vocal gestures accompanied by their respective mirror neuron systems and the adjacent primary motor cortex. As Corballis (2002) has told us: "the origins of language are not to be found in the mouth alone but in the hand, and their mutual interaction." We have seen how important bodily gestures are in facilitating vocal speech. This is reflected in archeological findings that the cavities needed to house mirror neurons in the skulls of *Homo habilis* two million years ago were already strongly developed. Circuits controlling voice and handedness are still tightly connected and that handedness can lead easily to vocal capacity (Rizzolatti and Sinigalia 2008: 165).[4]

In one study relating hand to mouth, participants were asked to hold objects of different sizes in their mouths while opening their right hands at the same time. When the largest objects were held in the mouth, the hands of the participants opened widest. Participants were then asked to open their mouths in the same way at all times while their hands moved to various sized objects. In spite of the instructions to open their mouths the same way, subject's mouths opened wider when their hands were grasping larger objects. Clinical studies also verify this close connection between hand and mouth. Over time then, hand gestures may give way to verbal gestures but the evidence for this certainly is not conclusive. Pointing to objects on a screen helps aphasics in verbally naming tasks; the use of manual gestures helps patients recover speech. Just when the vocal system split from the gestural one in evolutionary time is of course a matter of debate but whatever happened it was probably a very late development and had to involve the transformation of verbal sounds into corresponding simulations in the oro-laryngeal part of the motor cortex. The discovery of a recently developed mirror neuron system, referred to as the *echo-mirror neuron system*, constituted evidence that this actually came about (Rizzolatti and Sinigalia 2008:168).

Iacoboni also discusses how inconvenient it would be if we imitated all actions we observe around us. Obviously we must be selective in what we mirror in order to adapt to the constraints of society and this implies some high-level mechanism for cognitive control and modulation of classical mirror neurons. Iacoboni refers to these as "super mirror neurons" and locates them in three brain regions: the orbit frontal cortex, the anterior cingulate cortex, and the presupplemental motor area.

The latter area puts simple actions together into more complex motor sequences and is important in some of the more complex forms of human imitation.

Returning to the simulation of sound in throat muscles, it seems apparent in light of the above that understanding speech clearly depends on simulating tongue movements making up the observer's speech movements. How we get from the simulation of motor movement to the understanding given by intangible symbols is yet to be known, even though super mirror neurons code for the *logical analogies* observed in action. Some cells, for example, fire not for the same observed and executed action but for *logically related* ones, such as putting food on the table and putting it into one's mouth (Iacoboni 2008: 201).

With the exceptions of the transcranial magnetic stimulation studies we are still dealing with correlations and however reliable these correlations may be, we are still in the dark as to the final link between mind or semiotics and motor movement. It

[4] Gentilucci et al. (2001) also found this relationship between hand and mouth movements.

is important to note another step: such simulation is imitation and human imitation depends on *understanding* the purpose of the movements. It would appear that at the end of the semiotic process this understanding no longer is biology but becomes *verstehen*. This seems to be as far as we can go, but it is not closure. We meet this end point time and again in brain research and it goes by the name of the mind–body problem. There is always an irreducible gap in the causal chain when dealing with biological explanations of conscious experience.

Mirror Neurons and Emotion

If mirror neurons have any thing to do with emotions, which they certainly do, it would stand to reason that they would have a great deal to do with empathy. We have already seen that we feel for others through "as-if-loops," a phrase first coined by Damasio. It is impressively common that parents and lovers genuinely feel that they would rather go through the pain of their loved ones themselves than watch them bear it. Evidence for the strong link between mirror neurons and empathy comes from studies of brain imaging, work with brain-damaged patients, and studies involving electrodes implanted in patients. According to Iacoboni (2008: 124) there are also strong connections between motor mimicry, capacity to imitate, perception of facial expressions, and the ability to read emotion in others. Consistent with what we know about mirror neurons and language, it seems that motor mimicry by the observer is *prior* to the conscious identification of emotions in others. "…mimicry actually precedes and helps recognition"(Iacoboni 2008:111). This causative reversal is implied by studies where participants are made to hold pencils in their teeth, which severely impaired their subliminal ability to mimic the expressions of others with their face muscles. These subjects were very poor at identifying changes in affective facial expressions compared to subjects whose face muscles were free to imitate the observed expression. Iacoboni deduces from this that persons who can imitate others' facial expressions also tend to have more positive feelings about them than observers who cannot. Once again, we see the familiar pattern where simulations in the motor cortex are associated with human connection. This implies a strong link between mirror neurons, the motor cortex, and the limbic system so associated with emotion.

The intermediate brain area linking the mirror neuron system and the limbic system is the insular, which is a large, complex, and multifunctioning area strongly connected with many other brain areas. It lies deep with in the front part of the temporal lobes and because it is so inaccessible neuroscientists had to wait for the development of fMRI to investigate it. While the anterior part of the insular is related to emotion, the posterior part is related to the motor cortex. The insular is the area that Damasio (1999) found critical in mapping visceral states associated with emotion and giving rise to conscious bodily feelings in the manner originally described by William James. It played a predominant part in Damasio's (1994) somatic-marker hypothesis stating that decision-making depended on input from the body. Without an emotional predisposition, one is left endlessly thinking of alternatives giving everything equal weight whether they are relevant or not.

It is the insular that puts the body into our conscious lives. In the frontal insular, body states are recast as social emotions. Without bodily feelings, fear, lust, anger are oxymorons. The insular puts the bodily feeling into emotion and thus, it could be said that it unites mind and body. It is this bodily input that produces the compelling quality which characterizes love and hate or drives us against our will into cravings for drugs, food or affection, and addictions as well. We could not cry without an insular.

The emotion of disgust has been relatively well researched in terms of mirror neurons. "Experiencing disgust and perceiving it in others appear . . .to have a common neural base constituted by the back of the left insular and the cingulated cortex of the right hemisphere" (Rizzolati and Sinigalia 2008:184). Sounds of other people's retching which usually make persons feel sick themselves, have no meaning for patients without functioning insulars. Rotten food that would make others throw up can be ingested by these patients with no problem and there is no ability to recognize expressions of aversion in others. In these cases, understanding disgust in others is not based on inferential or cognitive processes, but on the fact that we are directly and automatically experiencing the same thing in ourselves which we are observing in others (Rizzolatti and Singalia 2008: 181–182).

The insular's importance in linking the mirror neuron system and the emotional/limbic system holds true not only for disgust but also for emotion in general. Iacoboni's fMRI studies showed a strong simultaneous increase in activation between these areas when subjects were subliminally imitating other's emotional expression. The part of the limbic system which stood out in this activation was the amygdala, which is not altogether surprising given its well-known sensitivity to faces and their gestures.

Any part of the brain which brings the body into human consciousness should be closely involved with pain. In 1999 William Hutcheson et al. found single neurons in the anterior part of the cingulated cortex which responded to both a pin pricking a patient's hand and the patient's observation of others being pricked by a pin. This same situation was repeated with electric shocks instead of pins. In both conditions, parts of the anterior insular and the cingulated cortex became active showing that both direct suffering and its evocation in others are mediated by a mirror neuron mechanism similar to that demonstrated for disgust.

Conclusion

Compared to the complexity of the links between mirror neurons and language, those between mirror neurons, emotion, and human connectivity are relatively straightforward. We need to recognize, however, that we can also be linked together in social relations by emotions of hatred, fear, and rebellion. Empathy clearly is not the whole story of human connection, we must also recognize that the frequency of *Homo sapiens*' decidedly unempathetic behavior toward his own kind. Without mirror neurons there could be no sadism. We are quite capable of knowing by means of our "as-if-loops" that someone is in pain without feeling sympathy with them. Thus, the visceral feeling compelling the recognition of pain given through mirror neurons is not sufficient for the occurrence of sympathy or compassion and depends on many relational and cognitive factors other than mirror neurons. Iacoboni (2008: 268) discusses this issue and notes that the same processes that encourage empathy can also mirror less desirable behaviors like those stemming from mirroring violence on television as well as real life. Mirror neurons, he says, are also involved in addictions. But this is unsatisfactory in explaining man's cruelty to man. Iacoboni at least broaches the issue and makes reference to how cultural beliefs can overpower the processes leading to empathy. However, he is silent about the possible relevancy of super mirror neurons in the explanation of why we so often fail to empathize with others. Super mirror neurons are not super in the sense of increasing simulation or feeling. They are super in the sense that they are control mechanisms determining when to empathize and when not to empathize. They add a strictly cognitive component to the process and draw on social constructions which can rationalize concentration camps, blaming the victim, justify genocide, and concoct the myriad of ways we have of demeaning each other's humanity. In fact, a person trained into a harsh macho stance intolerant of any show of weakness will very likely react with violent disdain at another man's "whimpering." The perpetuator's unconscious simulation of a victim's cries in this context could well evoke a reaction formation resulting in even more extreme hostility. There is little doubt that mirror neurons attest to our deep connectivity, but much more than is also going on and we need more attention to the relationship between empathetic and non-empathetic processes. If emotion organizes the brain and creates priorities as LeDoux suggests (1996), the brain's massive motor system would have to rank a close second. That system is highly complex, functionally incorporating cognition, sensation, perception, and motor activity – i.e., all the processes involved in perception as well as motor activity. Structurally, its complexity is reflected by the different brain areas shown in Fig. 5.1.

The priority given motor behavior by mirror neurons provides an intimate connection between current work on mirror neurons and the earlier American pragmatists. This has been a major theme throughout these pages. This connection becomes clearest perhaps, in the concept of affordances and how the meaning of an object lies in its "action possibilities," This emphasizes that the activity of the hand controls vision and vice versa. Now we know that the neurons in Broca's area *transform* the visualized object in terms of the actions it affords the hands and gives it a meaning that pure visualization (whatever that might be) could not. These neurons then are responding to what actions (and intentions) the object makes possible rather than its mere sensory aspect. The authors add that these neurons are responding to behavioral meaning, which is precisely what one means by *understanding*.

We have seen that the same brain area which we use to make a particular body movement is involved in the process of giving meaning to words that are related to that anatomical part.

These findings have given detail and substance to a view of language that no longer separates it from our bodies. They suggest that the brain anatomy supporting language is not localized in Broca's and Wernicke's areas alone but involves widely distributed motor areas contributing to various aspects of motor activity. As we have seen, these areas contain a massive part of our brain that is differentially activated according to the semantic content of the word such as lick, kick, or prick. How the brain constructs our understanding of more abstract concepts is still an open question, but we have reviewed some progress even in this area. We do have facts. Remember the findings that super mirror neurons fired for *logically* related events like putting food on the table and putting it into one's mouth and that children's neurons fired more when engaged in making sequential patterns with their toy blocks.

Granted, all we have at present concerning the link between mirror neurons and language production and comprehension are reasonable clues, but we currently have enough information to stop and take stock of what we have to date. That has been the intent of this chapter.

Despite the lack of closure and our difficulties in securing causation, we can say that comprehension, understanding, and intersubjectivity have been dislodged from the airy realm of pure symbols where any event can be "spun" in any manner into a firmer behavioral world of real success and failures (see Mead on this point, 1934:74). While lawyers can argue that water boarding and torture mean different things, the behavioral world to which our symbols respond is not so arbitrary. The avalanche rumbles down on prince and pauper alike oblivious to their fervent prayers. With all the powers of the symbols that can be used to make nature submit to us, and in spite of our constant interpretations of its ways, the behavioral world is not as open to debate – at least not in brain science. In the vast majority of cases we cannot use the stem of a daisy for a nail, at least not if we intend to pierce wood with it. The most extreme cases of power and arrogance are brought down not by others so much as by their holders' own inability to face social and non-social "realities." With all our constant interpretations, we live in real worlds – of real actions and real consequences (Lyng and Franks 2002). Our brains and their mirror neurons seem constituted to respect this fact.

Lakoff and Johnson (1999: 3) have argued that analytic and postmodernist philosophies have ignored three basic facts about the brain and thus lack firm grounding. These facts are that (1) mind is inherently embodied; (2) thought is mostly unconscious; and (3) abstract thoughts are largely (not totally) constructed from metaphors taken from our behavioral worlds. Hopefully symbolic interaction, with its solid roots in pragmatism so compatible with current knowledge of our brains, will not be vulnerable to the same critiques of analytic and postmodern philosophy (Fig. 5.3).

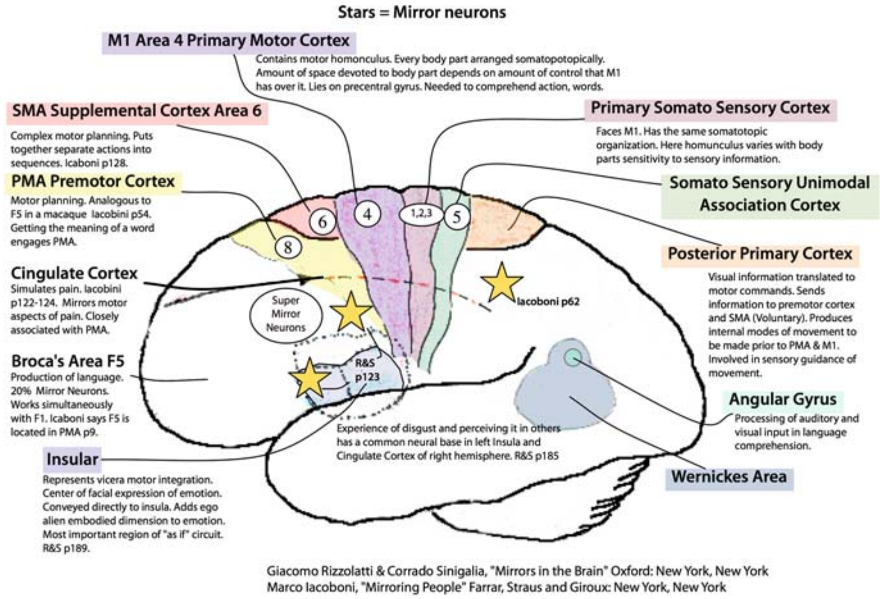

Fig. 5.3 Mirror neurons and motor areas of the brain

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Chapter 6
The Neuroscience of Emotion and Its Relation to Cognition

Thought by itself moves nothing (Socrates as quoted by Irwin 2007:161)

In recent years an appreciation for the emotional dimension of life has asserted itself in all of the major disciplines of the liberal arts. There is a good reason for this. While the dangers of passion are well known to all, this chapter will demonstrate neuroscience's contributions toward making the case for the necessity of emotion for effective cognition. As Socrates implies above, cognition alone and by itself lacks the capacity to move us to action or to grant a critical component to understandings and "realizations" that only experience can give. While an emotionally distanced attitude may be essential to science, as Scheffler (1982) observed, even the notion of the un-emotional scientist is incomplete. One can be passionately devoted to objectivity. If the "unexamined life is not worth living" certainly experience without emotion is pathologically empty.

One of the mnoost important contributions of neuroscience established in this chapter is that the brain can know the emotional quality of an object or an event before cognition and consciousness enter the scene. I will present the neurological pathways which contribute to this because the finding is so counterintuitive. Although this emotional appraisal may be outside of our awareness and lived experience, it has an enormous impact on the cognitive course of that experience.

We shall see that perspectives as different as philosophy, and artificial intelligence and neuroscience converge in recognizing the necessity of emotion for rational decision-making, bringing together two processes once viewed as diametrically opposed. This is only one of the fascinating examples of the capacity of neuroscience to penetrate the boundaries of academic divisions.

This chapter will also address one of the most contentious problems in neuroscience – that of clearly articulating the senses in which cognition and emotion emerge from separate pathways of the brain and the senses in which they are intertwined and inseparable. Evaluating this issue is still a challenge to the field of neuroscience and it is especially difficult for sociologists who are looking from the outside in. It is important nonetheless, for sociologists to become acquainted with the complexities of the issue and its various positions.

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There are many examples which suggest the ways in which the varied fields can be compatible. For example, many involved in genetics have come to appreciate the importance of the environment even as sociologists have recognized the importance of genes, although their effect on social activity is highly qualified. Neuroscientists have recognized the importance of self and the social nature of the brain, while sociologists have become interested in mirror neurons and their place in the development of language.

The Distinction between Unconscious Emotion and Conscious Feeling. In neuroscience this is evident in the reversal of the common sense notion of emotion. The traditional view put forward independently by William James and Carl Lange starts with something happening to trigger emotion. For example, losing someone we love or being insulted produces emotions like sorrow or simple anger, respectively, and these emotions lead us to weep or take steps to avenge the insult. The James–Lange "specificity theory" reversed this old four-stage order: (trigger, perception, emotion, and emotional expression). James and Lange suggested a process with only three stages (1) We get insulted; (2) We perceive it as such, and (3) This makes us angry and at the very same time, the body produces objectively measurable events in terms of physiological changes that we simultaneously experience consciously. These bodily changes (expressions) *are* the emotion. Here emotion does not cause the following behavior assumed in stage three of the old model because the behavior is the same thing as the emotion, i.e., the last stages of the commonsense model are collapsed into one (Fig. 6.1).

This perspective placed emotion solidly in human consciousness even if it was due to being conscious of one's bodily reaction. The key to emotions was the consciousness of our physiological reaction. James' classic example of fear has been often quoted:

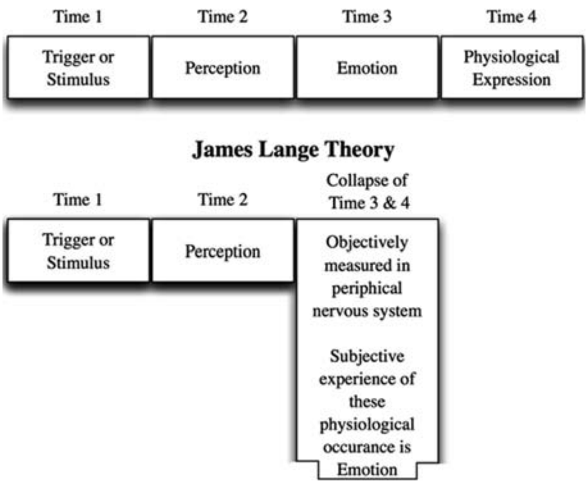

Fig. 6.1 Common sense notion of emotion

> I cannot help thinking that all who rightly apprehend this problem will agree with the proposition laid down. What kind of emotion of fear would be left, if the feelings of quickened heart- beats nor of shallow breathing, neither trembling lips nor of weakened limbs, neither of trembling goose flesh nor visceral stirring, were not present, it is quite impossible to think (James 1884: 193–194).

The ends up meaning that instead of crying because we are sad, we are sad because we cry, mirthful because we laugh, angry because we tense up and fearful, because we shake. This means that the physiological reaction to the stimulus is at the same time the emotion. The emotion here is conscious feeling of bodily reactions.

The James–Lange theory inspired a great deal of critical work over the early years of the twentieth century until it was finally accepted that at least parts of the theory seemed valid – namely that the bodily responses which are the emotion are shaped at least somewhat by the facial expressions they produce. There is significant evidence that we can sometimes transform our emotions if we are able to smile when we least feel like it. The result may not be large and completely reliable, but the effect of facial expression of emotion cannot be ignored, as many actors know. Cornelius (1996:101) says, "where the face goes the emotion follows." This conclusion came after the development of highly technical techniques that measure what goes on inside of the body during emotional experiences. Facial expressions of emotion seemed to accelerate that emotion, at least for some of them according to Cornelius (1996). As the lover in a parked car professes how he would travel the ends of earth to be close to the woman he embraces, he may or may not be successful in convincing the woman, but there is one person whom we *know* is turned on the more he professes his feelings and that one person is himself. Ekman and Davidson (1994) found significant increases in heart rate for the facial expressions of fear, anger, and happiness while anger increased most of all. Facial expressions of disgust produced a decrease in heart rate. No doubt this is why verbal assault so frequently precedes physical assault.

In a complete reversal of William James, current neuroscience differentiates emotion from feelings and often places emotion as essentially unconscious. Damasio (2003:19) argues that feelings are critical for the same reasons as sociologists do. It is only through what Wentworth and Ryan (1992) calls the "limbic glow" that emotion puts the *imperative* into duties, the *ought* into morality, and the *sting* into conscience. It is the "ego-alien" feeling of guilt, shame, and embarrassment that produce social order and give persons their own private reasons for avoiding these sanctions. People do not avoid these feelings so much for the sake of others but for their own sakes because they are profoundly uncomfortable. But the fact that feelings are conscious and vital does not mean they are "first" in a "causative" sense. According to Damasio, emotions, which are unconscious, are first and cause conscious feelings later.

Damasio (2003: 67–78) demonstrates this point by a patient who was a woman of 65 years with a long record of Parkinson's disease and was being treated with an electrical brain stimulation. She had no experience of depression. The doctors found that when they passed an electric current through the mesencephalon 2 mm below the contact that relieved her condition, the subject immediately stopped her conversation and was overcome with sadness. Suddenly she began to cry. She was in profound misery, and as her sobbing continued she began to say that she did not want to live and she was fed up with life. She continued saying that she felt useless and unworthy of attention. Realizing this, the doctor stopped the current and in 90 s she returned to normal. Her facial expression and words stopped as quickly as they began. According to Damasio (2003:69) "There were no conscious thoughts whatsoever to induce her behavior.... The display of sadness, in all of its spectacular complexity, came truly out of nowhere." The evidence, Damasio says, reveals first that the neural trigger of emotion was completely independent of conscious appraisal and second the dependence of conscious feeling and thought on emotion. What initiated the whole process had nothing to do with her consciousness at the very point of the electric stimulation (pure emotion). This was certainly embodied, but it was not caused by her thought, conscious, or unconscious. "Emotions come first and conscious feelings come after." (Damasio 2003: 29,101, 111). He also details other research that implies the same sequence.

Damasio also describes a phenomenon equivalent to the above except it was for laughter. This also involved a person undergoing brain stimulation. The purpose here was to locate precisely the area of the brain that needed to be removed to control seizures; but it was also necessary to know what nearby areas were essential to the patient so the surgeons could avoid injury. When they began to stimulate their target they noted that such stimulation at a number of related sites consistently and exclusively produced laughter. Like the lady's depression, this came totally out of the blue. The patient was not being told any thing funny nor was there anything that others saw as funny in the room. The laughter was followed by a sensation of merriment in spite of its involuntary character.

These two examples lead Damasio to collect other examples of emotion preceding thought. This was a significant challenge to cognitive psychology, philosophy, and sociology. And especially symbolic interaction all of which had insisted that linguistic appraisal directed emotion.

Why would Damasio insist on the causal position that the emotions came first? His first answer was that "We have emotions first and feelings after because evolution came up with emotions first and feelings latter" (Damasio 2003: 30). The earliest organisms maintained life with ways of solving the basic problems of life automatically. As these survival mechanisms get more complex, we finally have an animal with emotion. All organisms must successfully seek forms of energy, then a chemical balance must be maintained within the body, and finally the organism must develop immunity to disease and injury. This is what is meant by homeostasis. As we come to the animals with the most complex regulations from basic reflexes to drives and motivation, we finally come to animals with emotion. In an evolutionary perspective feelings are just "icing on the cake," but for conscious human beings this is a very important icing as Wentworth and Ryan (1992) and others knew. It follows than, that emotions and feeling are not synonyms. According to Damasio (2003: 86) "Feeling is the perception of a certain state of the body along with the perception of a certain mode of thinking and of thoughts with certain themes." As such they are at the top levels of the homeostatic regulation from simple to complex. We have seen that Damasio insisted that the critical characteristic of true emotion as part of producing homeostasis was its automatic and involuntary character. For Damasio the measurements indicating emotion were objective and arose from the body. They included (1) heart rate, (2) blood pressure, (3) skin conductance, and (4) endocrine responses, all of which are outside of our awareness.

Damasio's first real experiment demonstrating that emotions come first and thought afterward was inadvertently found in a study of the neural mappings of feeling. Somewhat like James, the hypothesis was that various signals from the brain mapped the physiological state of the body. Damasio's team had 40 normal subjects split evenly between genders. They told these normal subjects that they were studying patterns of the brain when four emotions were felt: fear, sadness, anger, and happiness. These emotions were measured by the amount of blood flow in multiple brain areas related to emotion. These included nuclei in the back of the brain stem referred to as the tegmentum, the cingulate cortex, and the insular. Normal feelings of emotion depend on the cooperation of all these areas especially the insular.

The areas were measured by blood flow which correlates with the amount of neuronal activity in these areas. Damasio's team asked each subject to pick one of the four emotions that where especially compelling. The researchers asked subjects to think in detail about the episode they chose prior to the experiment. Damasio and his colleagues determined the emotion each subject could relive the best, measuring heart rate and skin conductance. At the moment that they started feeling the emotion they raised their hands. In addition, data were collected on brain activity in all brain areas related to that particular emotion in order to measure changes with the different emotions chosen for each participants. Most important for my point is that changes in skin conductance (the measure for emotion) always came prior to the experienced feeling.

Damasio was not the only one to make this point. A philosopher named Ronald de Sousa (1987) summed up emotion as providing three critical functions. First, emotion sets the agenda of thought. Bureaucrats know that the agenda organizes what will be discussed and that this is a way to maintain power. The second function of emotion is that it sets what is important to us (salience) and thus tells us what we do not have to bother thinking about. Damasio's "prefrontal patients" could never make choices because without priorities everything was equal as an option. Third, emotion is what we see the world in terms of. When in love, a cold rainy day makes you want to cuddle up and when we are depressed music losses its luster and even a sunny day looks bleak and sad. The compelling nature of emotion lead to an understanding of why it is said that emotion drives and organizes the brain (Le Doux 1996). Also understanding emotions and the brain is not a matter of merely learning its separate parts. For many neuroscientists the brain is holistic. What is crucial is the particular interaction of the brain as a whole.

Finally many neuroscientists have agreed with Sperry who said that emotion seen as an emergent is not unrelated to its past. Evolutionarily, recent parts of the brain carry some elements of the old brain with them and new parts work back to affect the old. Lakoff and Johnson, as already noted, see the emergence of the symbolic as a totally new way of communication that is largely (but not wholly) dependent on metaphors that arise from bodily action.

Likewise it is worth repeating that "primitive" parts of the brain do not stay unchanged, but the new changes the old by means of its many neuronal connections.

Gazzaniga on Modulation and Emotion. There are two broad perspectives on the brain's construction – the modular theory and the more holistic network theory. The modular perspective is supported with some qualifications by Gazzaniga (2008). By the term modularity, he means that the brain is organized into relatively independent functioning units that work in parallel with the neocortex. Comprising 75% of the brain, the neocortex is the largest by far of the brain's components (Gazzaniga 1985:4). According to most neuroscientists, the mind does not solve problems in one single way Gazzaniga :147(2008). Certainly, any idea of a unified conscious is wrong even if questions still remain about modules. In fact, in the 1980s these modules were referred to as "an army of idiots" which have to be pulled together in some meaningful way by the left "interpreter" side of the brain. It seems that our brains have neuronal circuits which have developed over time to specialize in particular jobs. Damage to specific parts of the brain produces a lack of functioning in other parts. Currently evolutionary psychologists have proposed the idea of modularity as units of mental processing which evolved in response to selection pressures; however, Gazzaniga (2008) reminds us that "modules are defined by what they do with information, not the information they receive." According to Carter (1999:16), the modules that nestle beneath the corpus callosum are generally known as the limbic system, which is associated with emotion. It is clear, however, that modules are not like isolated units that are stacked up neatly in the brain (Gazzaniga 2008: 127). On the contrary, the electric currents for these modules are widely scattered throughout the brain.[1]

Five modules have been postulated to elicit moral emotions. Gazzaniga offers some reasons why we would not want a world which was completely rational and devoid of emotion. He gives the example of why we leave tips in restaurants to which we will never return. Haidt (2005) makes the point that there are more to emotions than altruism and niceties. Emotions which lead to righteous vengeance, ostracism, and shame are no less a part of the human moral nature and should also be seen as be seen as moral emotions. Emotions can show moral authenticity. Humans are the only animals that cry out of distress and thus we have a tendency to be trusted as such times.

As we know, emotions can overcome pure rationality. For example, despite our current present divorce rates, people still seem eager to get married and lavish a great deal of resources on wedding ceremonies and receptions. A purely rational person with no emotions of social control or fidelity would be very wary of going into partnerships since a purely rational partner like himself would be likely to be

[1] The modular theory of the brain was a creation of evolutionary psychologists and has come under a great deal of criticism. They present modules as being laid down far in the evolutionary past. It is hard to imagine that the human brain has not changed fundamentally in the last 100,000 years or more (See Small 2008).

unfaithful. Emotions generated by this problem according to Gazzaniga (2008:132), as love and trust can lead to marriage and trust leads to partnerships.

Gazzaniga describes five moral modules that are most commonly discussed. I will list only one example since he offers so little evidence for his modular thesis. This is *reciprocity* and needs little elaboration for sociologists. Moral emotions generated by reciprocity are gratitude and a sense of being cheated when one does not receive reciprocation. Christmas cards were sent to a list of people whom the recipients did not know, but most of those receiving cards sent cards back without even asking who the senders were. Although I have not found specific information on the anatomical areas of the brain that can be considered "seats" of these modules, there are hypotheses, however, about areas supporting depression which could be seen as modules. It should be re-emphasized that this is in contrast to a holistic position that places the connections across multiple brain areas.

Mayberg's Work on Brain Areas Especially Related to Depression. According to Dodds (2006) in the mid-1990s, Helen Mayberg and Wayne Drevets, now at NIMH, independently isolated a particular brain area just over the roof of the mouth deep in the older part of the cortex identified as area 25.[2] They were interested in finding ways to curb depression which is characterized by brain under activity, particularly in frontal areas involved in thinking. Early in her career, Mayberg had inserted pace-like electrodes into this spot deep in the cortex. She found that area 25 was a conduit of neural traffic between the "thinking" frontal cortex and the deeper, central brain region associated with emotion. This area is like a gate left open which allowed negative feelings to impact on the frontal cortex. Usually depression is associated with a lack of activity in these parts of the brain. But in her patients, area 25 was particularly over-active. Even though Mayberg did not know how area 25 modulated traffic between these areas, it was obvious that the area was very fundamental to depression.

At the turn of the century, Mayberg's research revealed more. Healthy subjects were asked to think sad thoughts and then were scanned when the tears were flowing. The scanning showed depressed activity in the frontal cortex and a hyperactive area 25. She also found that patients who recovered had increased activity in frontal activity and a calming in area 25. As usual there was a problem of establishing cause based on a correlation. Depression either decreased frontal activity in area 25 or rose from hyperactivity in that area" (Dodds 2006; 173).

In (2004) Mayberg scanned two groups, one going through drug treatment with Paxil and another utilizing cognitive behavioral therapy. The patients receiving Paxil showed the usual pattern when recovering, but the frontal areas of the cognitive behavioral group displayed a calming of area 25 when this group became better. Oddly, the frontal areas exhibited diminished activity instead of the low to high pattern of drug treatment recovering groups. At first this did not make sense, but the

[2]Brodmann's area 25 is in the brain's cerebral cortex and the region called the subgenual cingulate. This is a map of the brain's cytoarchitectural structure used to determine different cellular tissues in the brain and their functions by staining the tissue to distinguish nerve cells.

answer was found in a selective bias in the patients. Successful cognitive behavioral therapy patients showed activity in the frontal area because they were more fit for such treatment, namely because they were busier thinkers by nature which attracted them to this particular therapy. They were already trying to think their way out of their moods. The frontal areas could relax when they started to come out of the depression. Regardless of these differences, area 25 was overly busy in all types of depression and was calmed as treatment became effective. Starting in 2003 Mayberg and her team inserted electrodes in area 25 in severely depressed patients. A pair of nickel-sized holes were drilled in the top of patient's skulls and electric leads connected to a small pacemaker were sewn under the collarbone sending a 4-volt current to area 25.

This treatment met with remarkable success. Some patients felt immediate relief and two-thirds recovered within months. Mayberg still does not know why calming area 25 has such an effect but it is now well established that when this area is overactive it causes depression and when it is calmed down it brings relief.

Mayberg's work would seem to be at odds with that presented by Gazzaniga because it strongly confirms a network model of the brain. Reason, passion, thought, and emotion are linked in a loop as Dobbs puts it, they are not stacked in a hierarchy with cognition reigning supreme.

Parts of the Brain Related to Emotion

Neocortex. We have seen that the neocortex is the largest component of the brain by far. Its expansion to the human cortex in the frontal lobes is critical to thinking, planning, and language. Motor areas, the sensory cortex, and association cortex lay behind the prefrontal lobes. These lower level structures readily overpower and regulate higher neural structures. Carter (1999) informs us that the wiring from this lower part of the brain is robust and thick going up the cognitive systems, but the reverse is not true. Cognition going down the emotional systems has to fight a tough battle to make an impact.

Cingulate Cortex. Running from front to back of the corpus callosum is the cingulate cortex. Especially related to emotion is its frontal region which plays a strong part in depression and sadness. Cognitive processes are involved in its posterior section. The cingulate cortex supplies an integral part of our ability to map somatosensory systems that create bodily feelings. The "limbic glow" that compels us to follow rules and act in a way which avoids sanctions is also in large part due to the cingulate cortex. The capacity to have feeling depends not only on the organism having a body, but it must also represent that body inside of itself. As we have seen, there is much more to emotion than feeling, but feeling is vital nonetheless. Surgical destruction of the cingulated cortex has relieved patients of intractable pain, but the right side of the brain produces negative emotion and the left side produces positive emotion. If a person were to have a stroke it would be better to have it on the right side because the negative emotion would be dampened. According to Turner

(1999) the cingulate cortex integrates emotion with the forebrain and it is well connected with other structures. The front of the cortex is also connected deeply with the amygdala.

The Insular. The insular has been partially described in Chapter 3 as a latecomer on the neurological scene because it was deep inside the temporal lobe meaning that the lobe has to be pulled back for the insular to be seen. Damasio (2003) sees it as the most important site of feelings and calls it pivotal to emotion. Signals of emotional feelings are sent from the brain stem to a dedicated part of the thalamus to neural parts in the front and back of the insular. Next, the insular sends these messages on to ventromedial prefrontal lobes and the anterior cingulate cortex. The insular plays a large part in organs having to do with maintaining the bodily homeostasis and from which unconscious emotion is derived according to Damasio. The cingulate cortex and the insular are important sites of feelings stemming from ingesting ecstasy, heroin, cocaine, and marijuana. Damasio (2003) considered the body sensing regions such as the insular to be the sites of the neural patterns which are the proximate cause of feeling states.

The insular is connected with an astonishing number of brain areas and it has an equally bewildering number of functions. Connections include frontal lobes, Broca's area, cingulate areas, temporal lobes including Wernicke's area, the amygdala, hippocampus, and the periaqueductal grey matter, and other areas of the brain stem.

Hippocampus and the Amygdala. The hippocampus and amygdala lie at the center of the brain deep inside the cerebral cortex. The amygdala consists of two eye-like structures that protrude out of the front of the hippocampus. The hippocampus is a long structure whose tail wraps around the front of the thalamus. The amygdala wraps around this front end. We have seen that it is an instantaneous warning system because sensation plays an important part in fear. Of all the many parts of the brain, the amygdala is most involved in emotion. It plays a pronounced role in evaluating negative emotions and emotion in general. According to Birggit Röttger-Rössler and Markowitsch (2009), amygdala damage in patients produces deficits in memories and impairments in attending to relevant aspects of their social environment. Patients with Urbach–Weithe disease are an example. Urbach–Weithe disease is inherited and in two-thirds of the patients; it leads to bilateral calcification of the entire body. Changes in social behavior included problems with integrating memory and emotion as well as inappropriate behavior. This is a common finding.

Studies with large samples of Urbach–Weithe patients found serious problems with their ability to identify expressions in the faces of others. Other patient studies also demonstrate the central role of the amygdala in evaluating emotions in general and negative emotions in particular.

While the task of the amygdala is to search the social and physical environment for danger and to react with lightening speed, the slower and more considered input from the cortex gives a more considered assessment. In both cases inputs to the senses proceed first to the thalamus where they are sorted out. In the case of something provoking alarm, the information is split along the two paths and both are sent to the amygdala.

Inputs from the quick path of the nearby thalamus are a one-way street which bypasses cognitive control. The slow path sends information to the visual cortex in the back of the brain and, as we have seen in Chapter 4, breaks it down into "feature extractions" like shape and depth and sends this forward to areas in the prefrontal lobes that identify exactly what the object is. Finally, the prefrontal lobes send the refined information to the amygdala which generates the emotion compelling the body into action. In the fast route, only the thalamus and the hypothalamus are involved. They are very close to the amygdala and this provides the quick but unreliable path from eyes to body in milliseconds (see Carter 1999: 94–95). The mechanism both creates and then receives its own cortical input – a most curious interaction (LeDoux 2000). This one example gives us an important insight into the enormous complicity of the brain (Fig. 6.2).

Diencephalon. Between the cerebral hemispheres and the midbrain lies the diencephalon. The midbrain lies on top of the brain stem and connects with the spinal cord. The diencephalon and the pituitary gland mediate sensory inputs which carry emotional charges. They also produce hormones and peptides responsible for emotional behavior. The diencephalon is composed of the thalamus and the hypothalamus, which lies in front of and below the thalamus. The thalamus processes and distributes sensory data from the periphery to the cerebral cortex. This cerebral cortex covers the top and sides of the brain with dense cell matter and interprets meaning before emotional responses. The thalamus determines whether its information gets to awareness in the neocortex. The pea-sized hypothalamus controls the autonomic nervous system and hormonal secretions by the pituitary gland. It has input and output connections to all the regions of the central nervous system which are critical to emotional feeling. Bodies within the diencephalon integrate

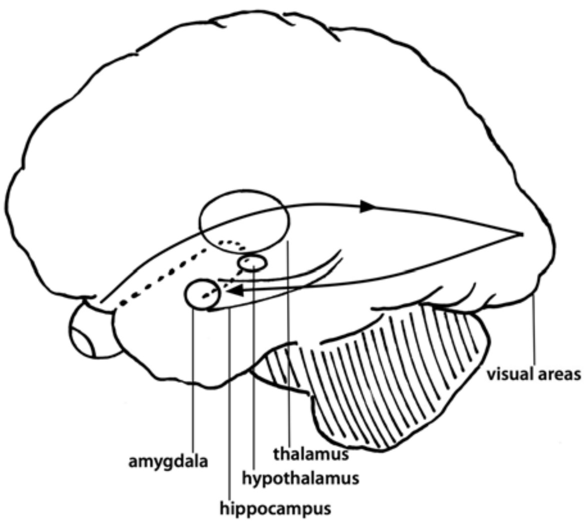

Fig. 6.2 Fast and slow routes of the amygdala

emotions and memory. It has been known for a long time that aspects of our lives are best remembered when they are emotional. Units within the diencephalon select information for long-term storage. Chronic alcohol abuse leads to the destruction of the thalamus and the hypothalamus. These patents become emotionally flat and detached. They are also unable to generate emotional involvement in ongoing events (Röttger-Rössler and Markowitsch 2009: 117). Traumatized insulars are associated with apathy and an inability to tell fresh from rotten food. The insular reads the physiological state of the whole body and then creates the subjective feelings which can bring about activities related to homeostasis such as eating to keep the body in a standard state of balance.

Brain Stem. The foundation of basic life maintenance functions such as metabolism is seated in the brain stem. Its predecessor was formed 500 million years ago and is similar to the brain of current reptiles. Because of this it is called the reptilian brain, as it is the conduit between the front of the brain and the body and vice versa. The forebrain's ability to create the feeling of pleasure or pain depends on making its way through the brain stem. Damage to the brain stem most often results in loss of consciousness and thus feeling. Damasio (1999) states that areas of the brain stem work with the forebrain structures of the cingulate cortex and the prefrontal cortex to generate consciousness, including unconscious emotional states. Other structures playing a lesser role in awareness are the cingulate cortex, forebrain structures, and prefrontal cortex.

Midbrain. On top of the brain stem is the midbrain which harbors a group of nuclei referred to periaqueductal grey matter. This area is critical to the high order control of homeostasis and a significant part of the control of emotion. The periaqueductal grey releases opiod neurotransmitter receptors which are important to many emotional states. Panksepp (2000) suggested that this is the area that first allowed animals to cry out in pleasure and distress.

Orbitofrontal Cortex and Phineas Gage. A great deal of clinical data suggest that the ventromedial prefrontal lobes have more influence on social and emotional processing than any other brain structure. The best known case demonstrating the function of the ventromedial prefrontal lobe was that of Phineas Gage who lived in the mid-1800s. His case is so important to neuroscience that I will describe it in some detail.

Mr. Gage was in charge of a large number of men laying down new track for railroad expansion. While he was well liked and athletic, Mr. Gage was more than that, he was the most capable, reliable person in the whole group. They had to work with outcrops of very hard rock. Blasting stone with explosives was a regular part of the job; to blast the rock, a hole must be drilled and filled half way with powder, then filled with sand. It required that the sand be pounded carefully with an iron rod. Distracted by one of his men, Gage did not realize that the sand had not been poured in the hole and he tapped the powder with an iron bar. A brutal explosion shot the rod into Gage's right cheek and then went through the top of his head. The rod flew out and landed more than a hundred feet away. He lay on the ground awake but he did not speak. As soon as he spoke his men put him into a cart in which he sat erect for three quarters of a mile to a shelter.

When the doctor finally came, Gage spoke with him in his usual manner and his wound has dressed successfully. Gage's physical recovery was complete. But after he healed, his behavior changed. According to his friends, "Gage was no longer Gage." His new behavior prevented him from finding work because of his lack of self-control and temper. The story of Gage gets worse, not better. He died an early death at 38 unable to keep a job or interact socially. Damasio (1977:10) says that this "hinted" at an amazing fact: somehow there was a part the human brain which had a large part to do with an intact orbital frontal lobe that was dedicated more to reasoning then to anything else. Gage's detriment included an impairment of the personal and social dimensions of reasoning. This was true even though his basic intellect and language remained unaffected and he constantly defined and interpreted his environment just like every body else. Much later his skull was examined and it was discovered that the initial site of injury was probably the orbital frontal region (Fig. 6.3).

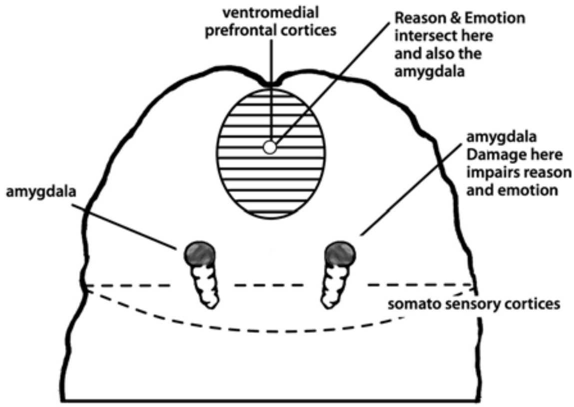

Fig. 6.3 Areas whose damage impairs emotions reasoning affecting decision-making

Damasio's Somatic-Marker Hypothesis

In 1994 Antonio Damasio wrote *Descartes' Error* and continued the story of Phineas Gage by using that case to develop hypotheses about patients who were similarly traumatized in the ventromedial part of their prefrontal lobe. Metaphorically, reason and emotion intersect in these cortices (Damasio 1994:70).

To set the stage for Damasio's hypothesis and to demonstrate how emotion relates to decision-making, it will be instructive to relate story about how the AI (artificial intelligence) workers found the need of emotion for the decision-making which neither Gage or Damasio's patients could do. The story refines the discussion about emotion setting saliency.

We are asked to imagine a robot being told that a bomb was to be set off inside its hanger. To no one's surprise the robot decides to leave, but as it turned out, the bomb was in its own wagon and went off. The robot knew this, but being a machine, it had not drawn the inference because it had not been wired to do so and he was blown to pieces. Therefore, the robot's builders picked up his remains and made robot number two. This time they made sure that it was set to draw the consequences of what it knew. We humans do not need to be told all the steps to make a decision but the robot is basically a computer. That meant that the AI workers needed to know all of the steps involved. This illustrates the interesting ethnomethodological insight *that we need to know much more than we think we know in order to know anything at all.* It was no wonder then that the AI workers were faced with a challenging task both for their robots and themselves. When the experiment was repeated and the robot had to decide whether to leave or not, it remained stalled in its tracks still trying to think of whether or not leaving the hanger would change the price of tea in China. This was because the robot, being absolutely objective, had to give equal weight to literally all the consequences it could think of. Of course, the bomb went off again.

Undaunted, the AI workers went back to work on robot number three telling it to only think of *relevant* consequences, but once again the robot remained unable to decide to leave the hanger. This time, its creators yelled, "Do something!" but it answered, "I am! It takes time to ignore thousands of implications that I have determined to be irrelevant." de Sousa's point is "*that we need to know whether a consequence will turn out to be relevant before drawing it*" (de Sousa 1987: 194). The solution to the problem is relevancy and that is set by emotion. Another conclusion is that there is no such thing as pure reason separated from emotion. As de Sousa puts it: no logic can set saliency.

Characteristics of Damasio's "Prefrontal" Patients. Going back to Damasio's patients, most, like Gage, had been successful in their businesses and professions as well as social lives before their injuries. After their injuries they were especially poor in judging people, making decisions, and learning from previous emotional experiences. Also like Gage, after their trauma their lives unraveled socially at home as well as in business.

During interviews the patients told of their loss in a very matter of fact manner while it was all that the interviewers could do to hold back their tears. The patients could not even sympathize with themselves. When asked to look at photos of car wreck victims that would have made anyone cringe, they sat emotionless; they recognized cognitively the devastation and anguish the pictures conveyed, but their bodies showed none of the skin conductance responses that indicate emotional feelings. They could talk about feelings in this context but could not feel them. They were capable of doing well on a variety of tests which would make them appear perfectly normal – they could "talk the talk" as Damasio says, "but not walk the walk" in non-verbal real life.

"Elliot," for example, had been a successful professional and a community leader before his trauma. He was given a number of tests dealing with social convention and moral value. The tasks involved in the test included awareness of the consequences of action, ability to conceptualize means of achieving a social goal, ability to predict the social consequence of events, and a test of moral judgment. Elliot's scores were excellent. The trouble was that his words contrasted with his deeds. He had cognitive access to social knowledge but he could not apply it. Never in the tests did Elliot have to make real-life decisions. In another interview, after producing a list of options for action that were impressive in quantity and quality, he said, "After all this I still would not know what to do" (see Damasio 1994) It appears that Elliot had the same problem as the robot and in his own way he had blown up because of it. *Without emotion eliminating certain possibilities as unthinkable or emotionally preferred, there was no basis on which to decide.*

The Somatic-Marker Hypothesis

Whether Damasio was aware of the robot story is a matter of intellectual conjecture, but it is clear that both narratives demonstrate the place of emotion in rational thought. Damasio starts by pointing out that experiencing the fact that an option has had a bad consequence in the past is dependent on one having a particular gut feeling when the option comes up again. In emotional terms, I would think the thought of choosing this option would usually be met with "apprehension." In Damasio's words, it "marks an image." This embodied "marker" forces attention to the negative outcome and functions as an alarm bell (Damasio 1994:174). The number of options under scrutiny depends significantly on one's intelligence and the "theater of the mind," but the actual choice can depend on messages from the "theater of the body" which produce apprehension. The partnership between cognitive processes and emotional ones is clearly established.

In order to test his hypotheses, Damasio and his team created a gambling card game which is made as life-like as possible. It poses the risks of real life as well as its uncertainty. It offers choices but no gives no indications of what to choose. The goal is to lose as little as possible and to gain as much as possible. Four decks of cards labeled A, B, C, and D are placed in front of the player. The player is given $2,000.00 dollars of play money to start the game. He/she is instructed that all cards will earn at least some money. However, some cards will also demand that players *pay* some money. No written records were allowed. Deck A was usually worth $100 dollars as was Deck B. However, both sometimes imposed a $1,250 fine. Decks C and D were only worth $50 dollars but sometimes they too demanded a payment. These were less than $100 dollars on the average (Fig. 6.4).

Since none of the players knew this, healthy players typically sample from all decks looking for clues. Usually they gain a preference for decks A and B but within the first 30 moves they come to prefer decks C and D and retain this preference to the end. Little by little they develop an apprehension about decks A and B because although some times they gain with them, there are also times they really get "burned."

As hypothesized, things were different for the ventromedial prefrontal patients. In fact, their choice-making behaviors were just like those they had exhibited in real life and diametrically opposed to the comparison group. They were attracted to the A

Fig. 6.4 Gambling decks

Decks	Reward	Possible Cost
A	100.00	Sometimes comes with a fine of 1,500
B	100.00	Sometimes comes with a fine of 1,500
C	50.00	Sometimes you won 100 or less $\bar{x}$ = Less than 100, which is not bad
D	50.00	Sometimes you won 100 or less $\bar{x}$ = Less than 100, which is not bad

and B decks and declined the safer C and D decks. Because of their preferences, the penalties they sustained were disastrous and they were bankrupt half-way through the game.

As usual Elliot was particularly interesting. When the game was repeated after several months he differentiated the safe decks from the high risk one's but he did not behave any differently in his choices from the first game to the choices he persisted in making in real life (shades of Phineas Gage). "As with his other behaviors" Damasio (1994: 115) says, "we can evoke neither lack of knowledge nor lack of understanding of the situation." This was true of all Damasio's prefrontal patients. Interestingly, those with large lesions in other close-by regions could play the game as normals could.

There are always competing hypotheses and one of several possibilities that Damasio explored was that his "prefrontals" were only motivated by reward and not sensitive to punishment. To test this possibility, the schedules of reward and punishment in turning the cards were reversed with the punishment coming first. The patients would actually avoid the bad decks for a while after getting "punished" but this never lasted very long and they went back to drawing the risky cards. Deprived of a reliable and steady concern for future consequences, the prefrontal patients had no way to control their impulses and bank on the future. This deprives the patients of one of the most distinctive of human traits which is the ability to be guided by images of future prospects rather than insisting on immediate rewards. Damasio calls this a myopia for the future.

In a replication of Damasio's somatic-marker hypothesis, Carter and Pasqualini (2004) provided important support for the external validity of Damasio's thesis by using normal female patients. Somatic markers are not just the consequence of the ventromedial prefrontal cortex. The information which they coordinate is strongly connected with other systems of the brain. These include the somatosensory and insular cortices, the brainstem nuclei, and the amygdala. These produce a replication of the emotional consequences of choosing previous cards. Thus, skin conductance reactions became a major indication of the existence of an embodied marker in Carter and Pasqualini's replication. It had been shown before that skin conductance had not been strong enough to steer brain-damaged patients from making risky decisions. Controls were considered homogeneous and even had almost identical skin conductance responses within their group.

Results showed that the stronger the autonomic response before risky choices, the greater the success in the game.

However, limitations of the somatic-marker hypothesis remain. By necessity the experimental group was limited to a small number of patients, even if the data on the women received strong support. We need to remember that in this case and others, the neural substrates of the semantic marker hypothesis are not fully established. We also do not know which specific emotions are related to somatic markers, such as feelings of foreboding and apprehension.[3] Damasio's argument is not the only one that places emotion as necessary for cognitive decision-making. We have to remember the convergent findings to that effect by the artificial intelligence workers.

The Limbic System Debate

Early in the last century, sensory perception and control of bodily movement were understood as being located in specific areas of the brain.[4] This encouraged others to think that emotions also had a dedicated center in the sensory cortex. In Jamesian fashion this drew researchers once again into conscious feelings. Emotions were considered the cortex's perception of the bodily feelings preparing for action in their appropriate situations. We ran not because of fear, but we fear because we ran. But Cannon (1928) demonstrated that the removal of the neocortex did not impact on emotional responses. If the neocortex was irrelevant to emotion, the search for its "home" was pushed down into the deeper parts of the brain parts "limbic system."

MacLean's Triune Brain. This comprised a discrete network of primitive structures between the supposedly more recent structures and the brain stem (Franks 2006:49). MacLean's argument was thoroughly evolutionary. The neocortex at that time was thought to have the learning capacities of mammals as apposed to reptiles. MacLean (1949) call the Limbic system the "reptilian brain." The limbic system was composed of the hippocampus including the thalamus and the amygdala. His association with the limbic system and the reptilian brain was an offshoot of his belief (in opposition to current scholarly thinking) that emotion was a primitive reaction involving our blind visceral reaction to environmental stimuli. According to MacLean, this notion of mentality "eludes the grasp of the intellect because it its ancient structure makes it impossible to communicate in verbal terms".

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[3]For a further highly technical critique of the somatic-marker hypothesis see Rolls (1999). He sees the somatic-marker hypothesis as a weakened James–Lange theory.

[4]This section relies heavily on David Franks (2008).

Difficulties in MacLean's Theory. Phylogenetically then, humans have three brains from major evolutionary periods – the reptilian brain, the paleomammalian brain, and finally the more advanced neomammalian brain shared with later mammals and other primates. We know now that these levels of evolutionary brain development have influenced and changed each other. They certainly do not have their own kinds of intelligence, memory, and other features that would be characteristic of any age of evolution. MacLean's theory also helped retain the devaluation of emotion by associating it with the primordial.

With the development of neuroscience, the cortical areas became impossible to order phylogenetically; this advancement rendered the evolutionary perspective of MacLean no longer viable. Primitive creatures had rudimentary cortices similar to the advanced mammalian neocortex. This meant that there was no distinctive reptilian which had remained unchanged throughout our evolution. The areas were just located in different places and had been hidden. MacLean had defined the limbic system as being comprised of any structure connected to the hypothalamus, but as research proceeded, it became clear that all of the areas were so integrated that they had essentially become new structures. This is an excellent example of Sperry's statement about the new carrying with it the old and vice versa. Taken as a whole, the old structures were not what they used to be. Also some structures outside of the limbic system were more closely related to emotion than were some areas of the limbic system. The final blow to the idea of the limbic system as the seat of emotion came when researchers found that all parts of the limbic system were not connected to the thalamus and the hypothalamus and that the thalamus actually had more connection to the cognitive process including declarative memory.

Why the Limbic System Did not Die. Even with all these limitations, the concept of the limbic system refused to leave the neuroscience scene. One reason that the amygdala proved so valuable to research was because it sits conveniently in front of the limbic system and is relatively available for research. It also has a very low threshold to electric stimulation as a function of its fast path. The amygdala is called the gateway to the limbic system for these reasons. Damage to the cognitive areas involved in the amygdala's slow path affected those pathways that work down to decrease and control its emotional strength. The consequences of such damage include decreasing the ability to understand the emotional implications involved in social interaction and to respond appropriately to those implications (Fig. 6.5).

The amygdala is more closely involved in emotion than any other area between the hypothalamus and the neocortex. However, it is not involved with all affect and commonly depends on areas outside of the limbic system in forming emotions. Some researchers think that it might be easier to study emotions separate from thought and cognition because the fast system of the amygdala was so closely connected to the thalamus that it could send noncognitive messages directly from the outside environment without involving time-consuming pathways for input from the distant neocortex (Franks 2008: 50).

While originally the limbic system was reified to explain all emotion and it was located in one specific part of the brain, emotions came to be seen as involved in many places tightly interconnected with cognition, memory, and motivation. In

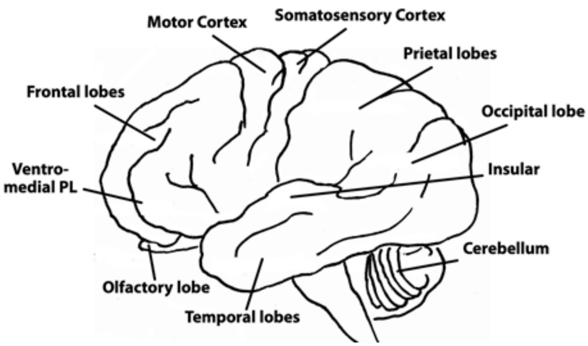

Fig. 6.5 Emotion related structures of the brain

other words, there is much more to emotion than the limbic system. According to Berridge (2003), "the neural substrates of feeling and emotion are distributed throughout the brain from front to back and top to bottom." The criticisms of the limbic system by LeDoux and others are now accepted in neuroscience, and it was for this reason that LeDoux chose to title his book, *The Emotional Brain* (1996). Others have suggested that so long as we are aware of the deficiencies involved in the concept of the limbic system, we may still benefit from its use. It communicates a great deal of information very quickly.

Challenges to Cognitive Appraisals Seen as an Inherent Part of Emotions

We have seen that Damasio and other leading neuroscientists have insisted on the causal priority of emotion over thought. To Clore and Ortony (2000) the "cognitive core of emotion" acts as the representation of emotional meaning. Their definition of cognition is so encompassing that it includes such varied processes as perception, attention, and even action. Of course, they also include appraisal. These authors would argue that a belief that someone may be stealing from you and the anger which results from that belief, do not occur in that order. Rather they are parallel and separate ways of experiencing the personal significance of what is happening in the world outside of your will. Emotion represents the mute character of expressions coming from the "theater of the body"; others who are more interested in cognition see the intertwining of cognition and emotion (such as in "appraisals") as coming from the "theater of the mind." Each process is independent of the other. Fear produced by the amygdala is definitely related to consciousness, but because of its speed (even in the long, cognitive path of the amygdala) we have already acted before we know just what it is that we are afraid about.

In fact, Ohman et al. (1999) produced a study making just this point. He recruited two groups: those who professed to be very fearful of snakes and a comparison group of those fearful of spiders but not snakes. The control group said they were not afraid of either one. Subjects were exposed to pictures of snakes, spiders, flowers, and mushrooms at a speed much faster than that which allows conscious perception. Those exposed to the snake slides, who were fearful of snakes had higher skin conductance with pictures of snakes but not with pictures of spiders. Similar results were found for those fearful of spiders and not fearful of snakes. In sum, subjects had shown increased sympathetic responses to pictures which triggered fears without being conscious of them.

A significant challenge to the position that emotions are an inherent part of emotions was provided by the two examples of electric stimulation of the mesencephalon described earlier.

Some have tried to keep the idea of appraisals as essential to emotion by labeling the behavior in these cases by the broader term "affect" rather than emotion. But affect is usually used to mean arousal – a much broader term, which does not distinguish between laughter and depression. The fact remains, however, that the subjective experience of these epileptic patients was that of emotion. This reduces the argument for the absolute necessity of appraisal for emotion to a mere word game.

The Fallacy of Either or Thinking. A common feature in the public's thinking about emotion and cognition involves either/or thinking; in this case, as in dualism. Emotions and cognition have been defined in such a way that there is an antithetical friction between the two, which are seen as antithetic to each other. Traditionally, emotions and reason are seen as inherently in opposition to each other while this chapter has argued from several directions that some emotions are necessary for effective thought. A more productive approach might be to address how emotions can most often be inextricably linked with cognition and at the same time be in tension as when we struggle with our diet or in the many times when reason dictates one thing and our passions dictate another.

Leslie Brothers Social Constructionist View of Emotion. Following social constructionists Perinbanayagam, Coulter, Haare', and Dennett, Leslie Brothers has challenged the neuroscientific world by proposing that emotions are not a brain function, but rather a function of social communication. She replaces the term emotion with the concept of "action tendencies" by which the brain readies the organism to act. When these potentials are extreme, they are socially labeled emotion. This means that the brain's action potential is real enough, but the interpretation of the behavior is a social construction. This construction is made to appear real by the circular process of the "documentary method" wherein the factualness of a concept is made to appear true by interpreting all that happens as consistent with the expectation.

Brothers (1997 and 2001) contends that there is no clear difference between the notion of emotion and general subjective experience. We only have the tendency to use the label emotion when the body is more mobilized. The limbic system is not totally eliminated because it generates strong action tendencies linked to the body such as tears, the sinking sensation of fear, and the bodily expressions called joy.

Next, Brothers reminds us that labels are essentially interpersonal, communicative acts. Facial expressions are communicative, sending signals to others which we label anger, fear, or compassion, etc. She notes that even Perinbanayagam (1989) and Coulter (1989) retain hints of the assumption of emotion as real. Perinbanayagam holds that bodily sensations cooperate with emotional symbolic constructions and Coulter proposes that physiological substrates enable, but do not cause emotion.

She ends her argument by suggesting that if we use the term emotion at all, we should think of it as a system of social regulation, frequently involving bodily changes that act as symbols. Fear and anger, for example, impact the behavior of others. She says, "that in the tradition of symbolic interaction... we can say that the meanings of a threatening facial display comes into being through what they call forth in the other" (Brothers 1997: 123). It comes as no surprise that her impact on neuroscience has been minimal in this particular case, but herein, she presents sociological argument that she uses later (2001) for a thorough going critique of present neuroscience.

The Seven Sins of Emotion Schacter (2001) warn that there are a number of false beliefs about interactions between the behavioral expression of emotion and their underlying neurobiological substrates. Schacter (2001) has called these false beliefs the "seven deadly sins" in the study of emotion. They are as follows:

Separate independent circuits subserve:

(1) Affect and cognition. There are clearly different positions on this matter, which make it important to understand how they are meant.

We have seen from the story of Phineas Gage and his similarities with the more detailed studies if those traumatize in the ventromedial prefrontal lobes that emotion is necessary to rational choice. This is because emotions are integrated in this area so they are not separate but integrated. Emotion, not logic sets salience and without a number of predetermined preferences there is no way to chose. Few people in the United States and other places seriously have to decide whether to have their pet cat for breakfast. It is among the many "unthinkables" needed for choice to proceed. To be "objective" in the dictionary sense and to really consider all choices equally makes decision-making impossible.

However Damasio (1994), LeDoux (1996) and Zajonc (2001) do indeed see cognitive and emotional processes as emerging from separate, but interacting levels or processes of the brain. Damasio (1996: 69) gives numerous reasons for his position (a) One can loose the capacity to appraise the emotional meanings of certain stimuli without losing the capacity to perceive the same stimuli as an object. (b) The emotional significance of an object or event can be determined by the brain before we are conscious of perceiving it. We have seen that the amygdala can "know" whether some thing is good or bad before it knows what it is. (c) Memories of emotional experience are stored in brain mechanism which are different from those processing cognitive memories. (d) Systems involved in cognitive processing are flexible compared to emotional systems. Some call cognitive systems "promiscuous" because one can take an abstract position just to justify some action that they do not believe. A lawyer may do this for a client. Cognition in this sense is flexible.

Emotions are connected with brain systems which control behavioral responses and lack flexibility. It is possible but hard not to believe one's emotions.

It appears from the above that we need to know in detail in what sense emotions are distinct and in what sense they are integrated in transactional fashion.

(2) The next sin is to view emotions as subcortical. This would be true if they were independently seated in the limbic system, but they involve many cortical parts of the brain even in the amygdala when it takes its slow route that draws on the neocortex.
(3) Emotions are seen as being in the head. This is untrue for two reasons. They relate to the whole body especially through the visceral. Also, emotions are not self-contained like feeling; they relate to something. This is expressed linguistically through prepositions and is called "intentionality." Emotions are directed to something in the environment outside of its self. We have emotions about or at ourselves. Emotions contrast here with feeling because as much a little Sally has her emotional feelings hurt by the "mean" bee on her birthday, this sensual sting remains as a self-contained entity. Emotion sometimes dissipates when we learn some harm to us was unintentional. Sally can forgive the bee all she wants, but it will not take the sting away. Emotions (in the everyday sense) change as appraisal changes in contrast to sensual feeling.
(4) It is frequently held that emotions can be studied from a psychological perspective because feelings are conscious. But conservatively 95% of emotions, or brain activity in general, is unconscious and, in Damasio's point of view, have to do with continuing homeostasis which is unconscious.
(5) Another false belief listed by Duam et al. is that emotional circuits are similar in structure in both age and species. Emotions are not even the same in human girls and boys much less within different species. The differences in young women and men that do exist finally settle down until significant brain differences are few. For boys and girls the differences seem to be in their sequencing. Relevant to emotional development girls 2 to 3 years old could interpret facial expressions better than boys who were five.

An NIMH study (2007) concluded that understanding these difference means you are able to discourage stereotypes when girls are taught in the same fashion as boys. One would think that given the popular interest in gender differences in emotional expression, there would be substantial research in the area of brain-related aspects of emotional regulation. There is some fMRI evidence in gender differences in controlling reactions to negative pictures. Both men and women showed increases in prefrontal regions associated with appraising their reactions differently, but men showed less increases than women. Men also showed greater increases in the amygdala associated with emotional responding.

Relevant to emotional development girls 2 to 3 could interpret facial expressions better than boys who were five.

(6) The next false belief is that specific emotions are instantiated in discrete locations in the brain. Not even the limbic system meets this requirement. The cortex serves even the amygdala and we know little about the brain circuitry of the more subtle emotions.

(7) The last sin is to view emotions as conscious feeling states. This ignores much in neuroscience as this chapter has shown. This was true in William James' philosophy which has its virtues as a whole but has been rejected as technology in neuroscience has advanced.

A Critique of Hard Wired Primary Emotions. Kagan (2007) notes that there are some serious questions about the existence of primary human emotions. In his opinion, the belief that basic emotions exist which transcend history and culture is tenuous at best. A cultural and historical context selects a small number of emotions from a large number of possible emotions for that specific historical era. The emotions which are considered basic are defined by what is seen as salient in that particular culture and time. Traditional Japanese regard for "amae," an emotion experienced by those that place their complete trust in the nurture of another, was considered a basic emotion to them. For the early Christians put much value in "agape" as a fundamental emotion. But few people today know what it is. For those Christians it meant a self-sacrificing love from God that was to be reciprocated.

Primary emotions are considered the most basic ones that can be combined in various ways but not fundamentally altered (Averill and Nunley 1992). According to Kagan, an emotional state can change in its prevalence depending on historical conditions within a particular culture. The historical events that created bureaucratic, capitalistic economies with densely populated cities, and a diversity of values made a new emotion possible Kagan says. Sartre described it as "inescapable nothingness" and he might have added ennui.

Conclusion

We recognize that no satisfactory common thread is available drawing emotion into one common basket. Nevertheless one stands on solid ground in recognizing that emotion is necessary to balance the cognitive bias which still reigns in sociology and neuroscience (Franks 2006). Although we have not come to closure on a definition of emotion per se, we can view emotion generally as a very important residual category in the sense that it can be just what cognition is not. It may even be prudent to see emotions on a continuum from pure emotion to thought without emotion as in Damasio's "prefrontal" patients (Franks 2009 forthcoming.)

In Chapter 3 we summarized the implications of Tredway et al. (1999) neuroscientific reanalysis of the Spitz studies, which suggested another way the emotions precede thought – in this case developmentally. Emotions supply the ground, not only for human cognitive abilities but also for overall human functioning as well. Brain development requires information from the physical and social environment in order to correctly wire brain structures. During the first stages of infancy, the primary caretaker accomplishes the emotional shaping of the child. Since the so-called limbic system and brain stem are operational at birth, emotional development precedes and shapes the neocortex and thus the cognitive system. Tredway et al. (1999) go as far as to say that from an evolutional perspective, emotional processes are more important to survival than reason. This seems consistent with Turner's ontological thesis that emotion preceded gesture and speech. The phylogenic primacy of emotion was extended when the priority of emotional development to reasoning capacities and over all health was extended by the neurological work on child development. Regardless of Brothers views, it seems that LeDuox is on very solid ground in his belief that emotion organizes the brain.

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Chapter 7
The Self in Neuroscience and Social Psychology

Less than 40 years ago the reigning opinion in much of social psychology was that thinking about the human self was a waste of time. Fifteen to twenty years ago this was also a popular view among neuroscientists. The study of self is now a thriving enterprise in both fields. In 1999, Antonio Damasio published *The Feeling of What Happens* which put the self on center stage in his thinking. In Joseph LeDoux (2002) wrote the *Synaptic Self* and that same year the New York Academy of Sciences gathered the most noted neuroscientists in America to a conference called *The Self: From Soul to Brain*.

It is not difficult to understand why the self was such a "hard sell" in traditional science; its subjective implications, its vagueness, and its many paradoxes make it a difficult to fit into "scientific" fields. Unfortunately, if the term is used four times on a page it well might have a different usage each time. Given the varied meanings of self that abound in the literature, it is inevitable that some one will find one meaning without substance closing their mind to all other meanings of the term. For example, the self of desire rejected by some forms of Buddhism is not the same self that is involved in the reflective self-process of symbolic interaction, nor is it to be confused with the westernized, "encapsulated" self decried by Norbert Elias (1978).

There is little wonder the self took so long to arrive on the scientific scene and when it did, its perceived importance had to outweigh its inherent vagueness and semantic difficulties. If we do not clarify the different dimensions of self, we slide around from one meaning to the other without knowing it and end up in a cognitive no man's land.

Different Aspects of Self

The Subjective as Foundational. Some see the self as the foundational rock of our existence. For, example Zimmer (2005) glibly states, "The most obvious thing about yourself is your self." This may have some truth in it, but there are many parts of the self that others may clearly see but we do not, especially when our faults are pointed out to us. Defensive strategies and self-illusion are critical parts of the self-system as many have consistently pointed out.

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Qualifying Zimmer's statement above, a frequent anthropological observation has been that the last thing we can be aware of is what is around us all the time. These are things so fundamental to our existence that we miss them in passing. Like the eyeglasses on our face, they are the means by which we see rather than the object seen.

The self as foundational carries with it the notion of ultimate subjectivity. Others can give you support, instruction, and encouragement, but only you, yourself – in John Dewey's (2004) terms – must do, suffer, and undergo. For every "objective" or "impersonal" calculation in the world there is a subjective, singular actor who is doing and experiencing that calculation, however, socially constructed the units of that calculation may be. No doubt, these actors – like all of us – are thinking for themselves with other peoples' thoughts, but only they alone can do this thinking. It is in this sense that the subjectivity of the self is the bedrock, or the *point of reference*, for experiencing the world. It is that which experiences your world which no one can do for you. It is that thread of subjectivity without which there can be no impersonal or objective knowledge, or – for that matter – any self-consciousness at all.

Reflexivity: The Self as Object to Our Selves. Humans, in addition to their perception of external objects, carry with them a subjective, imaginary object and that object is their self. This "Looking Glass Self" (Cooley 1902) is formed developmentally by our imagination of how we appear to significant others. It is one thing to know about objective things but another thing to know that it is you who is experiencing the knowing. In sociology and especially symbolic interaction, it is this self-conscious reflexivity that is paramount to having a self and therefore having access to the *self-control* of one's behavior. One is simultaneously the one doing the knowing and the object known. This capacity for being self-conscious allows us to delay action for a split-second and to "think out" our on-coming behavior. As often as not this involves considering how what we are about to do or say will be understood or evaluated by others. This process of "taking the role of the other" not only gives us control over otherwise unreflective, spontaneous behavior but also gives a critical flexibility that surpasses that of other animals whose actions are at least relatively fixed by their biological constitutions or environmental regularities. The form of self is the agent in determining Libets' "free won't." This flexibility was especially advantageous for a carnivorous animal whose hunting skills depended on cooperative abilities rather than pure strength and speed.

The Self as the Cause of Experience and a Sense of Continuity. In the vast and varied literature of the self, two other overlapping dimensions inch to the foreground. One is the self as the owner of sensation, experience, intentions, and one's life-story. Having intentions means that we perceive ourselves to be the authors of what we purposely do. The other dimension, as Damasio has detailed at length, is the sense of unity and continuity of our lives. This continuity has two very different sources, one biological and the other social, symbolic, and linguistic. As we shall see, the biologically given sources of this continuity derive from the repetitious sensations of our bodies while the symbolic self of consciousness derives such continuity from word-formed interpretive memory. Paramount to supplying this interpreted unity of the self is our verbal left-brain "interpreter" as Gazzaniga (1985) designates it.

The Self as Fiction. A key characteristic of the self running through the symbolically interpreted dimensions is its largely fictional nature. A cat's sense of meaning is pre-constituted by its biology. Not so for the more flexible but fragile human selves made of intangible symbolic hypotheticals. Although the intangible nature of ideas and symbols give us the ability to change as situations dictate, it also makes the self – as critical as it is to behavioral control – a vulnerable and emotionally defended system that is our weakness as well as our strength as a species. Although symbolic beliefs, once adopted, are perceived as giving life meaning, they can always be challenged by other beliefs as we mentioned in Chapter 2 . It is the irony of the human species that human cultures will, by necessity, differ all over the world while at the same time we have enormous difficulty living with these inevitable differences.

Symbolic interaction and most of sociological social psychology has stressed the strengths of the self as a voluntaristic source of behavioral control, but we must also be aware of its grave weaknesses. A self that is made of socially constructed symbols is always vulnerable to challenge. Individuals, therefore, defend their self-systems within groups just as they defend their societal beliefs even more vigorously between groups. On any level, much of the self is pure defense which seriously diminishes our potential flexibility and rationality. Greenwald (1980) coined the phrase "totalitarian ego" to convey this brittle defensiveness. Unfortunately, the Methodist's "peace that passeth understanding" is a rare and fleeting experience for modern city dwellers surrounded by different symbolic worlds which leaves them open to challenges by other belief systems.

This defensiveness has relegated our "fellow feeling" most typically to in-group relations where it is tightly regulated even there. While self-consciousness has led to unabated increases in technological developments, the history of humans' inhumanity to "other" humans has also continued unabated through the generations fighting an unending sequence of "war to end all wars." Thus, any balanced view of the self must take into account both its strengths and weakness. Home sapiens are great deceivers – not only of others but also of themselves. Furthermore, the self may be our "primary adaptive mechanism" and a critical organizer of the brain, but it can be a great weight on the individual whose self is vulnerable in the form of guilt from the past and anxiety about the future. Additionally, its need for socially constructed status, which is ultimately contingent on others along with manufactured "certainty" propped up by rituals, guarantees that we will often be brittle animals especially prone to violence against its own kind.

Some sociologists to this day think of the self as an unnecessary illusion, in part because of its fictional nature, but this is to ignore the evolutionary function of the self. As will become evident, the self has as much to do with enabling life in social groups as it does with individual behavioral control. Fictional or not, the self as a process is a reality critical to what it is to be human. This is true on the functional level of the brain organization as well as on the symbolic level. Regardless of its vulnerabilities and illusory defenses, it is through this self-process that we relate to a peculiarly human world and therefore it cannot be ignored.

Evolutionarily, the process of self is a very recent event covering an infinitesimally small time on earth – a veritable speck in the eons of evolutionary time – but one that has nonetheless changed the very face of the earth, sent its benefactors to outer space, and, in a myriad of other ways, is the quantum leap whereby the course of evolution produced a qualitatively different level of intellectual existence. In controlling ourselves we also control our environment. The subjective reality of the self as a constantly reinvented process, however fictional, has been rediscovered by leading neuroscientists in their own way writing to the general public.

The fictional nature of the self derives from many sources. First are the ad hoc explanations of our own behavior manufactured by the left-brain as it forces the experience of sensibility out of the impulses from our numerous mute brain-modules, all of which have their own motives, capacities, and styles. Some have referred to these modules as "an army of idiots," but much needs to be done before we have reliable knowledge in this area. Whatever kind of unity the self temporarily has or provides to our consciousness, it does not arise from the unified nature of these modules. The self as a sense of unity does not diminish the fact that we are often at war with ourselves, whether it be a small skirmish about sticking to our diet or being faithful to our spouses. Gazzaniga calls the left-brain a spin-doctor who is trying to keep our personal life together in the wake of the inevitable tensions within (Gazzaniga 1998). We have seen that Lyman and Scott have referred to these ad hoc "rationalizations" as accounts that we unreflectively use to present ourselves in an acceptable light to others quite unrelated to their original motives.

Another source of this fiction is that the left-brain must spin us into believing that we are personally *in charge* of what we do, regardless of the numerous qualifications and exceptions to the veracity of this belief. The human sense of efficacy – the feeling that we can make things happen – is an important and often neglected aspect of self-esteem (Bandura 1977; Franks and Gecas 1992). Writers in this area (Smith 1968; White 1959; Bruner 1961 as well as Rawls 1971) often refer to the infant's innate "joy of being a cause". Regardless, however, of the importance of efficacy to the sense of one's powers, subjective feelings of the self as causing things to happen are often highly contingent on factors extraneous to actual cases and even this important dimension of self can be socially constructed fiction.

The third source of the fictional self is memory. Because of memory, we are the main actors in our life-story. The autographical or narrative nature of selfhood stems from the fact that to know who we are today, or who we will be tomorrow, depends on who we remember we were yesterday. If a professor considers herself successful, or if a boxer thinks of himself as a champion, it is because they remember past deeds. Memory is the *sine qua non* of one's ability to learn. A forgotten learning experience is an oxymoron. It has become axiomatic, however, that memory, however necessary to the self, is also highly revisionist. Daniel Schacter has catalogued the recurrent sources of distortion and bias in memories and yet, LeDoux and others see memory as the essence of the self. All of these will be considered in detail below.

Limits to the Reflective Self. In contradiction to the above, one could think that the one thing we can be most sure about is self-knowledge. No one is closer to us and knows more about our private thoughts and feelings than ourselves. It would seem obvious therefore that we, and we alone, have direct knowledge about our selves. But oddly, nothing could be further from the truth. Granted, we have absolute access to our own thoughts of the moment, but this is only the smallest sliver of a broader, holistic notion of self and what there is to know about it. If approximately over 96% of what our brain does is unconscious, and if much of the neurological *machinery* of the self has evolved to operate on this unconscious level, self-knowledge becomes highly problematic.

Defining self as limited to reflection is to arbitrarily place a significant amount of other aspects of the self off limits. For example, Timothy Wilson (2002) included in Burton (2008:142) gives detailed reasons why broad self-knowledge is difficult to impossible. Because our minds have evolved to operate largely outside of consciousness, Wilson suggests combining introspection with observing how others react to us and deducing the otherwise inaccessible nature of our minds from their responses. He warns that introspection without incorporating the way that others see us can be counterproductive. The responses of others, however, are *interpreted* responses which are highly influenced by factors such as self-confidence, defensiveness, and global self-esteem. Self-conceptions and the emotions connected with them are highly resistant to change because they are the lenses through which we see rather than the objects seen. Greenwald (1980) has likened the self-system to a totalitarian government which explains away all information that could otherwise challenge it. We cannot underestimate the power of defense mechanisms to blind us to unwanted information about ourselves. Significant and intentional changes in the self-involving belief systems and life styles must overcome many forces, and even then old ways persist in the form of the *style* of one's thought even when we change substantive beliefs. A person can give up a fundamentalist religion for science and be unaware of retaining the former rigidity by seeking "certain" unquestionable facts and categorically rejecting "theory" of any sort. Science can be pursued in a close – minded manner like anything else.

Other levels of self that are part of the non-verbal "theater of the body" form a critical foundation for the symbolically constructed self that includes the social "me" or one's "self-conception." Lewis (2000) insists that we need to disentangle this embodied "machinery" of the self from the process of self-consciousness. In describing the biological machinery of self he says

> There is unbeknownst to us most of the time an elaborate complex of machinery that controls much of our behavior, learns from experience, has states and affects, and affects our bodies, most likely in part, unavailable to us (Lewis 2000: 109).

Biologically Given Boundaries to Self. While the symbolic self can extend to, or incorporate one's family, work or even one's car, some mute apprehension of its boundaries is also critical to the organism. For example, both simple and complex organisms possess the ability to differentiate self and non-self. Even T cells differentiate themselves from foreign protein and young rats run around walls instead of into them. Lewis (2000:108) says that by 3 months and probably by birth, infants make this distinction between body and non-body. Reaching for an object implies acting as if there is something else there across space to reach for. Also appearing early in the infant as well as simpler creatures is the "conservation of self" across time and space. This includes responding the same way to similar events or in developing habits. Again, reaching for objects also involves consistency as similar results over time are experienced.

The Self of Immediacy. Finally the distinction between the self and the non-self means that no one can have direct knowledge of what it is like to be anyone else. Some followers of G.H. Mead would insist that we do not have direct knowledge of our isolated selves either, since we must use other people's symbols to know ourselves. Mead, however, did give early recognition of this direct knowledge. *Immediacy*, as he referred to it, gives us direct knowledge of our bodily selves through its sensations. Immediacy was important to Mead because we, and we alone, know our momentary sensations and thoughts (McAulay 1977). Vipassana meditation[1] takes advantage of immediacy to become aware of the preobjective semiotics of the body's own mute reflexivity. Merleau-Ponty (1945: 42) says:

> At the root of all of our experiences and all of our reflections, we find, then, a being which immediately recognizes itself. . .not by observation and as a given fact, nor by inference or any idea of its self, but through direct contact with that experience.

Human reflexivity then has two layers, one given by our brain's automatic biological monitoring of itself and the other given through G. H. Mead's significant symbols. Of course Mead would consider truly "minded" behavior as self-awareness. While the biological or "foundational" machinery underlying the symbolic reflexive self is too fundamental to our experience for it to be an object of awareness, this embodiment makes a profound contribution to selfhood and more general thought processes as we shall soon see. As the fundamental source of our bodily feeling of continuity, the brain's self-monitoring is a kind of reflexivity that can be seen as our "somatic assumptive order." As we shall see, it only becomes recognized when it is missed.

The Embodied Self. Damasio (2003: 254) talks about three major levels of reflexivity: the proto, the core, and the autobiographical self. He makes it clear that none of the three involves some sort of homunculus or little ego residing somewhere in the brain perceiving and directing things. Nor should we be looking for some sort of brain center where the self would reside. The level of the *proto self* is purely mechanical and unconscious and has to do with the brain's automatic regulatory system; this system which is reflexive in the sense that it must constantly regulate itself to keep within the narrow confines of survival much like a thermostat as we respond to the objects of the senses that come and go. All living creatures have such a system. Being so far removed from consciousness one may wonder about its relevancy to

[1] Michael Pages, personal correspondence.

the human self, but without it, the other levels of self would be seriously affected as will be shown below. A disembodied self is not a normal process. DeFazio's next level of self is the *core self*. This involves preverbal consciousness of sensation and the physiological state of an organism's internal milieu deriving from the viscera, as well as the vestibular and musculoskeletal system. Damasio's core self (1994:227) is a repeatedly reconstructed biological state of the entire brain/body relation. Thus, it is not to be found in a specific brain center even though it gives us a pre-objective sense of being a unitary and continuous biological being with a stable and consistent perspective. According to Gibbs (2006), dogs, cats, and human infants are aware of changes in these systems and thus have core selves. The core self includes the recognition of the boundaries between self and non-self, alluded to above.

The autobiographical self is a conscious protagonist, author, and private witness to one's life events. Mead's reflexive self of significant symbols is a step further than Damasio's autobiographical self because the autobiographical self is driven so much by emotional memory via specific brain organs like the hippocampus and amygdala (see also Gibbs 2006:21). I will elaborate on the proto and core self below.

The Proto Self. Damasio's explanation of brain-given reflexivity starts with the assertion that the brain is exceedingly nosey. It tracks a myriad of things, but the thing it is nosiest about is itself. In such tracking, the brain has a complex double function. First, it must produce output from a nervous system that is then tracked. This output is comprised of changing body states and emotions created by the requirements of inner homeostasis and perception of the world outside. Second, in tracking and creating maps of such output, resulting neural patterns must be transformed into mental images called representations. (Mental images are not necessarily conscious.) In contrast to cells in the kidney or liver, brain cells are designed to have intentionality – they are about other things and activities. In Damasio's (1999: 65) words, "They are cartographers of the geography of an organism and of the events that take place within that geography."

One systemic feature of the reflexive brain lies in the self-monitoring needed to regulate the chemical balances maintaining survival. These are located in the brainstem and hypothalamus – the brain's core. Thus, the brain is holistic in the sense that it must represent to itself the structure and state of the *whole* living organism (Damasio 2007: 65). Again, this routine self-monitoring of basic functions provides the foundation for all other levels of self. The brain is in constant re-creation; it knows no rest.

Damasio feels that the biological foundation for self is in the brain devises that "represent moment by moment the continuity of the same individual organism" (Damasio 2007:65). A non-verbal sense of continuity then is provided by the proto self that underlies the sense of symbolically constructed continuity of the symbolic self.

Evidence of the brain's tendency to retain this permanent and unified self can be observed in its creation of the "phantom limb" (Ramachandran and Blakeslee 1998). As if it isn't enough to have one of your limbs amputated, often there is one aspect which remains – the sensation of pain in a limb no longer there. One can feel the non-existent limb's presence and sense the movement of fingers in hands no longer there. As we have seen, until recently the consensus was that neurons once lost could never be replaced. The existence of phantom limbs corrected this fallacy. The brain and its neurons are especially plastic when we are young and remain plastic even as we age.

Recognizing the brain's tendency toward maintaining stability, both Ramachandran and Sirigu found different ways to fool it into thinking that amputees had their original limb. The former used mirrors in a compartment that reflected the patient's remaining arm where the amputated arm should have been. That is, according to what the person's eyes saw the patient had two arms. The patient then was asked to move both hands. This suggested to the brain real movement from the lost arm. At this point the pain went away because the brain no longer had to maintain the limb's continued existence by way of the pain. Sirigu accomplished the same thing with similar results through a video apparatus. The phantom is the brain's way of insisting on a consistent body image in face of change. This consistency is essential for the brain to continue functioning normally. It is also taken to illustrate the importance of the brain's mute reflexivity and of maintaining continuity as well as the struggle to retain the system as a whole. All of this seems necessary but not sufficient for the self of symbolic self-awareness.

The Transient Core Self. This is the self of the moment and of Mead's immediacy. It has no content other than sensory, transient experience. It is limited to experiencing the non-verbal apprehension that it is you doing the feeling in the moment. According to Damasio (1999:16) "The scope of core consciousness is the here and now. There is no elsewhere, there is no before, there is no after." Some change in the organism's routine is important in instigating the core self and its consciousness. Damasio (1999:168) says "We become conscious, then, when our organisms internally construct and internally exhibit a specific kind of wordless knowledge – that our organism has been changed by an object." He goes on to add that "the simplest form in which this knowledge emerges is the *feeling* of knowing. . ." (Damasio 1999:169). This is a crucial choice of terms and implies a wordless apprehension that something just occurred of which a self is aware. It is a feeling with a domain of its own like anger, excitement, or love and it carries with it the two phases of knower and known.

The Importance of Embodiment to Full Selfhood. Patients with anosognosia offer concrete evidence of the necessary part that the proto self plays in the construction of the self of symbolic self-awareness. The body offers to the mind precisely what is lacking in the selfhood of anosognostics. Viewing the mind as basically disembodied is to miss an important, emotional dimension of self and cognition. Thought consists not only of content but of *valiance*. The content of an idea exists on a continuum from bare recognition to full realization – from merely "subsisting" to "fully existing" – from being on the edge of consciousness to taking center stage in consciousness. A thought can fully exist as when someone is "hit" with a realization that they have forgotten to bring the ring to the wedding or be in awareness but not register as a mother tells her son to "drive carefully" as he leaves the house. The determinate of this continuum is precisely how embodied the thought is. The same applies to the self. Depressed patients can be fully aware that they are breathing and are biologically alive but insist that they are no longer real as persons and do not really exist. On this level they only subsist. The feelings of the body then play an important part in the human apprehension of the self and what we will consider, forget, or ignore.

The exclusive cause of anosognosia is damage to the somatosensory cortices (Damasio 1994:63). However debilitating severe strokes and paralysis can be, most patients still continue to refer what is happening to themselves. Since they are conscious of the fact that this is happening to them they feel the difficult, but appropriate emotions of the loss, as well as concern for those who care for them and for the consequences for their futures. Damasio (1994:237) points out that no anosognostic has ever made such a self-attribution. Not one says in effect, "My God! I no longer feel any part of my body; all that is left of me is my mind." Neither can they tell you when the problem, started. Not only do anosognosic patients lack the ability to attribute what is happening to themselves, but they also lack the feelings appropriate to their situations. This is true for self-related emotions of sadness and anxiety, but it is also true for emotions of concern for others and especially those who must care for them.

As described in the last chapter, highly intelligent anosognosics can think that their paralyzed arm belongs to some one else. Regardless of what doctors say they insist that there is nothing really wrong and that they will be back to normal soon. When they are told differently they sometimes show brief acceptance but soon snap back into denial. Damasio thinks that lacking current somatic input they cannot update the recognition of their bodily states. Being intellectually sound and having intact memories, they form mental images of what their bodies were like before their strokes and, as Damasio puts it, "since their body was fine, that is what they report." They have no feeling – emotional or sensory – of their bodies in the present and thus, no feelings of those constant somatic perturbations necessary to a fully existing sense of self.

The damage done to these patients is in the right hemisphere, namely to a select group of the right somatosensory cerebral cortices. We will remember that the somatosensory cortices lie behind the motor cortex crossing the brain and ending at the temporal lobe. They include the insular deep to the inside of the temporal lobe. This system collects, and is the final step in producing, the external and internal feelings of the proto self. Damage also affects the white matter in the right hemisphere disrupting the intercommunication among those parts of the brain responsible for self-mapping. The right hemisphere offers the most comprehensive meeting ground for signals from the somatosensory sectors. The right hemisphere is also generally more productive of emotional feelings than the left (see Damasio 1994: 65). This damage paralyzes parts of the left side of the body. In anosognosia it also means that emotion and feelings emanating from right side are either nowhere to be found, or seriously limited.

Mead's Forgotten Emphasis on the Semiotics of the Unconscious. Damasio's patients demonstrate that disembodied minds are seriously compromised in their functioning and this applies to minds in general. This is only one of the ways that neuroscience and empirical experience with patients breaks down the age-old antithetical contrast between mind and body as well as underscoring the importance of the mute reflexivity identified by Merleau-Ponty (1945). The implications of Damasio's work with anosognosics and with patients traumatized in the parts of the brain that integrate cognition and embodied emotion indicate, as we saw in the last chapter, that a semiotic relying exclusively on significant symbols is more appropriate to psychopathology than to normal human behavior (see Damasio 1994).

A Self for Social Interaction. Any time we use the pronouns "I," "my," or "me" we are referring to ourselves. This does not prove the self's existence, but the frequency of the use of these pronouns in everyday speech means that the self is a focal point in our thinking and social communication. It also hints at the strong possibility that the evolutionary origin of the consciousness of self as expressed in language has to do with a very social animal that must coordinate his or her actions and intentions closely with others in the group. Chimpanzees, dolphins, and elephants also share this capacity. The human ability to recognize oneself in a mirror emerges around 2 years of age along with the onset of the use of "I" and "me." While the term "I" implies a linguistic distinction between self and others, the effective use of the term involves a thoroughly social process. This process is not one of literal imitation because the child is never referred to as "I" but by name or as "you." The term "I" can only be comprehended from the perspective of the group – as what others call themselves. This is not a matter of simple conditioning; nor do others directly teach it. It must the grasped by the child for him or her self in order to interact with others.

Daniel Dennett (2003: 46) takes a position, which also stresses the social self as a flexible controller of one's own behavior:

> It is only once a creature begins to develop the activity of communication, and in particular the communication of its actions and plans, that it has to have some capacity for monitoring not just the results of its actions but of its prior evaluations and formulations of intentions as well.

This, according to Dennett assumes a self: "In fact," he says:

> . . .we wouldn't exist as Selves. . .. If it weren't for the evolution of social interactions requiring each human animal to create within itself a sub system designed for interacting with others. Once created, it could also interact with itself at different times.

In a vein familiar to symbolic interactionists Dennett quotes Wegner (2003:314): "People become what they think they are, or what they find others think they are, in a process of negotiation that snowballs constantly."

Another aspect of Dennett's rendition of the self that is endemic in the neuroscience literature is its connection with the past. "A person has to be able to keep in connection with past and anticipated intentions, and one of the main roles of the brain's self is to act as a *center of narrative gravity* providing the "me" with the means of interfacing with itself at other times." Whatever the cultural differences are in the selves they construct, a conception of self is necessary which allows for self-monitoring. In the process of evolution this became necessary with increasing behavioral options and the need to weigh different courses of action in advance and predict their probable outcomes. As social interaction became so important for the survival of a relatively small and slow animal, the predictive function had to focus on the actions of one's self and on role-taking which underlies our sense of being in control of actions and participation in an ongoing stable social and moral community.

A Self for the Normative Order. In the last chapter we discussed one other way to argue for the self's sociological function. This is through the self-reflexive emotions and through their embodiment, which is vital to the part emotions play in social control. We all have our moments of embarrassment, shame, and guilt that are virtually the emotional earmarks of being a socialized person. Without a self we would not be vulnerable to these emotions. Without their pain or their anticipation, we would have no *personal* reasons for exerting the self-control of behaviors that minimize these emotions and make us accepted members of a society. Neuroscientists Gazzaniga, Wegner, and Schacter also see these emotions as central to the self. This is important for sociology because, like the more cognitive view of self-awareness through taking the role of the other, it breaks down the reified distinction between self and society. It blurs the contrast between the public and the private insofar as it is in our privately felt self-interest that we follow pubic decorum. The broader implication of this is that there is no society without selves and we have no selves without society. Self and society become just different foci of the same process. This places the self on the same level of importance for sociology as the concept of social structure since they are both implicated in each other (Scheff 1990).

Culturally Bound Selves and the Generic Self. There is an important distinction between the ideologically tinted self of western individualism, often pitting self-interest and altruism against each other as contradictory motivations, and the more generic role-taking process emphasized by G.H. Mead. A particular culture-bound notion of what constitutes the person or self is separate and distinct from Mead's content-free *process* of the self-control of behavior by using the anticipated responses of others to guide ongoing conduct. The psychologist Edward Sampson (1981 and 1988) scolded colleagues of his time for accepting the indigenous cultural assumptions about the self-contained isolated person as an objective model of the self. He showed how the popular notions of the self-contained individual, exemplified so well in the cinematic portrayals by John Wayne, served the ideological functions of western capitalism much more than an accurate understanding of the human self. As Geertz (1973) stated it in an oft referenced quote:

> (T)he Western conception of the person as a bounded, unique, more or less integrated motivational and cognitive universe, a dynamic center set forth contrastively both against other such wholes and would seem to us a rather peculiar idea in the context of the world's cultures (Italics and parenthesis added.).

Sampson joined Elias (1982), Tuan (1982), Westen (1985), and Buameister (1986) who viewed theories that set the self off from others as a western "egocentricity." These battles with the cultural biases of cognitive neuropsychology are as relevant today as they were 30 years ago, even though some present neuroscience research is attempting to correct the self-contained picture of the self.

Cultural variations in the nature of persons can be arranged according to two dimensions. One has to do with where the person obtains power and efficacy; the other has to do with boundaries to the self, i.e., where does one seek the differentiation between self and others? Western society sees this boundary within one's skin which sets others "contrastively" apart from the self in Geertzs' words. The power of the self is also located internally in self-esteem and love for "number one" in the vernacular of the American "self-help" literature" of the 1970s and 1980s (see hyperlink "http://www.informationliberation–The"*The Century of the Self* for a critique). In many primitive societies studied by anthropologists, the power of the self, as well as its boundaries, are located external to the biological individual in the family, group, or the totem. Such cultural variations on the nature of the person can be seen as cultural self-concepts and have to do with selves as reflexive *objects* regardless of how they are conceived in various cultures.

In stressing role-taking, Mead was formulating *a generic* theory of how symbolic reflexivity developed out of communication. He was talking about the self as a social *process* rather than an *object* to be construed culturally. Evolutionarily, the self-consciousness involved in the process of role-taking gave flexibility to human behavior that mere conditioning did not. What is anticipated in this context is not the social response to one's whole, unitary "person," however, this may be culturally construed. We only anticipate the response to *specific bits of one's emerging behavior*. For example, one may anticipate a negative reaction to the word "liberal" or "taxes" when appealing to a conservative audience. Focus here is not on one's whole personhood but on the use of certain words. This point is seldom made, but it is important in clearing the way to a notion of self-process that transcends culturally relative indigenous belief systems. Some have argued that self-awareness was a recent historical development rendering Meadian theory ethnocentric. This criticism ignores the important difference between culture-bound assumptions of the person and the very delimited process of reflexive behavioral control described by Mead. The Buddhist exercises designed to eliminate ego concerns of the western self, do not entail eliminating the effective communication that takes other's responses into account. The two meanings of self are very different from each other.

Literally speaking, self as process should be denoted as a verb, i.e., "selfing" which, as any activity, is episodic and discontinuous. It is not to be reified and given the stable, enduring content of a noun as in the western tightly boundaried, subjectivized self of contemporary western culture. Granting that the term "selfing" may be awkward, "reflexivity" can be used instead. This means the process of simultaneously reacting as a subject to our own actions as objects, that is we are both observers and the observed at the same instance. In this sense there are no selfless societies even in those cultures where the self as individual is significantly underemphasized.

The Brain Processes Behind the Social Self

Damasio has detailed the anatomy of the proto and core self with the goal of eventually demonstrating the importance of embodiment in constructing a clear sense of one's self and the minds of others. He has demonstrated how the boundaries of self can be distorted in cases of anosognosia. But we have explored more specifically some forms of emotion and their embodiment which are also necessary for rational decision-making and the sense of self as agency, as well as for the symbolic reflexive self.

The claim that special structures and functions exist in the brain exclusively devoted to self-processes and nothing else has been difficult to establish. Discrete functions like sight, language, and face recognition have well-defined areas of specialization devoted to these capacities. These areas have no other functions other than supporting those specialties, i.e., they serve nothing else. Ideally, establishing such specialization for the process of self-reflection would necessitate demonstrating that the supporting system is physically and functionally distinct from other general-purpose brain processes. This would also involve identifying where such a brain area is located and determining whether the way it processes information is distinctive.

At this point we also need to be reminded that neuroscience is in its childhood and that appropriate cautions about the validity of its findings comprise the better part of wisdom. This is even more the case in what follows about the brain's different supports for the sense of self. This particular area is truly in its infancy. The parts of the human brain are much more like clouds than clearly defined parts of clocks. Furthermore, the brain is amazingly plastic and has an amazing ability to change its wiring. In many cases, other parts can be recruited to take the place of damaged ones. Rather than having one function, brain areas can have many of them in contrast, for example, to the systems that give exclusive priority to hearing and sight. To make matters even more ambiguous, every brain is somewhat different and brain surgeons have to make very sure that they consider this before using invasive techniques. The fact that many brain areas supporting the self have multiple functions is not illuminated by the fact that there is often disagreement and contradiction about what these are. Often the brain works in holistic manners which we only vaguely understand and are at a very early stage of exploring. The same goes for body chemistry and genetic contributions even though there is a young and capable contingent of sociologists working on possible effects of these influences. We have no final word at any of these points. So what follows is simply a story of what has currently been achieved in the neuroscience of the self and its relatively rapid development.

So far in this chapter we have found that there are numerous facets and kinds of self which seem to depend on various brain areas and their processes. Some are "cortical midline structures" involving mirror neurons and bridging the gap between self and other. There is also a "C" system of brain areas which involves the reflexive self, then we have the "self we take Anthony Greenwald e for granted" called the "X" system and finally, the "default system" which is the self at rest tending to ruminate about itself instead of practical actions it can take on the world. Some conceptualizations regard the self as represented by both cortical midline structures (the so-called default network which is the self at rest) and mirror neurons. These bridge the gap between self and other. Other researchers identify a "C" system and an "X" system of brain areas representing controlled and automatic self-process, respectively.[2] How consistent the conceptualization of the first pair (involving cortical midline structures and mirror neurons) and the second pair (emphasizing the "C" and "X" systems) are to each other remains to be seen. These are elaborated below along with Zimmer's early picture of the neurological self, which simply acts as a baseline for these later developments.

The Recent Search for Dedicated Brain Areas Underlying the Self

Currently, a number of neuroscientists are devoting a great deal attention to identifying those brain parts which are activated when persons are thinking reflexively as subjects about themselves as objects. If the human self-system is an evolutionary product forged through its contribution to rates of genetic survival in an animal dependent on group skills and capacities for self-awareness, this should be reflected in the way the brain is organized anatomically. As in the Broca's and Wernicke's areas, one might expect specialized brain structures and functions for the act of self-reflection that are separate from other areas with their associated functions. (This is not to ignore the fact that the two speech areas act in concert and are connected to each other by many fibers.)

Problems with the Separation of Self and Others. While this search is still an ongoing enterprise, several things have become evident. One is that the brain devotes a great deal of its energy to the construction and maintenance of its biological self as a unitary system. The other is that *the same brain activity that constructs the self is also involved in the brain's construction of others as minded persons.* That is, parallel to the human recognition of one's own selfhood is the recognition of the mindedness of others and it is hard to separate the two activities.

The avenue of neuroscience research into the construction of others' minds borrows significantly from cognitive psychology's interest in "theory of mind" or ToM. This concerns the persons' attribution of mental states, beliefs, intentions, desires, and pretenses to one's self and others. As such, ToM is the study of "mind-reading" and thus overlaps with Mead's notion of role-taking and its emphasis on anticipations of the responses of others so important in social interaction. The pace of this activity is such that focus is always one step ahead of itself on what is likely to be just around the social corner. We shall see that the brain devotes considerable attention to such anticipation of others' responses.

This raises some thorny problems for studying the relationship between self and other. I should note at the onset that we are not dealing with the proto and core selves which underlie the existential notion of isolation, but the extended self of social interaction. Gillihan and Farah (2005: 84) think that if the self exists in the

[2] Thanks to Lucina Odin (personal communication, 2009) for her discussions with me on these matters.

brain,[3] there should be discrete areas of specialization underlying it. If, in fact, the extended self and other are not that distinct in the first place, then we should not be surprised if we cannot establish an exclusive area and function for the individual self as contrasted to the other. But if the self is also social then it should be coterminous in some manner with social processes. Hypothesizing a distinct area for self and another area for others runs counter to the sociological, phenomenological, and anthropological thinking that self and others are normally interconnected and not that distinct.

The clear division between self and others is also questioned from within the neuroscience camp by Iacoboni (2008:33). He introduces mirror neurons into the picture at just this point arguing that self and other are co-constituted. However, as with all attempts to overcome contrasting dualities, the fusion of the two must be done in a way that preserves the possible tension. This is just what mirror neurons do. As Iacoboni (2008:133) writes:

> As we have seen time and time again-in every experiment ever conducted on mirror neurons, in fact-there is a stronger discharge of actions of the self than actions others. Thus, the mirror neurons embody both the independence of self and other by firing for the actions of both. But, they embody the *independence* we simultaneously feel and require, by firing *more powerfully* for actions of the self (Italics added.).

Cross-cultural research is clearly needed at this point since societies which do not assume isolated, individual selves and whose selves are more fused with others should reflect this difference in their neuronal activation, i.e., the discharge for the self as opposed to the other should not be as evident.

Initial Research on Special Brain Mechanisms for Producing a Sense of Self. Several early findings made researchers suspect that the brain used a different, more effective system to process information about the self as opposed to others. One was the finding that subjects were consistently better at remembering questions posed about themselves than the same questions posed to them about others.

In the earlier research described by Zimmer (2005) at least three brain regions are involved in retrieving information specifically related to the self or in producing a cohesive sense of self across situations. The first is the *medial prefrontal cortex* (MPFC) located between the brain hemispheres and directly behind the eyes. This area is especially large in the human brain and may operate indirectly as a gathering place that integrates memories and other perceptions into a coherent sense of self. Lieberman notes that the MPFC is “one of the most distinctively human of the brain regions.” He thinks that it may function for the self in a way similar to the way the hippocampus functions in forming new memories. The latter does not *store* memories on its own but creates them by linking together information from far-flung brain areas (Zimmer 2005:96). While the MPFC has functions other than constructing the self, it is distinctive in its greater concentration of “spindle” cells that are uniquely

[3] As put, this is a classic example of Brothers’ 2002 neuroism.

shaped neurons suspected to affect the manner in which the MPFC processes information. However, Uddin, referring to John Allman et al. (2002), thinks that spindle neurons have only been found in the ACC and insular cortices.[4]

Many of the early experiments tracked brain activities as subjects were asked to judge pictures of themselves which were morphed sequentially into pictures of someone else. The *anterior insular* became active when faces were perceived to reflect the subjects' faces. Thus, the insular may be involved in distinguishing self from other. In this regard the anterior insular is also activated by memories of the self as opposed to others. Other studies also supported the possibility that the insular (usually associated with emotions) was a part of a specialized system supporting the sense of self (Zimmer 2005).

The third brain area is the *precuneus* involved in retrieving memories about the self. Along with the hippocampus, the precuneus is the first region to be damaged by the tangled proteins in neurons producing Alzheimer's disease and the resulting loss of an autobiographical self. According to Zimmer (2005:101) these areas allow you to shift back and forth flexibly with images of your past and future. Alzheimer's patients have difficulty with this transition. In prefrontal dementia the medial prefrontal cortex is damaged and patients can undergo major changes in their personality.

Zimmer points out that the self is always with us and the neurons of the self-network are continually taking up energy while it recreates itself. The more energy a cell absorbs, the greater the risk of damage from toxic by-products making conditions ripe in later years for pathological conditions. Zimmer's notion of the self as continuous contrasts with the self of role-taking which is aroused episodically when action is blocked or the reaction of others is seen as consequential (Franks 1989).

Brain Areas Creating Self According to Zimmer

1. MEDIAL PREFRONTAL CORTEX (MPFC): Becomes more active at rest than when subsurving action. . .continuously stitches together a sense of who we are. May link far-flung parts of the brain.
2. ANTERIOR INSULAR: Relates information about self as opposed to others. (It has multiple functions and is critically involved in the bodily emotions of feeling.)
3. PRECUNEUS: Retrieves autobiographical memories about self. Involved in first person perspective – taking and experience of agency (Fig. 7.1).

Since 2005 there have been many qualifications and debates about these early findings that are most often limited to a preliminary correlation analysis which is not

[4] Thanks to Lucian Uddin (personal communication, 2009) for calling this to my attention. As we saw in Chapter 3 , the ACC system has to do with unconscious self-monitoring warning against possible error in our behavior. It warns us when our behavior my lead to a negative outcome.

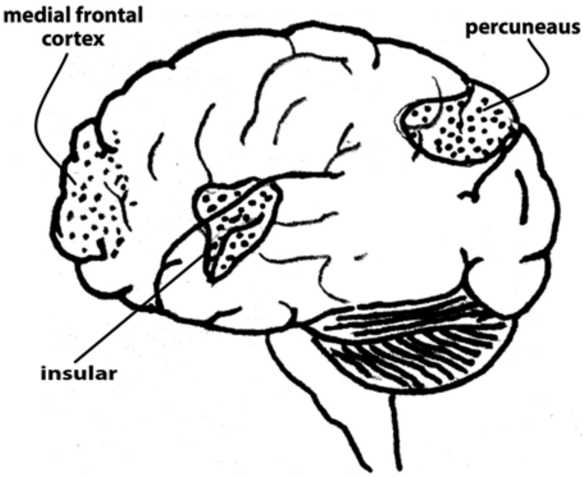

Fig. 7.1 Brain areas creating self according to Zimmer

capable of determining cause, nor can it eliminate alternative explanations. Many critics think that the brain areas noted above can be used when we think of others as well as ourselves and that we remember things about ourselves so readily only because they are so familiar – not because we have a special self-system in the brain. Distinguishing self from simple familiarity has become a major "control" issue.

Gillihan and Farah (2005) conducted an extensive review of 66 research projects on parts of the brain exclusively devoted to the individual self and exploring the question of whether or not these parts performed as a unitary system. This review made them conclude that the findings summarized by Zimmer were premature as he sagely warned they might be. Few studies tested the four major criteria for judging a brain part as "dedicated" to the phenomenological experience of a unified self, including establishing the necessary controls for accessing cause. Ruling out alternative interpretations of findings were very rare in the research reviewed, and not surprisingly, there was little convergence from the studies on similar findings.

Aspects of the self that were researched in these studies included the physical self, broken down into face recognition and body recognition (Does this face or limb belong to me?). Other areas included the sense of agency and the psychological self, divided into personal traits, autobiographical memory, and the first person perspective.

While the research reviewed was characterized by disagreement, some tendencies toward consistency did occur. Two aspects of the physical self seemed especially dedicated to the self. For example, we have seen that certain brain parts are necessary for the sense that a limb part belongs to its owner. While anosognosia refers to the denial of paralysis in a limb, a*soma*tognosia refers to the specific denial that one's limb *is one's own*. In this disorder, the patient sees the limb as belonging to someone else. Because there is no such mix up about other people's limbs, asomatognosia is exclusively self-related.

Gilliham and Farah define the boundaries to the self very narrowly in this review of 66 projects. If the brain parts and the subject's abilities under scrutiny have anything to do with others, the findings are seen as not pertaining to the self as defined in this study. However, it does not take a scientist to know that persons grieving the loss of a child or a love clearly recognize that a part of them is lost with the other individual.

Gillian and Farah's rigidly contained way of defining the self is not problematic in the case of asomatognosia which would cause difficulties in any culture, but generally their review assumes a western definition of the isolated self which precludes any findings that show a common system for self and others. The isolated self with clearly demarked boundaries is taken here as a definitional or methodological *requirement* rather a *question* to be tested. We have seen that this assumption of the self as antithetical to the other is a particular westernized view (and an ideological one at that) from the broad perspective of the world's cultures described by Geertz and many others, Iacoboni's work on mirror neurons, for example, moves us away from the possibility of the artificial separation of self and other made by Gillian and Farah.

Another discernable pattern of agreement about the existence of a special self-system emerged for the experience of self-agency in limb movements. This is referred to as autotopagnosia which would mislead one into thinking that it pertains only to the patient's body. Regardless of its misleading label, autotopagnosia is in fact characterized as a lack of ability to point to body parts belonging to themselves *or* others.

Asomatognosia is very different. Here, there is no difficulty in distinguishing self and other. Patients of asomatognosia see the distinction between self and other clearly and firmly believe that their paralyzed arm is not theirs, but that it belongs to someone else.

Since Gillihan and Farah (2005:84) define the self as isolated from others, they consider this as a *negative* finding. They say in effect that if autopagnosa were limited to one's own body (which it is not) that would be a *positive* finding implying that the representation of the self was special in neuroanatomical specificity and function (Gillian and Farah: 84). However, if selves are *not* in fact completely isolated from others on all scores, this may eventually turn out be *a positive* and instructive finding assuming if Geertz and others are correct in the actual blurring of boundaries between selves and others. This possibility appears often, but is unaddressed throughout their review.

Another pattern of agreement in these studies was the importance of the *medial prefrontal area* for emotional and person-related processing in general. They conclude that this is consistent with the hypothesis that self-related processing is a function of the same neural systems involved in other person-related processing, with the *self simply being the person we know best and care most about* since familiarity was not controlled. This unnecessarily minimizes the possibility that the self and other are fused – at least in important ways (Gillihan and Farah 2005: 94). This would seem more consistent with Iacoboni's approach which does not categorically separate self and other. In sum, Gillihan and Farah (2005: 93) conclude, "There are currently few appropriate data for testing the hypothesis that the psychological self is special, and claims to that effect are therefore premature." Given the acceptance of the western view of the tightly boundaried self and the date of their publication, this was likely an accurate statement. We shall now turn to see how things can change in neuroscience in just a few years.

More Successful Attempts to Join Self and Other. Lucina Uddin working with Iacoboni's team is a major figure in developing techniques that avoid neuroism and focus on the relatedness of the social self. Uddin et al. (2005) demonstrated that the *right fronto-parietal area* was more activated in viewing one's own face than it was when viewing faces of familiar others. Furthermore, when the fronto-parietal area was made dormant by the researchers, performances on self-other discrimination tasks were disrupted. Thus, Uddin et al. concluded that a right-parietal network was dedicated to the task of distinguishing self from others. This was consistent with the emerging picture suggesting a special role of the right hemisphere in self-related cognition. Lesions in this area were also involved in the disruption of body perception in anosognosia. Damasio (1994: 65) saw this incapacity as stemming from lesions in the somatosensory areas which include the mirror neuron packed areas 1, 2, and 3 of *the mid fronto-parietal* region and the *insular* exclusively. According to Uddin et al. (2005:154) when transcranial magnetic stimulation disabled the right inferior parietal cortex,[5] the recognition of one's own face was disabled but the left inferior cortex has no effect (Fig. 7.2).

In line with a less westernized notion of self, Uddin et al. (2007) produced evidence that self and other are two sides to the same coin. This held for mental processes as well as physical interactions (Fig. 7.3).

They also identify two large-scale neural networks that contribute to the construction of self and others. The first network is composed of the *anterior cinguate cortex, medial prefrontal cortex,* and the *precuneus* (see Fig. 7.3). We will remember these last two areas from Zimmerman's summary. As a whole they make up the "*cortical midline structures*" (CMS) that are in the middle of the brain going from

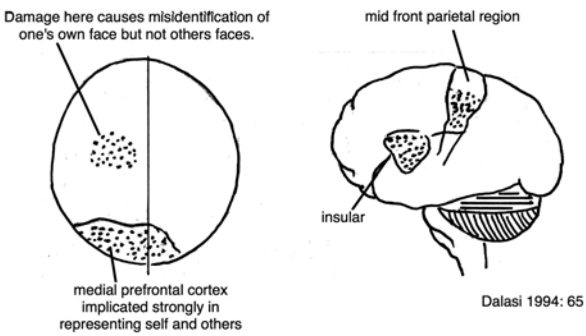

Fig. 7.2 Role of right hemisphere in self-related cognition

[5] We will remember that TMS is a coil place over a brain area to disable its effect.

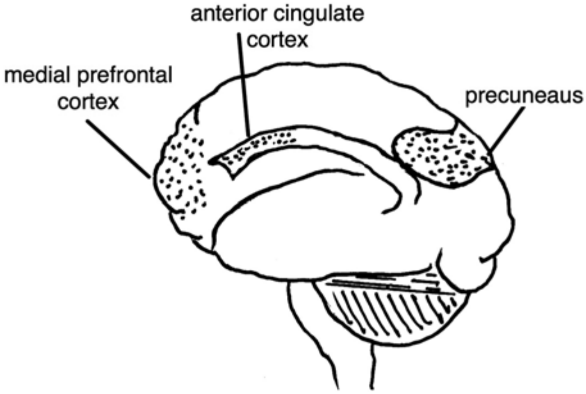

Fig. 7.3 Cortical midline structure

front to back seen from above. Following damage to the *right fronto-parietal area*, patients misidentify their own faces but identify others' faces correctly. The second network is composed of the right-lateralized fronto-parietal network and its overlap with mirror neuron areas. The mirror neuron system is involved in understanding the embodied self, like face and voice recognition, while the *cortical midline structures* are involved in the less embodied self as shaped by social relationships. The activity of this system is linked to "task unrelated imagery and thought" often taking the form of autobiographical reminiscences, self-referential thought, or inner dialogue.

Stress must be on the interaction of these systems rather than their independence. Iacoboni and Uddin free us from the encapsulated self seemingly assumed by Gillihan and Farah. Mirror neurons are especially helpful in dissipating the antithetical lines between self and other since what one observes in the movements and emotions of others is actually reenacted in the motor cortex of the observer. If Damasio's core self lays an embodied foundation for the linguistically constructed social self, mirror neurons lay an embodied basis for human intersubjectivity and the shared assumptive orders that make societies possible. At the same time that it joins self and other, the MNS (mirror neuron system) is critical for the individual sense of unity and agency. Activity in the *right fronto-parietal* network that overlaps with the mirror neurons in question correlates positively with persons' recognition of their faces in photographs. Here photographs of one' self are slowly morphed in incremental steps from all-self to an all-familiar other face (Iacoboni 2008: 143). Also, the purposive disruption by researchers of processing in the *right fronto-parietal lobe* by TCS, reduces self-face recognition ability. Following *right fronto-parietal* damage, patients misidentify their own faces, but identify others correctly in a condition known as "mirror-sign" associated with anosognosia. This suggests a causal role for this area in the important discrimination of self from familiar others. Although this is limited to physical face discrimination, the cortical midline structures relate to other similar abilities on the linguistic/symbolic level.

Uddin's Morphing Experiments. For sociologists, the most critical of Uddin's findings had to do with her morphing experiments when she was Iacoboni's graduate student. He was especially interested in her because she knew "practically everything" about the self and the brain issues he wanted to study with an emphasis on mirror neurons (Iacoboni 2008:144). As one would expect, Iacoboni was very familiar with the necessity of teasing apart the fact of self-recognition and the fact of familiarity. It could well be that certain brain areas were involved not so much in the discrimination of the self from other's faces and voices, etc., but that the brain area would do the same for any familiar face. They had to make sure that the effects they found were about self-recognition, not about changes in familiarity. In contrast to less satisfactory ways of controlling for familiarity in the past, Uddin selected the subjects *best friend*.

She and Iacoboni were stunned by the results of comparing brain activity as subjects who were looking at their own faces being morphed incrementally into the face of a familiar close companion. For self-recognition only, the relevant areas contained mirror neurons – the frontal lobe in the right hemisphere and one in the parietal lobe. The whole mirror system of the right hemisphere was involved in one's own face recognition.[6] Building on this correlative data, they used transcranial magnetic stimulation to cancel out the effects of the mirror neuron areas in self-recognition. Then they recruited the same subjects who were tested again. Her previous work had found that the two mirror neuron areas in the right cerebral hemisphere were most active for facial cognition. If this was the case, the electric coils placed over these areas would put them to rest and she could see if the mirror neurons were still activated. If they were not activated, one would have to conclude that mirror neurons were not a part of the casual chain in self-recognition. But they *were* activated. Her subjects showed reduced self-recognition after the TMS stimulation put the mirror neuron section to sleep. After applying other controls she still found that the *right supermarginal gyrus* (very close to the mirror neuron systems) was responsible for that reduction of face recognition. Mirror neurons profoundly link self and other. Uddin's work on morphed faces, according to Iacoboni, provides strongest evidence of the blending of self and other.

However, this may be, by the time we have seen how many brain areas are devoted to self in one form or the other, we must be impressed with the amount of space and energy the social brain gives to this capacity which gives guidance and sense to our behavior. Another generalization we can take from this is the enormous complexity of the brain, especially in terms of areas or structures which make multiple contributions to our different forms of selfhood.

Another early finding concerned a 75-year-old man who had a heart attack wiping out all memory of what he had done or experienced before. He was then given a list of 60 traits and asked if they applied to him. In spite of his total lack of recall, he gave answers about himself that were just as accurate as those given about him by

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[6] Iacoboni (2008: 147) explains that mirror neurons are about movement and the pictures of the morphed faces were, of course still. But mirror neurons respond to any still pictures involving movements like running and jumping. Morphing is perceived as change (that is, it's whole point). But there is another aspect in which we impute motion to a still photograph when we know it is in motion and this releases mirror neurons.

intimate family members. With no conscious access to memories about himself, his brain still produced self-knowledge of what he was like. This suggests that there are more than one distinct self-systems.

Different social structures may place differential pressures on such systems (TenHouten 2005). For example, feudal societies ascribed social status for the individual and left little choice for self-determination. This tended to encourage selves which were taken for granted and automatic. With little choice about the kind of person one could become, the forging of one's self-concept is relatively unproblematic. One's status was unassailable and guaranteed regardless of one's behavior. Contemporary societies, however, transfer these critical concerns to the individual. Freedom, however valuable to us, places an enormous burden on the person's construction of self as we attempt to choose occupations, spouses, life styles, and essentially who we will be and become. As jobs become less stable, recession increases, corporations downsize, and change in occupational identities become more common, this identity work increases even more. In a word, complex societies produce complex selves. Being one's self – once a taken-for-granted process – becomes a major issue as people struggle with the three foundations of identity – Who am I? What am I going to become? and How will I get there?

Lieberman and Eisenberger (2004) join brain and society by suggesting that there are two neurological systems, one which operates for relatively unconscious, habitual aspects of self-processes and another more complex processes wherein the individual plays a more active role in self-construction.

An earlier study by Lieberman et al. (2003: 92) suggested that the more complex system was built more on self-awareness and evidence-based factors while the other was habitual and intuition based. To tap into these two systems, their research involved brain scans of two kinds of subjects: soccer players and improvisational actors. Each group was exposed to three lists of words. One list contained attributes needed to be an actor. The second list contained attributes necessary for soccer players and a third list had adjectives that could have applied to anybody, such as messy or reliable. Both groups were asked to choose words describing themselves. When soccer players were selecting words which reflected attributes of typical soccer players (athletic, fast, strong), the same brain areas became active as when actors were selecting words descriptive of them (dramatic, performers, etc.). When subjects were asked about other traits which were not obvious parts of their roles, other brain areas became active. Lieberman et al. noted that responses to the first two sets of adjectives typical of the two roles took very little reflection because to be soccer players or actors they would obviously possess them. These answers were taken for granted, reached intuitively, and took minimum self-reflection to answer.

These questions concerned undeniable and consensually validated aspects of self, while the other questions concerned aspects of the self that were harder to establish and open to different judgments. For example, there is little question of a soccer players' speed, which can be measured, but whether he plays as hard as he is capable of playing might be more open to question and involves self-reflection.

The "C" System. When addressing the third set of questions that could apply to anybody, the subjects' answers demanded much more deliberation as each group often had to draw on their past to construct their self-conceptions. Because this involved reflective consciousness, the brain system that was more active in this context was referred to as the C system. These active areas included *the anterior cingulate cortex, posterior parietal cortex*, and the *medial temporal lobes*.

The "C" system: conscious self-analysis

a. involves personal memories used to solve similar conflicts in the future. Taps into hippocampus and memory retrieval parts of the brain.
b. When pressure from self-regulation is high, self-consciousness involved in "C" system is high.
c. Works in new situations when we have to think explicitly about our identities.

Brain areas involved in "c" system

a. anterior cingulate cortex:
b. posterior parietal cortex:
c. medial temporal lobes: retrieval of memories involving self; specifies the personal "when" and "where" context (Fig. 7.4).

Memory here differs from general memory in that it includes the particular context and the person's actual participation of the event. General memory is more factual and divorced from particular personal contexts. Remembering where and when one received an "F" on the last course needed to get one's degree will be more personal than retrieving the objective meaning of "F." In terms of identity formation, high points and low points which focus on a sense of agency produce vivid episodic memories that the "C" system uses to solve similar conflicts in the future. The retrieval of such memories involves the *medial temporal lobe*, *the hippocampus*, and the *lateral prefrontal cortex*.

The self-consciousness involved in the "C" system is important when societal pressures for self-regulation are high. The availability of diverse identities and

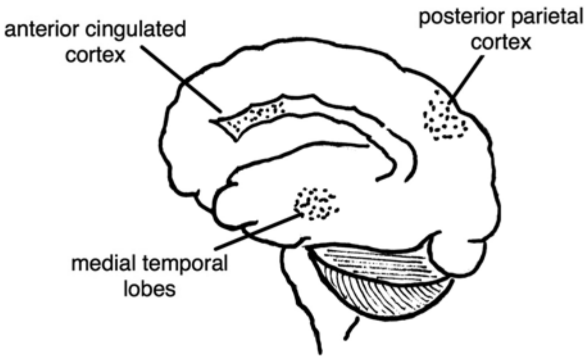


Fig. 7.4 The "C" system: self analysis

behavioral opportunities can create situations where persons feel "divided against themselves" as they struggle to control impulses that caused little concern to feudal noblemen whose salvation was assured by church membership and whose status was assured by the social structure.

The "X" system. The brain areas more active in answering the taken-for-granted traits which require little self-deliberation included *the basal ganglia*, the *ventromedial prefrontal* lobes, the *amygdala,* and the *lateral temporal cortex* (Lieberman and Eisenberger 2004). Since this system deals with an automatically known part of the self, it is called the "X" system with the "X" designating reflexes as opposed to self-reflection. The authors suggest that this system automatically generates the emotional and social aspects of the stream of consciousness, habits, and impulses that guide daily routine.

In arguing that the two are different systems, Lieberman applies this to a possible explanation of the 75-year-old deprived of an autobiographical, episodic memory but nonetheless described himself as accurately as did his daughter. While he had little difficulty with using his unconscious "X" system in making judgments of his obvious traits, the lack of memory in his "C" system could have prohibited him from constructing his more conscious reflective self. "X" system

a. Instead of memories it encodes intuitions. It taps into emotional regions producing quick responses.
b. Slow to form self-knowledge because it needs many experiences and associations.
c. Once it takes shape it is very powerful.

Brain areas involved in "X" system

a. basil ganglia
b. ventromedial prefrontal lobes
c. amygdala
d. lateral temporal cortex

An important change in the "X" system will be hard to establish on deep levels. For example, if persons have suffered with low self-esteem during much of their lives, attempts to alleviate this may lead to some linguistic changes in the more cognitive "C" system but it will have little effect on the "X" system (Fig. 7.5).

Finally, Uddin (2007:154) identifies the brain's "default mechanism" underlying its continuous expenditure of energy that maintains its ceaseless existence discussed above. Oddly to some, this system is most active when the person is at rest. These areas include (1) the *dorsal medial prefrontal cortex,* (2) the *ventromedial prefrontal cortex*, (3) the *precuneus,* and (4) the *posterior lateral cortices*. Activity in these regions decrease when the person is engaged in a task and attention is drawn outward. Subjective activities that activate these regions include inner speech reminiscences, and self-referential thought (Fig. 7.6).

Fig. 7.5 Brain areas involved in “X” System

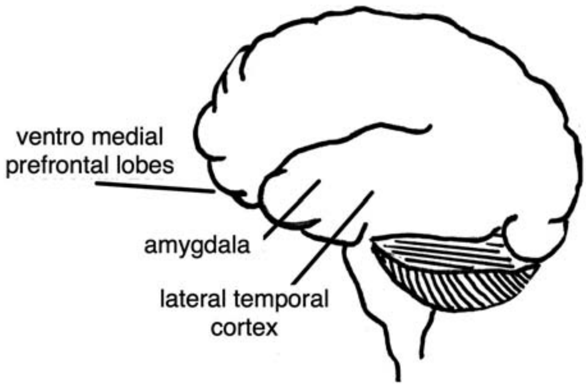
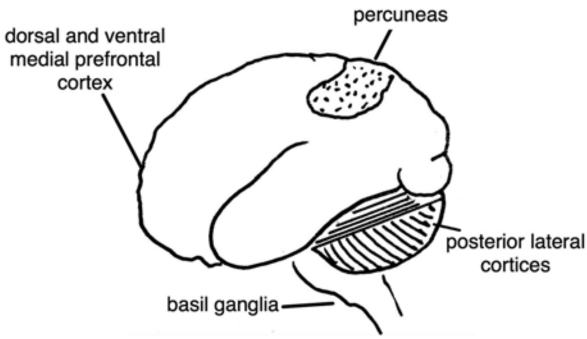


Fig. 7.6 Brain areas maintaining default mechanism



We have seen that mirror neurons are also important contributors to self – other relations. Growing evidence since Sperry suggests strongly that *right fronto-parietal* structures are crucial for self-awareness. Damage to this area produces a feeling of being out of one’s body, denial of limb damage, or misidentification of one’s own limbs – thinking they belong to someone else. This has long been confirmed by transcranial magnetic stimulation. The whole right hemisphere has a stronger reaction to one’s own face than does the left. In contrast, there is little consequence to self-recognition when TMS is applied to the *left inferior parietal cortex*.

In Uddin’s 2007 framework, mirror neurons help provide a link between self and other aiding the process of intersubjectivity. However, this must be qualified by the fact that they remain relevant to intentional bodily movements and cannot activate more abstract forms of self. Uddin et al. (2006) has provided the first evidence that disruption of the activities of the mirror neurons in the *right inferior parietal* lobe degraded self-face recognition.

Cortical Midline Structures. These structures show increased activities during tasks that require self-referential processing, or as Uddin puts it, they may *instantiate* the self. A number of brain regions have been found to support social and psychological aspects of the self-perception like self-referential judgments, self-appraisals, and personality traits (see Uddin 2007: 155). She suggests that a large body of literature supports midline activations during judging the social traits of others and correctly assessing social interactions. In short, *the medial prefrontal cortex* is heavily involved in accurate role-taking or theory of mind. These areas overlap with the default-mode-networks described at the beginning of this section.

In conclusion, Uddin and Iacoboni have been some of the few researchers who have escaped neuroism and directly applied neuroscience to an image of the self that is other-related. The picture they paint is of a special role of the right hemisphere in self-cognition. More relevant to the self-other link is the *right fronto-parietal lobe* in distinguishing self from other. Self-other discrimination is a necessary part of maintaining a distinct representation of self while engaging with others. This seems similar to Dennett's narrative self.

Epilogue About the Fragility of Self

This is a personal story about something which has happened to all of us in one form or the other, but it summarizes an important part of this chapter. One evening my wife and I were driving home from work. We were planning a trip. I was getting pretty exuberant about it and was waving my arms around and inadvertently touch the horn of our 1990 Toyota Tercel. It was small as four seated cars go with a horn to match that barely made a noise. It so happened that we were also passing a big pick up truck with huge tires that placed the whole thing way above our heads. We had to strain our necks to see the two guys who were screaming at us, shaking their fists, and honking their huge horn showing how dexterous they were with their fingers. They were truly some noisy, upset guys. We had obviously threatened their sense of selves as real men. It sure was easy! And that's my point. I'm glad we are still here to tell the tale!

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Chapter 8
Consciousness, Quale, and Subjective Experience

The miracle is that the universe created a part of itself to study the rest of it, and that this part, in studying itself finds the rest of the universe in its own inner realities

(John Lilly 1973:219)

From its origins in the philosophical structure of Chicago social behaviorism, symbolic interaction has retained a focus on consciousness and minded behavior. This is especially true when it focuses on lived experience. Concerted interest in the validity of studying the subjective aspects of life was given formal recognition in 1990 when Carolyn Ellis and Michael Flaherty organized a symbolic interaction symposium on the subject. This effort encouraged more scholars to be open to the study of consciousness and subjectivity. One participant in the 1990 symposium was William Wentworth (2002:15) who, like Mead, considers consciousness to be a result of the individual's participation in social communication, body, brain, and social interaction. For Mead, consciousness was an emergent from social behavior; it was not a precondition for such an act; the act was a precondition for it (Mead 1934:18).

This chapter examines how the subjective has been connected with consciousness by several noted philosophers and by neuroscientists who are interested in consciousness and the brain. Attention will be given to the concept of quale because it is the quintessence of the subjective, but for now, suffice it to say that the term quale refers to the subjective feeling of a sensation to the person. Persons who have different thresholds of pain experience different qualia.[1] It is the way things seem to us (Dennett 2001). Understanding LeDoux's work entitled *The Feeling of What Happens* and its potential contribution to the sociology of emotion would be very difficult without this concept. Even though symbolic interactionists have embraced the subjective, they seldom talk in terms of qualia. However, they are also interested in the embodiment of self and consciousness. The notion of quale becomes important in this context because just like Wentworth's "limbic feel," they are important messages from the "theater of the body" making us who we are. I discuss this issue because it is not a familiar concept to us. There is no question

[1] Quale refers to the singular case and qualia to the plural.

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about its validity. The debate in neuroscience is its usefulness. However, if one is interested in consciousness as so many leading neuroscientists are, qualia are what nudge consciousness along. Without qualia there are nothing to be conscious of. The problem is that the indubitable experience of quale does not appear to be amenable to science. This is what the argument is about. In my opinion those that reject the term supplant it with something else and we are presented with another word game.

What is Quale?

The direct "feel" of any sensation is its quale – the immediate sensual experience of something to the individual. This "direct" experience of a sensation is literally as subjective as anything can be. It is yours and yours alone. Once it is experienced there is no doubt that it is interpreted, but once again we need to go outside of language to make sense out of the term. While the usual sociological emphasis is on the objective qualities of significant symbols, Mead himself did not overlook the existence of a preverbal and thus, subjective, dimension of human activity; he just did not give it primacy (McAulay 1977).

The qualia of sensations and emotions are subjective because they are ineffable, non-verbal experiences changing within the same person from time to time and differing among persons. Kale tastes terrible to me but my wife loves it. It would be foolish to argue that one or the other person was just wrong or that the inherent qualities of kale are a different thing for different people. The qualities of the object remain the same; the difference is in the individual taste buds. It is the subjective taste that differs. There is no argument: that the quale of something to a person just is. Taste, for example, is a direct experience for you and you alone. Any college freshman trying to see just how much beer he or she can drink is aware of just how much its quale changes by the time she gets to the tenth beer. Even a pretty "wasted" person can figure out it's not the beer that has changed, but her experience of it. If a person could capture a particular quale in words, she could produce a certain sensation just by saying it. But the word "happiness" cannot produce the quale of happiness and the word "love" cannot produce the direct feeling of love. Suffice to say that your consciousness of your immediate thought and the quale of sensation are two very different aspects of concrete, lived experience – as it is happening for you right this second.

Next, we need to present the philosophical context in which these conversations about the concept of quale are imbedded. Most of this context comprises debates about the term, the concept of mind/body dualism, and dualism's leading proponent – Descartes.

Subjective/Objective Dualism. The question of mind and body has been an enigma for a very long time and many scholars have devoted effort either to making the two dimensions compatible or to showing how they are different. Some even see them as comprising antithetical realms. The latter position is known as dualism. It usually ends up making epiphenomena out of one side or the other. Dualism would force an either/or categorical choice between heredity or environment, mind or body, individual or society, and subjective or objective. If the contrasts are seen as contradictory, one side has to go. This eliminates the possibility of seeing both sides as implicated in each other or as necessary for the other side's existence. Dualism does not mean, as it implies, that both sides are given their due. It means that they are seen as incompatible. In the words of that great philosopher, Willie Nelson, it forces us to "choose and make everybody lose." Looked at transactionally, the subjectively and objectively measured passages of time clearly presuppose each other. Without an intersubjective, impersonal conception of 50 min we could not know that our classes may fly by for an engaged professor, but creep by at such a petty pace for some of our less-interested students.

Mead's Use of Transaction as a Way out of Dualism. Transaction not only allows us to appreciate the mutual reliance between the two sides but also allows us to keep the possibility of their tension (Lyng and Franks 2002). The term transaction is a part of the meta-theory shared by Mead and Dewey and Bentley (1949) in the "golden days" of Chicago pragmatism. The term is vital for a theory of consciousness that avoids Brother's neuronism – assuming the brain and consciousness can be understood as detached from the social world. Transaction formed the epistemological underpinning of social behaviorism and Mead's social theory of the act. This position avoided the futile, asocial debates between the enlightenment idealists and the empirical "copy theorists." Rather than conceiving of the link between mind and world as the rationalist's reason or the empiricist's bodily senses, pragmatists viewed the primary link as a result of behavior. We become conscious of the world by the way it responds to our actions on it.[2] In neurological terms this is analogous to the concept of "affordances" as described in Chapter 5 on mirror neurons and its implications for pragmatism in that we can only act successfully in relation to what an object allows us to do. This view made mind and consciousness dependent on behavioral process rather than arising from a substantial *tabula rasa*, self-contained in the head, on which experience could write carbon copies of experience. The latter would leave human knowledge as absolute – a highly suspicious implication. However, mind was not envisioned as a self-contained projector displaying its own structures on the world leaving nothing but our own ideas. This was the position taken by bishop Bererkley, the idealist who dismissed Herbert Blumer's "obdurate character of the world." The transactional view of the Chicago pragmatists was that human knowledge resulted as much from what our brains brought to the world as from what the impartial world brought to our brains. For Mead, when action was blocked actors had to turn self-consciously to their own capacities and determine what the impartial world would afford in relation to these capacities. In this way the pragmatists avoided dualism. As defined by Dewey and Bentley:

> If transaction assumes the organism and its environmental objects to be present as substantially separate forms of existence prior to their entry into joint investigation,

[2]Of course, language itself is a type of action, but as Lyng and Franks argue (2002), there are different levels of action depending on the amount of resistance that action must confront.

> then transaction assumes no pre-knowledge of either organism or environment alone.... (1994: 123).

We have already seen that free will and determinism cannot be seen as totally antithetical. We would be unable to evaluate what is possible if we could make no reliable predictions about how the world would respond to our own actions. Emirbayer (1997: 283–289) has made a more recent call for the same notion of transaction. He says:

> Uninvolved in a transaction take on their identity from the fluctuating roles they play within the transaction. These roles, seen as dynamic unfolding processes become the primary unit of analysis rather than the constituent elements themselves. Things are not assumed as independent existences present anterior to any relation, but gain their whole being first in and with the relations that are predicted of them.

The problem which is presented as we explore the coexistence of mind and body basically is this: How do we get from neuronal synaptic connections, which are essentially electrochemical processes, to our "lived experience" of reading these words, trying to comprehend them right here and now and deciding whether or not to drop it and go feed the cat. This is, after all, the most direct kind of experience we have. Descartes recognized this when he concluded that the one thing he was most sure of – or the only thing he could be absolutely sure of – was that at that split second he was thinking. From that realization he created what some consider the most dubious "sound bite" philosophy has produced: "Cogito ergo sum" – "I think, therefore I am." He could just as well have said, "I feel; therefore I am." Whether this conclusion was valid or a simple nonsequitur, we must agree that he was talking about the credibility of "direct experience" and its subjectivity. What "cogito ergo sum" does not do is to prove one's existence. No one but us can know our lived experience, whether it is our thoughts or our sensations. We may be thinking of things that are really not there, but the fact that we are thinking about them remains as certain as our breath, at least to us.

Thought, Sensations, and Mind

Descartes and most thinkers would consider both thoughts and the experience of sensations as creatures of the mind because our conscious lived experience in the here and now is the most fundamental aspect of existence which we can imagine. This means that mindedness consists of two very distinct dimensions – sensation and extrasensory symbols, the latter being more characteristic of humans. Mind therefore contains both immediate and direct sensations and hypothetical thoughts and thus, the intangible. Mind surely includes thoughts, but if we are to deal with the mind/body problem, we also need to include sensations or qualia because they are as different from electrochemical processes as are our intangible abstractions. Sensations usually arise from contact in one form or another with tangible objects located in time and space, while our intangible concepts are generally linguistic and therefore socially formed.

Perspective as Distance. In order to understand the nature of the mind/body problem in neuroscience, it is important to understand the enormous chasm between how we go about gaining knowledge of the brain's electrochemistry and how we understand quale. Science depends on taking a perspective. Things look very different depending on where you stand. In scientific thinking the best perspective is the broadest one possible. "Modern natural science owes its great triumphs to having looked upon earth-bound nature from a truly universal viewpoint, that is from an Archimedean standpoint taken willfully and explicitly, outside the earth" (Arendt 1958: 13). It was the great boldness of his imagination that enabled Copernicus to position himself mentally in the stars and to see earth from that vantage point. The vantage point of mathematics is even more imaginary. Objects do not consist of mathematical numbers. We see objects in terms of math, that is, from a mathematical perspective and like all perspectives, numbers are far removed from the concrete realities of the object. Note that most persons do not like to be considered a number because it takes away their human essence or humanity. The difference between a number and a numbered object is vast. Scientific explanations like cause and effect take a perspective far removed from the realities they "explain." Numbers are not inherent in objects; they change according to how many you are counting, but none of the individual objects change. More accurately, we look at things in numerical terms – a most distanced perspective and thus very different from sensual quale. If the goal of science is analytical explanation, which it surely is, then we must accept the fact that the end state of such an endeavor will be a very distanced one, far removed from the object itself.

Qualia as the Lack of Objective Distance. Scientific explanations have little to do with "capturing the reality" of something like the subjective quale of red. Similarly, in the sociology of emotions, there was an effort to gain perspective from looking at the feelings valued by different societies. It was found that many – though certainly not all –emotions in different societies were vastly different from those of our own and furthermore that these ways of feeling had a great deal to do with holding that particular social organization together and reaffirming it on the individual level in subjective feeling. Until colonizers outlawed the practice, the headhunters of the northern Philippine island of Luzon sought out an exalting feeling called "liget." It combined feelings of power and belongingness that could only be gained by taking some one's head. Believe me, the furthest thing I had in mind as a sociologist of emotion was any direct knowledge of the headhunters emotional quale of "liget"; I found the thought of such an emotion utterly distasteful, especially after reading some of the songs they sang of their conquest. My colleagues and I were quite satisfied with our distanced explanations of how the individual's experience confirmed the way their society was organized. It would have helped me not one bit to have actually felt "liget." Some of my peers still believe that the closer you get to the subject, the more you "capture the subject's reality" in some cognitive sense. However, that position contradicts the scientific method and such ineffable "capture" is not the goal of science. I would hasten to add that the scientific method is not the only way to think and that there are many types of knowledge.

In contrast, the experience of quale totally embeds you in it. Such close-up experience is the very opposite of distanced explanation. It tells you nothing outside of itself. Any cogitation is a distraction from it. To get distance from it is to destroy it. The best way to ruin any sexual experience is to be wondering if it was as good as it should be or if one's performance was good enough. Sensation gives you just what it is – sensation and nothing else. It is not about knowledge; it is about experience. Both are important, but they are separate and very different.

There is another way to make the same point about the irreducibility of the subjective "feel" of sensation. As we have seen, the notion of "umwelt" is a relational concept that refuses to separate the knower from the known or the organism from its environment. In other words it is a non-dualistic term. We have seen that umwelt refers to the world cut out for an organism's perception by virtue of its sensory transducers, cognitive capacities and its behavioral tendencies. Here the organism contributes as much to the perception of the environment as the environment contributes. Umwelt refers to what it is like to be a certain animal. Of course, we can never become bats or whales but if we could, we would surely experience the world very differently from the way do as human beings and the term umwelt emphasizes this notion.

Now suppose we knew every single thing about what caused a bat to be a bat. Suppose we knew all there was to know about echolocation with its very different way of perceiving through the ears and all the other plethora of experiences which are of distinctive of "batness" until we had it completely explained. Would we then see up close what it really was to be a bat? All the word-formed explanation in the world could not penetrate the irreducible subjective experience of the quale of the direct experience of "batness."

For the mind/body problem this means that the distanced cause and effect or mathematical approach of science will never penetrate the very personal experience of quale. We can never reduce it to other terms because then it would no longer be quale, which requires an organism to experience it. This is what is meant by the irreducible nature of subjective experience. To see quale from any other perspective but its own is to destroy its subject matter. But because the two dimensions of mind are irreducible in terms of our ways of understanding, does not deny both exist. Quale, consciousness, and thought are as brain-driven as the day is long. It is just that they defy capture by analytical processes. Some sociologists and philosophers disagree with this statement and reject the notion of quale because we, as linguistic animals, always interpret and categorize experience. Thus, they would argue that humans have no direct experience. But, again, as Katz (1999) argues, emotions are just what words are not.

Analysis first breaks objects and events into parts and then studies the relationships between them. As we have seen, this is very separate from our experience of them before such analysis. We can separate a substance like water into hydrogen and oxygen but we no longer continue to have water. Analysis also stops time in its tracks by breaking it into discrete minutes. In reality, time continues to move quite apart from our analyzing. Objective time is the essence of the hypothetical. It does not capture life as it is lived and experienced, nor is it supposed to. To explain your experience of red in other, more distanced terms are clearly a different endeavor from actually seeing red. They are both legitimate; they just should not be confused. It would be foolish to say that because the direct experience of red is not amenable to distanced analysis, it does not exist and is not an important aspect of our brains and personal lives. We are not merely firing synapses or molecules in motion. As we have seen, to insist that this is all we are is ontological reductionism and is rejected by most neuroscientists today. In short, mind matters!

The conclusion that distanced explanation can never penetrate direct subjective experience is inherent in the realization that human thought is an abstraction from life and thus, in an ultimate sense, thought is different from directly lived experience. None of this relates to the ontological question of whether thought or experience is real nor whether mind or body is "real."

Positions on the Connection Between Consciousness and Qualia

Damasio (1999) sees the problematic aspect of consciousness for neuroscientists as deriving from two closely related issues. The first problem is how the brain produces neural patterns which produce "images" or the representations of these sights of objects and sensations that become mapped in the brain. He uses the term images to include things as diverse as a person and feelings of touch, taste, and smell. To him the concept of quale is necessary to understand how the body produces these representations.

The second problem is that to be conscious of sensations, there has to be consciousness of the "you" who is having that sensation. This means that the self-problem and the quale problem are woven together in explaining consciousness.

A variety of thoughts and opinions on quale and the subjective aspects of consciousness have been developed by other well-known neuroscientists and philosophers connected with neuroscience. Here are seven different issues which stand out as important in this literature: (1) the meaning of consciousness, (2) how consciousness relates to subjectivity, (3) the selectivity of consciousness, (4) the unity of experience (known as the binding problem), (5) the intentionality of experience, (6) the significance of intentionality for human behavior, and (7) the relation of intentionality to self-consciousness. While we would be hard put to see the sociological significance of some of these issues, others may be more relevant. The relevance of the last issue is obvious, and sociologists Wentworth and Ryan (1992) have addressed the binding or unity problem. Consciousness does not exist independent of the discrete things about which it is conscious. We know that the brain edits raw reality and breaks it into these unified things. Wentworth and Ryan refer to this process as "a wonderful physiological foundation for social constructionism."

Like Mead (1936), John Searle uses consciousness to mean those subjective states of sentience or awareness that begin when one wakes in the morning from a dreamless sleep and lasts until one goes back to sleep at night or falls into a coma.

Above all, he says, it is a part of our biological process along with growth, digestion, and breathing.

However, it does have its own unique features, the most important of which is subjectivity. We relate to our own joys and pains in a way that no one else can. No one else can answer questions for us about how it feels to kill a rabbit or give a lecture. On the other hand, if I am asked what it is like to be a stone or a brick, there is no way I can answer because neither stones nor bricks are conscious. To Searle, the most important feature of consciousness is its subjectivity, and though he does not use the term quale, he adds that subjectivity includes the subjective experiences of sensations – how they feel to the subject now. He agrees that from the subject's point of view, this feeling cannot be challenged (Blackmore 2005: 203).

Consciousness should not be confused with knowledge, attention, or self-consciousness. If all perception is selective, some things take center stage in our consciousness and others are on the periphery. For example, if I am concentrating on my writing that effort takes center stage, and I am hardly conscious of the buzzer telling me that the clothes need to be put in the drier. It may not impact on my consciousness at all.

One can also be conscious but not self-conscious. Being conscious of rocks and stones or material things of every sort has little to do with consciousness of self. As an empiricist, Searle is looking for causal relations and his first step in finding the relation between mind and brain is accepting the fact that brain processes cause conscious processes.

This causal connection is not dualistic because the consciousness which the brain creates is not some extra entity or substance but a higher level feature of the whole system. Searle explains that "lower level neuronal processes in the brain" cause consciousness and the latter is just a higher level system which is the product of the first lower level systems. He is also aware that we do not know how this works but we only know that it does work. In the past electromagnetism was a mystery because it had no place in a Newtonian system. The mystery dissolved when the theory of electromagnetism was developed and the metaphysical concern vanished. Searle thinks that the same development may occur in our search for understanding consciousness. Once we recognize that conscious states are caused by neurobiological process, we can convert those states into a matter of scientific investigation.

He sees the unity of experience as an important feature of consciousness as do many others. The brain can have many complex ways of creating separate features, but we unify them into one conscious field. Another term for this issue is the "binding problem." To Searle it is much like producing different meaningful gestalts out of the same figures, all of which are cohesive wholes. A parallel can also be found in language where our awareness has to extend over enough time to bind the words of a sentence into a meaning in order to know what we are saying by the end.

Searle points to several common mistakes in consciousness studies. Until quite recently he notes, many thought that it was outside of the reach of science to explain qualia, but he takes issue with that saying that this is "precisely the task of neurobiology to explain these and other questions about consciousness." The second characteristic mistake made is to ignore its essential subjectivity.

We are still left wondering how he squares what he admits in so many words is the irreducible nature of quale with his faith in neuroscience's ability bridge the gap between the objective and the subjective.

Michael Gazzaniga notes that we do not attend to everything around us. He tells us to look around our rooms and then close your eyes. Do you know if it's dusty or how many pencils were lying around or how many pictures were on the wall or how many pieces of furniture there are? Your brain is processing all this, but the information is not making its way up to your consciousness. And although all this might be a blurring, disjointed confusion, the information is integrated into a nice package by our old friend, the binding powers. There are three prerequisites for information to make its way into our consciousness. First, it needs a certain time to get processed; second, it needs a certain degree of clarity. Third, it needs some connection with the attentional state of the observer.

Top-down processing can occur when you voluntarily focus your attention. This may be the result of activity in the thalamocortical neurons. Bottom-up processes occur when activities from the unconscious have so much strength that they capture attention whether you want to give it not. Attention and consciousness are not the same thing. Cortical processors control the orientation of attention. But there can be bottom-up unconscious forces of such strength that they can disrupt attention of attention.

Gazzaniga (2006) then proceeds to describe patients who have lost consciousness in certain parts of their body. Stroke patients traumatized in the right parietal lobes are convinced that the left side of their body and even the left side of their worlds do not exist. They certainly are not conscious of them. If you entered such a person's room on the left he would not be conscious of you being there. At dinner he would only eat from the right side of his plate. He would shave only the right side of his face. Even more curiously he would see nothing wrong with this. The information that escapes consciousness is irrelevant to him. This condition is known as "hemineglect." Patients who have had a stroke in their right hemisphere will be unconscious of sensory events located in the left side of the body even though that side is perfectly fit. Some patients may neglect half of their body. They will climb out of bed without using their left arm or leg regardless of being perfectly capable on that side.

Gazzaniga applied what he learned from the split-brain research to these patients. The patient does not experience two independent sets of consciousness coming from both sides of the brain because their corpus callosum has been severed. When the sensory nerves fail to inform the brain of their existence by communicating information (such as my arm is paralyzed), there is no way the patient can be conscious of this. If the physician held the patient's hand up to his face, the interpreter in the left brain has no way to know the right side exists. The patient insists that it is not his hand or it belongs to someone else and he believes just that.

Working directly with these patients made Gazzaniga realize that one essential thing about consciousness is its intentionality. It is constantly concerned with the world. First, we do not learn to be conscious; it develops automatically and there is no getting rid of it unless your brain stem snaps. Clearly, we do learn to be conscious of certain things. The ocean looks very different to a seasoned sea captain from the way it does to his passengers. Second, consciousness carries with it a *feeling*. Gazzaniga then adds that the feeling of being conscious never changes in life. Consciousness is a feeling, he says, a feeling about life that doesn't seem to change (Gazzaniga 1992: 204).

David Chalmers is a noted professor of philosophy who is also trained in neuroscience and psychology. At present he is director of the Centre of Consciousness at the Australian National University. His most noted theme revolves around the fact that science has failed to explain consciousness using its traditional methods. He breaks this failure into two problems. The "soft problem" in neuroscience is explaining how the brain operates to produce sensations in the first place; this is very different from the "hard problem" which is to make the subjective first person perspective fit in with the objective third person perspective. The hard problem comes about from the irreducible nature of quale that cannot be captured by science.

The soft problem is explaining each of the functioning parts of the brain such as focusing attention, deliberate control of behavior, discrimination of stimuli or differences in waking and sleeping. In comparison, the hard problem in conscious studies is explaining experience, i.e., what it is like to be a certain animal or to be in a certain mental state. Since the feeling of qualia is subjective, one might think that science was not able to deal with consciousness in general. Chalmers rejects this view. He feels that omitting consciousness would leave out what is essential to being human. This he calls the hard problem. There would be little quarrel about that. His first step in bringing consciousness back into science is to see consciousness as data; however, where he goes with this is not so clear. In the simple solution we might reduce consciousness into a physical issue but no one knows how to do this or if it is possible. If we have a certain sensation of blue and there are brain processes which go along with that, we call this a correlation. However we want more than that. We want to look a certain processes of the brain and to be able to tell just why this created consciousness. The soft problems are those which are aimed at understanding particular behaviors. But to explain subjective experience is even more challenging than explaining qualia. Perhaps this should be called the "very hard problem."

The process of discovery involves explaining the presence of the object in terms of other objects with which we are familiar. When an object or process seems to defy that kind of analysis we talk of its irreducibility, i.e., clearly, the final word on that has yet to be written. Space and time are good examples because they are considered as irreducible "givens." Consciousness may also turn out to be one of these givens.

Chalmers believes that if we are conscious there must be some evolutionary reason for it. He views it as a quality which was selected for its survival capacities. He also suggests that it gives us a world of meaning. It makes our lives comprehensible, interesting, and gives us a locus of value. Once again we are left with the necessity of the concept of quale for the exploration of human consciousness, but no guidance in how to study it scientifically.

Gerald Edelman (1992:114), another Nobel Prize winning neuroscientist, places special emphasis on the concept of quale. He takes issue with the prevailing opinion that qualia are separate from topics amenable to scientific analysis. In his opinion no scientific theory can proceed unless it includes the assumption that observers have sensation as well as perception. We must assume, he says, that qualia exist in others as well. Relevant human reports about such experiences can then be correlated with actions and brain structures. He does not deceive himself that this will happen soon but the central place that the notion of quale has in his theory is reflected in the title of his book, *Bright Air, Brilliant Fire* (1992: 114) which implies the importance of the sensual to consciousness.

Vilayanur Ramachandran, or Rama, as he is called, deals with patients whose sense of embodiment has changed; they also have experienced a change in their sense of selves and their experience of qualia. He agrees with Damasio and Edelman that in normal situations, without self we could not have qualia. We need a person who experiences it and for whom it is usually central to the existence of consciousness. Zen practitioners think the phenomenon remains, but the self does not. Of course there are many ways of looking at the self and it seems plausible that the Zen workers are talking about a self-involved western self. In the Zen world-view it is the self of desire and self-occupation which disappears, not the qualia. As a matter of fact, it is focused attention to one's bodily sensation that allows this preoccupation with self to happen. But Ramachandran rejects the notion of any total loss of self (defined in western terms) because it takes a conscious individual to experience it. Both self and consciousness exist together and each implies the other. He thinks self and qualia are falsely dichotomized.

At this point Ramachandran insists that this is not dualism nor is it neutral monism (the belief that every thing is either mind or matter). He points out that we need a self, which is conscious of itself and knows that it experiences red.

Summary and Conclusions

Looking at these selections from the work of some neuroscientists and philosophers who focus on awareness, we can conclude that an explanation of the connection between neuronal circuits of nature of consciousness and the closely related concept of qualia are accepted as appropriate areas of study by some neuroscientists and some behaviorists specializing in the philosophy of neuroscience. Probably most in the field are not comfortable with the subjective paradigm. Contrary to the scientists discussed above, Brothers (1997 and 2002a, b) tells us that if neuroscientists have one justified "emotion" it is fear of qualia.

On the other hand, there is a somewhat broad interest in the subjective aspects of the binding problem and the selectivity of perception which places one thing at the center of our consciousness and another on the periphery. Perceptual selectivity has strong social psychological implications, especially if we apply it to the relation to power and the perception of the concerns of others. Among the powerful, some people's desires count and those of others exist only at the periphery of consciousness. The history of the civil rights movement tells that story clearly enough. As several female executives have described it, "they just have a hard time focusing on what I say; I've just learned to say it twice." Qualia go beyond the senses. Even knowledge has it's own feeling (Damasio 1999).

Burton (2008: 218) devotes his book on certainty to feelings of knowing and conviction. His theme is that such feelings rely on underlying neurological ensembles independent of consciousness. They are mental sensations that happen to us. He sees the sensations of thought as critical for any theory of mind. These feelings are not the consequence of reason and deliberate thought. Using a process similar to the documentary method, he describes how these feelings determine what we will see as reasonable and confirm our unconscious predispositions. This adds neurological evidence for the well-known fact that individual observation is very often not so dependable.

Coming from a very different direction, but one that is so important for social psychologists, Robert White (1959) contributed significantly to the early sociological literature on self-esteem by balancing the "over-socialized view of man" with his conception of competency motivation. He called attention to the feeling of self as an active agent of the sense of effectiveness and its importance to self-esteem. The intrinsic joy of making something happen was a part of this discussion in the middle of the last century. White argued that a certain kind of self-esteem was derived from the experience of self as an active agent of making things actually happen and realizing one's intents on an impartial world. In contrast, a different feeling is produced by self-esteem bestowed by others and the concern about the opinion of others often associated with this bestowal. He argued that feeling that one was controlling situations and practicing self-competence had a different feeling than that of being liked (Franks and Marolla 1976).

This chapter has proposed that the subjective and its cousin quale is critical to expanding the theoretical range of sociology. I would hope that the exploration of subjectivity by sociologists might benefit from an exposure to the work of contemporary neuroscientists who address many of the same problems we do. My opinion is that subjectivity for its own sake is not enough; we will need to develop understandings of its role in human development and its impact on social interaction. The persons discussed above are by no means an exhaustive selection of those working in neuroscience or philosophy. I have tried to select a few who might offer some promising leads for sociologists interested in the embodiment of consciousness.

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Chapter 9
The Place of Imitation in Social Life and Its Anatomical Brain Supports

For non-reductionist sociologists, imitation may well be seen as less than exciting because it sounds so superficial. Imitation is learning an act from seeing it done (Rizzolatti 2005). During imitation the person transforms an observed action into an executed action that is similar, or identical, to the action observed (Rizzolatti 2005). I would suspect that some sociologists might see imitation as mere copying and disregard it as cognitively undemanding and even a childish form of behavior.

On the level of common culture, it is also foreign to the western ideology of individualism wherein one is supposed to be independent of others. In certain cases copying can be seen as an inauthentic. But underneath its surface, imitation hides a number of complex processes of interest to sociologists, especially those interested in intersubjectivity.

Taken literally, imitation would be like memorizing a formula without understanding its content, meaning, or application. However, to make imitation useful at all it must be generalized to many situations, and to do that one must understand the principles that guide the imitated act. Knowing these principles allows us to make changes in the imitated act according to the dictates of any number of social situations. There is much more to effective imitation than simply copying what some other person does. According to Dijksterhuis (2005) humans have an enormous capacity to automatically and unconsciously bring their behavior in line with their social environment. He points out that we not only imitate the observable behaviors of others (such as facial expressions or gestures) but also adapt multiple and sometimes rather complex aspects of other's psychological functioning.

Dijksterhuis sees imitation as an unconscious default mechanism and believes that not doing it is the exception. In contrast to chimpanzees, who are stereotyped as "aping" other apes and humans, it is we humans who are the experts; imitation in the sense given above is, indeed, a rare ability, however, it may be understood at first glance.

While observation alone attests to the existence of imitation in humans, establishing this as fact does not answer important questions about how it works. In Hurley and Chater's (2005) judgment, the most difficult problem in explaining how the brain creates imitation is the "correspondence theory." How is the perceived action of another person translated into a similar action by the observer? When a

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person imitates another person's hand-movements, one can see his own hands and adjust errors. This is not possible when you are imitating a facial gesture. Hurley and Chater also point to the problems in infant imitation when their bodies are so different from those adults they are initiating.

Imitation and Mirror Neurons Reviewed

It is possible that mirror neurons could answer this problem and that they are the dynamic on which imitation is based. The fact that these neurons fire both when we observe certain actions and when we enact these actions ourselves is not a sufficient explanation of imitation because the question also revolves around the ability to understand the *intent* of a person's action and *the ability to replicate this intent*. In some contexts this entails changing the motor means in order to achieve the inferred ends. Without some apprehension of inner intent, it would indeed be true that all we would have is rote and mindless copying. Understanding the goal is vital to imitating it successfully. In Chapter 5 it was stressed that the replication of the observer's act, which is simulated on the observer's motor cortex, makes it meaningful since in a way the observer is doing it himself. Mirror neurons need to have the whole context observed, or at least implied, in order to fire. As we have seen, they do not discharge when movements are observed without any hint of its purpose. The discovery that the mirror system overlaps with Broca's area and has an essential role in imitation suggests that language may depend on the capacity to imitate because we simulate other's mouth movements on our motor cortex. In fact, Iacoboni (2008) argues that evolution leads from action recognition through imitation to language. By enabling action understanding, imitation and the human mirror system may be the major basis for the intersubjective sharing of meaning that is essential for language. By now it should be clear that imitation is far from a simple subject and extremely relevant to the broader questions of our social natures and of society.

Furthermore basic capacities to imitate are with us at birth even if our imitative abilities improve over time. At one time, it was assumed that infants needed at least some minimal experience with others before they had the capacity to imitate and that imitation had to wait until they were about 1 year old. However, Meltzoff and Moore (1977) changed this view dramatically. Hand movements were imitated in the first months of life. Facial expressions were possible a few weeks after birth and evidence for the imitation of facial expressions were later found among newborns. The average age of these infants was a mere 32h old. Once more we have evidence of our profoundly social brain. Imitation is not simply something we learn (Dijksterhuis 2005: 209) although actors can perfect it. Humans share a neural system which has the ability to perceive actions of others and then execute these actions themselves. Mirror neurons discharge in situations of perceiving and of executing. Dijksterhuis concludes that we are wired to imitate.

The Scope of Imitation

Looking at imitation simply as fact, independent of neuroscience, has its surprises too. We are totally unaware of its ubiquitous effect on our daily lives and how much we accommodate to others in the smallest of matters. An early finding was the relationship between imitation and liking the individual whom you are imitating (Dijksterhuis 2005: 210). A correlation of 0.74 resulted from imitations of posture and liking the person imitated. Chartrand and Bargh (1999) went further than correlations and established cause by using confederates. The confederate either shook her foot or rubbed her nose at the researchers' direction. They found that the confederates who would rub their noses when face to face with a participant evoked nose rubbing in their subjects. The confederate who shook her foot evoked the same behavior in their subjects. The same researchers extended this finding by reversing the process. Now the confederates imitated the body posture shown by the subjects. The subjects who were imitated by the confederates liked the confederates more than did those that were not imitated.

Consistent with the above, Lakin and Chartrand (2003) found that those who wanted to affiliate imitated more. To make their subjects want to affiliate, the participants were presented with subliminal words related to affiliation like "friend" or "together" whereas comparison groups were not presented with such words. The subjects who were subliminally motivated to affiliate did so more than the comparison group not so motivated. When the confederate touched his or her face repeatedly the subjects who had been subliminally motivated did so too. Lakin and Chartrand summarize these studies pointedly. "If we want to be liked, we imitate more without being aware of it."

On the basis of these findings van Baaren et al. (2003) instructed waitresses to literately repeat the order for each customer on some days. On other days waitresses were to avoid this mimicry. Prior to this, the average tip which the waitresses received in a normal evening was established. It was found that exact mimicry significantly enhanced their tips whereas avoidance of mimicry reduced tipping (van Baaren et al. 2003). They see the function of imitation as a "social glue":

> . . . .imitation of postures, speech, and facial expression lead to greater rapport and liking, to smoother interactions, to mood contagion which can lead to more satisfactory relationships, and even to higher income.

Bargh et al. (1996) primed their subjects with rudeness or politeness. After the priming, they were asked to meet the experimenter at a different room. The experimenter was talking to another confederate when the subjects approached them. Participants primed with rudeness were 60% more likely to interrupt than the unprimed control group.

Other studies took advantage of stereotypes. These were the first to show an effect on behavior rather than simply liking or demeanor. In this case participants were primed with stereotypes of the elderly, words used were slow, grey, bingo, or Florida. When the participants were through with the experiment they walked to the elevator significantly more slowly than unprimed participants.

Another experiment used stereotypes involved in mental performance. In the first case, participants were primed with stereotypes of professors. They were asked to write everything down that came to mind about professors. The remaining participants were not asked to do this. The primed subjects were then asked to answer numerous general-knowledge questions which were taken from the game, Trivial Pursuit. Consistent with the previous study, primed participants did better on the questions than unprimed participants. Another group was asked to think about soccer hooligans who were associated with stupidity. These subjects scored much lower on the same test.

In sum, all these behavioral studies demonstrate the power of stereotypes and their effect on actions such as intellectual performance and interpersonal behaviors that are modeled in our social environments. Dijksterhuis (2005:207) makes the point that the activation of stereotypes and priming does not by itself elicit substantial behaviors but affects the parameters (like walking slowly or fast, elaborating verses being sloppy, etc.) of ongoing behavior. The authors' other points are that imitation covers an extremely broad domain of behavior. In making us like each other more it leads to smoother and more pleasant interactions. Dijksterhuis implies that imitation is *the* social glue, but it is a fragile one and imitation leaves out other processes that can draw us together like role-taking, language, and other processes critical to creating intersubjectivity.

Cognitive Psychology and Imitation

If the fact that we imitate and the breadth in which we do so are clear, the neurological foundations for imitation as ongoing processes are far from certain. According to Hurley and Chater (2005) imitation is different from other forms of learning which may look similar on the surface. Depending on the discipline, there are different accounts of these forms of learning. We have seen that there are two cognitive phenomena which comprise imitation.

First, we must make sense of the other's actions. Second, we need the capacity to replicate it. In this case, the motor means are open and variable. Second, both the goal and the motor-behavioral means for achieving the goal may be activated and there is a broader and more literal replication of what is observed. This implies an understanding of what another person is doing and the ability to use that understanding only in certain conditions (Rizzolatti 2005:56). Whichever the case, the neuroscientific mechanism underlying the understanding of an action has to include a direct matching of that action with its representation on the motor cortex. But direct matching of the action and its motor system is not enough; other brain processes that modify and change the mirror neuron system must compliment it. Rizzolatti thinks that action understanding precedes imitation and (it appears to me) is an additional processes.

The Correspondence Problem. The way in which this understanding is accomplished in the brain is designated as the "correspondence problem," and its solution is a necessary prerequisite for a full understanding of imitation. According to Hurley and Chater (2005), when we imitate another's hands, we can observe our own hands although the perspective is different. When we imitate facial gestures, however, we cannot see our own faces. How then is the mapping on the motor cortex achieved? We need to know what mechanisms are involved in such mapping; this becomes even more important when children imitate adults, especially when the bodies of children and adults are so different.

Hurley and Chater suggest that a promising avenue lies in the fact that certain neurons provide a link between perception and action. Some of these neurons are referred to as *conical* neurons. They fire in two circumstances: when a certain action is perceived and when they reflect "affordances" – i.e., those objects which we perceive will answer to, or allow, our ability to manipulate them. Gallese, in Hurley and Chater (2005: 108), describes conical neurons as firing at the observation of objects of a particular shape and size in the absence of any detectible action directed toward them. On the other hand, mirror neurons are sensitive to the actions of others, but they are also sensitive to equivalent actions of one's own (Hurley and Chater 2005:3). They can be very specific. Certain cells fire when a monkey brings food to its mouth, but they will also fire when another monkey, or the experimenter ingests food. This is true even when the monkey cannot see his own hand.

Mirror Neurons and Intersubjectivity. Gallese's (2004:102–118) version of mirror neurons is that they are sources of the sense of having experience of common experience with other people which obviously relates them to intersubjectivity. To him, mirror neurons are part of an automatic understanding of others. Imitation mirror neurons are important for that process.

According to Susan Jones (2005:206) until we have single-cell recordings on mirror neurons in humans, there will always be reason for caution. She says this doesn't mean that mirror neurons are not involved in imitation, but that we need to know more. There is substantial neurophysiological evidence for the existence of clusters of neurons that become active when actions are both observed and self-initiated. However, Decety and Chaminade (2005: 119) claim that while such activation is necessary, it is not sufficient to form an understanding other's intentions underlying bodily movements or a sense of agency. They feel that exploring imitation at the neural level can give clues to how we share intentions through social interaction. To them, as well as Gallese and Iacoboni, imitation is the means by which we develop intersubjective transactions between the self and the actions of others.

Iacoboni (2005:88) then summarizes what he considers the most current and meaningful findings on the neural underpinnings of imitation in order to relate it to the neural processes of language and empathy among other domains. The last two capacities are of obvious relevancy to intersubjectivity.

For Iacoboni, the neural basis of imitation is in its first stage. The neuroscience of imitation has been limited by the lack of consensus on its definition as well as the hesitancy of researchers to tackle such complex problems. He, too, starts with neurons in the superior temporal sulcus responding to moving hands, faces, and bodies. What these neurons code is the sight of meaningful interaction between an intentional agent and an object (Iacoboni 2005: 78). However, no neurons of this area have any connection to motor behavior. Iacoboni hypothesized a division of labor between the frontal and the posterior parietal mirror areas. The frontal mirror areas would code the goal of the imitated action and the posterior parietal mirror areas would code somatosensory information relevant to the initiated action. This was confirmed in his lab. Finding a solution to the correspondence issue is especially important because of the critical role imitation plays in developing the forms a foundation for language acquisition.

Brass and Heyes (2005) bring up the intriguing possibility that imitation may be something that mirror neurons *do*, but this does not mean they are for imitation. Monkeys clearly have mirror neurons but, at least according to some authors, they do not imitate. This places us in doubt that mirror neurons "are for" imitation.

Currently there are two views on solutions to the correspondence problem. Adherents to the specialist solution suggest that imitation is founded on a special-purpose mechanism. Generalist theories take the position that imitation is founded on general learning and motor control mechanisms.

Brain Areas Involved in Imitation

Once again, we need to be aware of that the evidence presented here for the anatomical supports for imitation is in the process of development. We do not have anything close to what could be seen as closure on this subject. Nor do I expect the reader to remember all of the brain areas which will be presented. Hopefully the illustration will suffice to demonstrate the complexity of these matters.

Brass and Heyes (2005) say that the inferior parietal cortex is involved in imitation. But the role of the posterior part of the inferior frontal gyrus is still an open question. Brain regions involved in imitation are sizable. They include the inferior frontal gryrus (pars opercularis and pars triangularis), the dorsal and ventral premotor cortex, the inferior parietal cortex, the superior parietal lobule, and the posterior superior and temporal sulcus. These areas are consistently active during imitation. There is consensus that the inferior prefrontal cortex is involved in imitation, but controversy exists over the posterior inferior frontal gyrus because of the lack of satisfactory measurements to date (Fig. 9.1).

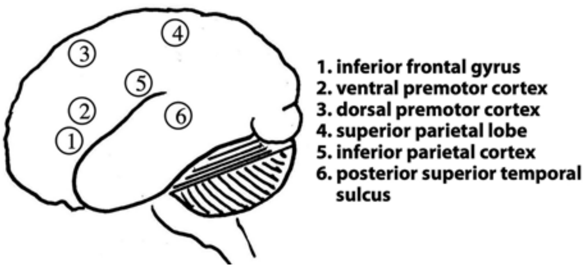

Fig. 9.1 Areas of activation during movement and imitation

Why don't we imitate every movement we see that has intention? We have seen that this happens some times to patients who are "echopractic." Like Echo in the myth of Narcissus, they involuntarily repeat what the other person says. Cognitive psychologists see a hint to explaining this phenomenon in the fact that cortical areas which are associated with distinguishing self from other produce inhibition of imitative behavior. When the functioning of these areas is diminished this distinction may be negatively affected.

Imitation and Social Theory

Stephen Turner (2007) grants imitation a central place in guiding social theory. In fact, the social environment becomes important only as giving guides for what to imitation. This places imitation and behaviorist learning theory as the primary unit of analysis used to explain human behavior and dispenses with the interactional view so important to sociology as a distinctive field. This implies a one-sided position wherein shared rules determine individual behavior. It also ignores a cybernetic view of society working down to shape (not to determine) the social interaction that maintains it while the interactions of individuals simultaneously maintain the same structure.

He argues that the present core terms of today's sociology are not in accord with the "developing body of knowledge about the brain and is potentially in conflict with it." The sociological emphasis on discourse is misguided, he believes, because it is not based on the correlates of mental processes as understood by the cognitive psychologists. This obviously puts another field in charge of sociology and dispenses with the original arguments by Durkhiem which set the boundaries of sociology and made it a distinctive field not reducible to separate individuals. The main purpose of his book is the integration of neuroscience and sociology. Sociology, he says, must be formulated in terms of the "real" properties of the brain. Nonetheless Turner (2007: 369) insists that he avoids significant reductionism:

> The idea that sociology ought to be physically and computationally realistic seems to be a very modest and unproblematic constraint. This is not reductionism in any problematic way, though it is certainly not, and this is an important qualification, an approach that is necessarily compatible with the acceptance of particular descriptions favored by traditional social theory such as the *notion of society* (Emphasis by this author.).

Before reducing sociology to neuroscience, one must consider the difference between cognitive psychology and the work of some influential figures in neuroscience proper. We will remember, for example, that Damasio (1994) opts for a non-reductionist approach, while Brothers, Gazzaniga, and many others are interested in the social nature of the brain. Iacoboni does not presume that mirror neurons take the place of Mead and Cooley's social accounts of the self. This is the very brain that Turner wants to see as asocial and divorced from society. Brothers would see this as neuroism in the extreme.

This ignores all of the themes flowing through this book. These themes include emergence, nonreductionism, the social nature of the brain, a socially adequate epistemology, agency, and certainly anything close to a transactional analysis. In spite of his disclaimer that he uses a problematic reductionism, he utilizes cognitive neuroscience to argue that every individual brain is the result of individual biography. Everything of significance comes from the brain. Turner (2007:364) rejects the assumption so basic to sociology that different worldviews are associated with different social groups. This is in line with cognitive psychology's emphasis on the universal character of human cognition (Krpic 2003: 813–814).

Finally, as Krpic (2003) notes, cognitive sociologists Cockerel and Zerubuval keep a distance from cognitive science, claiming that cognitive sociology stems from an opposing epistemological base. This is certainly true on many fronts including Lakoff and Johnson's argument for an epistemologically responsible philosophy modeled in accord with brain science.

Conclusion

It is clear from the descriptions above that cognitive science has a long way to go before they solve the correspondence problem and come near to closure on a neural explanation of intersubjectivity. However, it is interesting how frameworks as different as sociology and neuroscience arrive at intersubjectivity's importance for society and the social nature of the individual as well.

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Chapter 10
Determinism and Free Will

Science seems to say that all action is determined, but all experience goes against it.

(Samuel Johnson. See Burton 2008: 208)

We have seen that reductionism and determinism are conceptual cousins each implying the other. Benjamin Libet is another neuroscientist who rejected both the reductionism of Sir Francis Crick and the determinism that would reduce the self to its past causes; it is especially ironic, therefore, that he discovered a brain process which firmly challenges the notion of free will or better put the idea of agency. Libet, like Ramachandran, considered Cricks' "astonishing hypothesis" as a belief system – indeed a faith, rather than science. Libet saw ontological reductionism as a challenge to the notion of responsibility underlying our criminal legal system since it assumes that the defendant who was charged with an offense was capable of doing otherwise. We cannot hold people responsible for acts if they are not persons who were capable of deliberate actions and were capable of being conscious of what they were doing.

Libet: Our Bodies Do What We Want to Do Before We Know We Want It

Libet believed that conscious mental phenomenon could not be explained merely by nerve cell activities. Conscious mental subjective phenomenon, the intangible stuff of human existence, escapes direct observation. The only way to study subjective consciousness is to ask subjects about their experiences. When asked if physics could ever explain consciousness, Libet referred to the famous theoretical physicist Eugene Wegner's answer that "physics could not even explain physics." The major

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I am uncomfortable with the over-simplification implied in the term free will. None of us are "free" in the unqualified sense of western individualism. Being lawful is one of the most obvious ways we are not free, but we are not free of our emotions and our social natures for just a few examples. For the term to be useful one should specify freedom from what to do what (Eric Fromm 1944 Escape from Freedom).

D.D. Franks, *Neurosociology*, DOI 10.1007/978-1-4419-5531-9_10,

thrust of Libet's program was to connect mind and body by studying the relationship of action potentials and one's conscious experience of apparent voluntary action. Libet took what previously had been seen as philosophical problems and made them empirically testable.

Libet added to the irony of his work when he asked his subjects to voluntarily raise their arm, which seemed a clear act of volition; this volition was challenged, however, by the fact that the brain's "action potentials" fired before the subjects reported their movement. As Calvin (1990) says, "you just weren't yet conscious of your decision to move, but it was indeed under way." If Calvin and Libet are correct, this has wide repercussions. How can we have a viable self if our brain is acting before our conscious determination to act? Libet was not satisfied with the deterministic implications of the above and as we shall explore in more detail later, he claims that once an action potential has begun and is strong enough to reach consciousness, we have a small window of time left when we could change the action's direction or stop it altogether. Ramachandran has said that what Libet's argument gives us is "free won't." My own hesitation about this is that once an action has begun it has an impetus of its own and can be hard to stop. We want to complete the act. This would cut down the possibilities of free won't even further. I cannot count the times when my wife has told me that dinner was ready and I have responded "just a minute; let me finish this sentence first." This was not because I could not hold the thought. I just wanted closure. This was despite the fact that she is a very good cook.

Repercussions also flow over to the issue of consciousness. According to Libet, the voluntary act begins in the brain unconsciously before actors know they want to act. In this case one must question the necessity of consciousness in the voluntary act. Regardless of the label "voluntary," labeling does not make it so, and in the context above, the term voluntary seems superfluous. A deterministic finding was not what Libet had in mind when he initiated his research on the connection between subjective experience and the brain, but he stood by his findings (see his *Mind Time* 2004).

However, if one thinks that this gives closure to the determinism and free will issue they are sadly or maybe gladly mistaken. There is much more to the story. As Gazzaniga (1998) remarks, Libet has provided us with an intriguingly possible mechanism for explaining why we think we are doing things in "real time" when we have in fact already done them. Using a different recording mechanism, Libet later determined that the action potentials were firing 350 ms or a little over one-third of a second before the conscious determinations to act. As Gazzaniga (1998: 72) rephrases it, before one is aware of thinking about moving your arm your brain is at work preparing to make that movement. Libet's methodological insight was to instruct his subjects to associate the first awareness of an intention to act with the position of the second hand of a clock. The subjects' later report of that associated clock time could indicate the time at which the awareness appeared (Libet 2004: 98).

One of the many counterintuitive findings made by Libet is different from the emphasis on conscious initiation of action above. This finding has to do with how long it takes to feel sensation. If you tap your finger on a tabletop you subjectively feel the touch at the same time that your finger contacts the table (Libet 2004: 33). But his finding is that this is another illusion – a counterintuitive one to be sure, but an illusion nonetheless. It takes the brain about half a second to pass the event on to awareness. This is a relatively long time. Much of this depends on the voltage of the action potential.

Two separate factors must be distinguished at this point. This conscious awareness must not be confused with what Libet calls the detection of the signal. This sounds like the same thing, but detection is unconscious, not conscious, awareness. It is consciousness that takes the longest time. This delay produces its own profound problems. Libet asks if a national class sprinter responds to the firing of the starter's gun within much less than one-half second? Do unconscious mental functions have a different time requirement than conscious ones? (Libet 2004:34). At this point Libet turns to his evidence and its implications for these questions.

Initial Evidence from Electrical Stimulation

Libet's initial work piggy-backed in on other neurophysiological research involving electrodes applied to the surface of the primary somatosensory cortex. You will remember that this cortex receives messages from areas of the body and skin. In a subject who was awake, these messages would trigger a conscious sensation, either tingling or other responses. To the subjects, this was experienced as coming from the body instead of the brain even though it was the latter. Libet wanted to know what kinds of neuronal activations in the sensory cortex were responsible for the weakest possible sensory perception. The advantage of stimulating the brain itself was being able to tap into the processes at the cerebral level which were obscured when the skin was stimulated directly. The latter produced many unwanted variations that complicated interpretations.

Libet's team could now find out when the stimulus input was too low to produce any conscious response and when it produced the weakest possible conscious response. This offered a way to reveal more information on cerebral activities which intervene between unconscious and conscious mental processes.

The resulting findings were that neuronal activity requirements of skin stimulation cannot appear until after some 500 ms, although subjectively we believe it was experienced with no such a delay (Libet 2004:72). A weak threshold-level sensation had to continue for half a second, which was a very long time for a neural activity.

Daniel Dennett (2003) proposes that you are not "out of the loop but you are the loop." What this means to me is that we need to be careful about seeing the unconscious action potentials as too much of a threat to free will. They do not necessarily mean that they are independent of who we are. After all, regardless of time considerations and the illusionary experience of our "after the fact" awareness, our actions, much or most of the time, seem to be congruent with who we are. We could consider this as "being in the loop." We do not go around perpetually being surprised about producing actions that reflect nothing about our will or self-conception. If we do, we are vulnerable to being considered mentally disordered.

Nonetheless, Libet has confronted us with the difference between our experience of doing things in real time and the reality that we have already done these things. As Gazzaniga (1998:73) reminds us, Libet's team's previously made electric recordings from the scalp and determined that a certain brain wave begins to fire up to 800ms before a self-directed movement is made. Later, more advanced recording measures were created that produced the 350ms readings. Gazzaniga explains why we would not want information about the world or ourselves to come to us at the same time as it happened. In his judgment, it would a wasteful and distracting use of energy to be aware that things happen in our brain before we decided to run and the actions occurred in our legs and feet. So Libet has detailed how the brain has done us a favor by deluding us while significantly aiding our coordination. The only thing that counts to Gazzaniga is information about the world according to our brains, not whether the brain resembles the world.

While Libet's findings about volitional action were provocative, Gazzaniga argues that the brain diverges from real time in a number of well-documented cases. After all, it takes 50 ms to transmit information from the retina to our conscious prefrontal lobes as Wentworth and Yardley (1994) described earlier. Gazzaniga implies that Libet's unsettling findings are just another example of the general anticipatory nature of the brain. The brain acts first and our consciousness comes later. We have also seen this clearly when discussing the nature of social interaction. We live and experience our worlds in our futures. We normally guide our acts, at least most of the time, in terms of what we anticipate their consequences will be.

Ramachandran is also interested in Libet's work on senses of free will. His hypotheses are placed in the context of Libet's experiments. He talks of a spatiotemporal "smearing" of events in the brain (Blackmore 2006: 195). He suggests an experiment in which the researcher would give participants the readiness potential test and tell the subjects to move their finger three times any time they will it. As usual the readiness potential will activate a half a second or so earlier than awareness when the subjects would see this recorded on a computer. The question is: Why do the subjects have this feeling of being a cause or willing their finger movements when they know the feeling came after the action potential and thus, couldn't cause anything. The subjects should feel a lack of free will or efficacy, or, at least think that they thought of it first and rewrite the time sequence.

Daniel Dennett's Defense of Free Will

Dennett (2003) disagrees with Libet about the reduction of free will to "free won't." His reading of Libet's freedom of "free won't" is that the delay between action potentials and consciousness of volition gives us only "last minute vetoes." He sees the above as having a surface "ring of truth" but as ultimately incoherent. That is, he argues for more free will than Libet allows.

In order to mount his argument Dennett seizes on the one tenth of a second in which we can reverse the action potential's course and enact "free won't." His purpose is to seek flaws in the argument at this 100ms juncture. He starts by focusing on Libet's prized methodological strategy to determine when in that time frame one consciously makes a decision (or thinks one does) by having his subjects watch a clock. This depends on how long it takes to do two things: (1) Visually perceiving the clock and (2) Becoming conscious of the decision to move the arm or flick the wrist. As we know consciousness itself takes time to occur as does practical reasoning, and (3) Then there are the EEG tracings presumably to measure the beginning of the action potential.

Dennett gives three alternative interpretations that contradict Libet's conclusion.

I. Visualization of the clock face takes time. It needs to travel from the eyes to the back of the brain and then to the front again and can be seriously "out of date" by the time it registers on consciousness.
II. The same problem is involved in reasoning. This too takes time and can arrive too late to practice free won't.
III. Consciousness has to contend with time difficulties in both visualization of the clock and "the faculty of practical reasoning." If you are more distanced or for other reasons transmit at a slow rate, you may not be accurate in timing and suffer the illusions of simultaneity (Dennett 2003:42).

It is indeed possible, Dennett argues, that considering the above you can consciously decide to move when the action potential has geared up to do so, but you misjudged the time of that decision because of the timing of visualization and the generation of consciousness.

Dennett offers other hypotheses, but the ones above will suffice to understand his way of thinking. He further points out that Libet's conclusions are based on wildly unrealistic oversimplifications of what is known about how decision-making works in the brain." Dennett suggests that on the basis of this alone we should reject Libet's challenges to free will. This leaves aside Damasio's work on the integration of emotion and cognition for example. Dennett suggests that on the basis of this alone we should reject Libet's challenges to free will.

At this point Dennett (2003: 44) brings in the possibility that one can unconsciously decide both to flick one's wrist or to veto the flick just as one vetoes the decision in the free won't time frame. He points out that Libet at one point addresses this possibility directly (Libet 2004:51). Here Libet accepts the possibility that unconscious processes can precede the veto instead of the veto being a conscious one. It would seem that the possibility also exists that both the decision and the veto are unconscious (Dennett: 2003:44).

Dennett warns that there is no simple way to question Libet's thesis, but the brain is a complicated place with complicated issues. Dennett (1991:165) advises us to disregard the idea that deep in the brain in a particular area, an initiation of an act begins. Supposedly, it then starts out as an unconscious attention and slowly makes its way through brain-time where things are lightning fast compared to consciousness. As it gains momentum, it finally bursts on the stage of consciousness. The subject is given the task of saying exactly when the intention made its entry on the stage of consciousness. Once we have the information from the clocks three things can be calculated: (1) time of departure from the retina engaged in visualization of the clock, (2) time of transition of visualization to consciousness, and (3) this way we can determine the exact moment at which the conscious intention occurred in consciousness.

As Dennett said above, what he calls the "enticing" argument above cannot be true when two things happen together in consciousness. However, he does offer another alternative explanation. He suggests that "consciousness should not be considered as a time of arrival at a point, but a matter of representation exceeding some threshold of activation over the whole cortex or parts thereof" (Dennett: 1991: 166). In this alternative, an intent becomes conscious not by entering some brain area, but by acquiring some property or boosting the intensity of the property over some threshold. Dennett does not claim that he has resolved the full critique of the implications of Libet's work at this point, but he has given hints of which roads are unproductive and those that may be more promising.

Fortunately the turgid arguments above are not the only ways to address the possibilities of volunteerism and agency. One of the difficulties of Libet's approach is that his experiments were so different from normal life.

We shall now turn to clinical examples of real-life patients who, granted with significant help, have used their minds as a *causal force* to intentionally change the synaptic structures of their brains. This is something, which all students of agency should be aware of whether they consider agency as a real individual property or as a result of socially constructed labeling processes.

Daniel Wegner on the Illusion of Free Will

Daniel Wegner mounts an important argument that the human self manufactures an illusorily, but convincing argument that it is the agent of causation. He refers this illusion of "authorship" as the mind's self-portrait and sees its central feature as the assumption that the self and its thoughts cause actions. It seems obvious that as we are purposely lifting our fingers up and down that we are causing these movements to happen but this ignores, as Libet has shown, the immense amount of complex machinery beneath our consciousness. For this reason, Wegner sees what he calls the "minds self-portrait" as highly simplified and partial, even if its apparent validity is self-confirming and validated continually. Wegner doubts the existence of the self in any form even when he is writing in a volume published by the American Academy of Science from a conference titled *The Self from Soul to Brain* (2003). Wegner offers an explanation of how this portrait gets painted every few minutes of our waking days (Wegner 2003: 213).

These explanations come clothed in his theory of mental causation. Its key feature is that conscious will does not cause actions because both the inference of will and the action are caused by the same common forces of the mind and brain.

The three sources of the experience of apparent mental causation are (1) the thought should be consistent with the action, (2) the experience must occur just before the action, and (3) be consistent with the action and (4) the experience of "apparent mental causation" cannot be accompanied by another perceivable alternative reasons for it. We can see that these requirements also parallel the requirement for establishing causal analysis in science. When Wegner produces the evidence for the three antecedents to the feeling of willed action. He establishes plausible reason for being taken seriously.

Consistency Requirement. Wegner begins by saying that thoughts must be linked to action semantically to meet for the criteria for the consistency dimension. Here he uses a study of movements induced by the electric stimulations of the motor cortex by the experimenters. Because the movements were not preceded by any thoughts on the patients' part (there was no semantic connection), they did not experience authorship of these movements. This was true even though the movements were complex and life-like.

Schizophrenic patients commonly experience hearing voices that sound like they belong to someone else. Once again, the voices can begin totally unrelated to the patients' own thoughts and thus lack semantic consistency. Though there is good evidence that the voices are self-produced, the patients cannot experience this and lack the semantic preparation for the feeling of authorship.

Finally, Wagner looked at subjects who only had thoughts consistent with their actions was used to test the consistency principle. Here subjects were unconsciously primed to the word deer and then asked to type for 5 min. (You will remember that priming consists of flashing a word to subjects fast enough for them to hold it in their unconscious but too slow for them to be aware of it.) Then participants were asked to rate some words as to whether or not they had authored that word. None of the words the researchers gave to be rated were actually presented to rate in the experiment but the word deer and an associated word, doe, were experienced as being the result of the subject's willful actions. This establishes that normal people can experience responsibility or authorship for actions they did not produce.

Priority Requirement. Priority encourages feelings of willful action when thought about the action occurs just before the action. This is the first rule of establishing causation in scientific research. Without this priority of thoughts willing a certain movement, people do not feel authorship. Wegner presented participants with a tape-recorded statement of the word swan and then asked them to move a cursor to select a swan's picture on a computer screen. Unbeknownst to the participants, their cursors were controlled by a computer mouse shared with a confederate who gently nudged them toward the swan. When hints about how to reach the swan were provided for 1–5 s beforehand, the participants felt they were making the movements instead of the confederates. In contrast, no experience of authorship was experienced when the participants were prompted through earphones with thoughts of the swan 30 s before or 1 s *after* selecting the picture of the swan. In this case even though the participants did not perform the action, and the thoughts of the action were clearly given by someone else through earphones, the subject was convinced of their authorship simply by someone having supplied the suggestion prior to the action.

Exclusivity. According to Wegner, when events other than one's own thoughts or agents other than one's self become known in the context of an action, their presence leads to the discounting of one's own thoughts as a cause and thus undermines the experience of will. This happens in hypnosis and in cases of obedience to authority as in Milgram's (1974) studies. In contrast Wegner presents evidence that we can feel certain that we are the authors of actions we did not do when other causal options are not available.

For example, in one relatively definitive study, subjects were asked to move one or the other index finger when they heard a click. The motor cortex was manipulated by TMS to cause the movements, while the subjects were insisting that they were moving the fingers by themselves. In another experiment, participants were influenced by the unconscious priming of the word "I" to an ambiguous action with ambiguous causes. Without any overt alternative cause available, a false sense of authorship was created. These and other experiments demonstrate how easily outside agents hiding other explanations of actions can make us mistakenly attribute causation to ourselves.

A program known as "facilitated communication" (FC) provides us with an interesting application of this. The purpose of this program was to develop ways to facilitate communication in autistic children and others who had difficulties speaking, using a letter or keyboard. The "facilitation" included supporting the client's fingers above the letters but not actually producing the movements for the client. Facilitators were confident that this technique would be successful. As the program proceeded lengthy and articulated stories were produced indicating an apparently high increase in language capacity; It was soon discovered that the facilitators were proudly attributing the success to the clients when it had been the facilitators themselves who had produced the stories by inadvertently over-facilitating. According to Wegner (2003:218) the facilitators "strong belief that "FC" would work, along with the conviction that the client was indeed a potentially competent agent whose communications merely needed to be facilitated led to a breakdown in their experience of conscious will for their own actions. Without the perception that one's own thought is the exclusive cause of one's own actions, it is possible to lose authorship entirely and even to attribute it to an outside agent.

Wegner's three dimensions are subsumed under the concept of "previews." To go back to the concerns about accountability and our judicial system presented in the beginning of this chapter, to hold a person morally accountable does not necessitate a mind as a homunculus responsible alone for one's actions. According to Wegner, it relies instead on previews that cause persons to believe they are the cause of actions. This will not satisfy all readers or even this author. The three dimensions of Wegner's previews could be very useful to interrogators in producing false confessions and it may be premature to think that his previews are all there is to the story. However, we cannot ignore the strong data that underlie his propositions.

We shall now turn to clinical examples of real-life patients who, granted with significant help, have used their minds as a *causal force* to intentionally change the synaptic structures of their brains. This is something which all students of agency should be aware of whether they consider agency as a real individual property or as a result of socially constructed labeling processes.

The Controversy of Mind over Matter: A different Avenue for Establishing Agency

Despite George Herbert Mead's efforts to produce a naturalistic and thoroughly social view of mind, scholars in many academic fields including our own, still question the necessity for the term.[1] Following Sperry and Mead this section shows how advances from neuroscience have established the causal potency of mind over the cells from which it arose. This is a very different path from that of Libel and Dennett. We can also witness once again how the very different frameworks of neuroscience and Meadian thought have demonstrated the vital importance of minded behavior in human life. As we have seen there is certainly much that is determined in the brain. We would hope so if we are to breathe, perceive, remember, and feel as well as a myriad of other things like walking upright and recognizing our spouse's faces. But much of contemporary thinking in neuroscience goes well beyond the unproductive dualism between determinism and voluntarism. This is not solely due to the insights of current neuroscience or philosophers of the subject.

At the beginning of the twentieth century, American Philosophers were aware of the difficulties of complete determinism and the narrow reductionism it implies. To them, if one has a totally detailed understanding of all past causes, the "dependent variable" would have nothing left to it that had not already been explained. It would be really nothing but its past causes. To think otherwise is to posit some mystical thing that illegitimately inserts itself at the very end of the causal chain allowing the event to "be more" than its past. Since everything reduces to its prior history there can be nothing really new in nature. In this deterministic view everything just makes explicit what has already been done (Miller, 1973: 40). This issue was part of the philosophical discussion during the first part of the last century at the University of Chicago. Mead resolved these problems through his conception of emergence. Since the whole becomes more than the sum of its parts (taken separately), room is finally made for true novelty.

G.H. Mead's Concept of Emergence

Mead's view of emergence was understandably different from Sperry's since neuroscience offered very little in his time. Rather than seeking explanations for the material and biological world in the deterministic past or the teleologically divined

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future, Mead rooted his thinking in the behavioral present. Reality was lodged in what he referred to as "immediacy" – the experienced present. Behaviorally, this present is always a matter of adjustments to unpredicted situations. Some of these ongoing adjustments produce truly novel events. For example, following Mead and taking the point of view of impersonal nature, Miller (1973) says that grass, once ingested in an accommodating digestive system becomes something entirely new called "food." There is nothing in the grass itself (before being changed by the digestive tract) that would have predicted its change to something nourishing, i.e., food. Without a digestive tract grass is simply grass and there is no way for the observer to connect grass with everything in the world including certain digestive tracts. Mead labeled this type of "novelty" resulting from the interaction between grass and digestive tracks as emergence (Miller 1973:41). We should note what the above does to the common sense notion of the future. The grass in isolation from the digestive track had no future, as food unless you posit an all-knowing God which, being an answer to everything, does not advance the purposes of a secular science. The future of grass as food only exists in the process of digestion which Mead views as "adjustment" of the grass to the tract and vice versa. Likewise, for Mead (1934:2), mind was a true emergent from the interaction of structures in the brain and language – the latter also being an emergent from social interaction.

As we saw in Chapter 1 , the neurosurgeon and Nobel Prize winner Roger Sperry argued that consciousness and thus, mind, was decidedly more than an epiphenomenal result of the cellular matter from which it arose. That is, mind was a true novelty in nature. If mind were not more than the cells which gave it birth, it would have no reality of its own and the term would be unnecessary.

The reductionist view that "mind" was superfluous was taken for granted in biology during Sperry's lifetime, and his thesis has only secured itself in this century. Before Sperry, the allegedly airtight and irrefutable assumption was that "mind does not move matter"; that no physical action awaits on anything but another physical action (Sperry 1964). However, he argued that mind was a true emergent arising from the neuronal functioning of brain cells and containing genuinely new characteristics fundamentally different from the parts giving it birth. What Sperry saw as "mental forces" could direct electrochemical traffic between neurons at the cellular level (Schwartz and Begley 2002: 42). He insisted that the causal potency of an idea becomes just as real as that of a molecule, cell, or a nerve impulse (Sperry 1965:82). In emergence, the whole is more than the parts taken separately. The important dimension of what Sperry is saying is that the emergent whole can work back to exert influence on the parts that give it life.

On the Qualitative Difference Between Mind and Matter

The fundamental difference between mind and body has to do with the mind's intangible constructions. According to common sense understandings, "reality" belongs to a thing existing in a particular space and time. A real object gives resistance to the penetration of its space. According to Meadian thought, mind involves a process of communicating with one's self by means of significant symbols. These symbols, however, have virtually no tangible substance. In contrast to our bodily senses, the symbolic contents of minded processes are made up of purely intangible, extra-sensory, extra-material ideas. They have no place in actual time or space. For example, this is true even for the term "space" which we never see directly. What we see is "the cat down the hill." Space is the purely intangible conception of how long it would take us to get there. In this way the "airy" content of the emergent mind is fundamentally different from its cellular, and thus, materialistic sources. Mind, rather than immersing us directly in immediate tangibles and in some sense bringing us "closer" to them, gives us control over these tangibles only by looking at them from a distanced perspective, often as far away as possible – by standing back and apart from the felt reality of immediacy (See Lyng and Franks, 2002: 89).

Nowhere is this more apparent than in self-awareness where we can be "lost in action" until we take the attitude of the other and see ourselves from their point of view. Only then can we gain voluntary control over our own behavior, and only then, according to Mead, is our behavior fully minded. Furthermore, self-awareness typically comes about when our habitual (unminded) behaviors are blocked and we are forced to relate the resistance to our own capacities in order to unblock action. This distanced characteristic of mind, divorced from immediacy and facilitated by intangible symbols, becomes essential in applying mental forces to therapies that change synaptic brain structures.

For Mead, however, full mindedness went beyond taking the attitude of particular others and involved taking the role of the "generalized other." In this more abstract step the actor constructs an organized unity or composite "attitude" out of ever-expanding communities that form the audience relevant to his or her "inner" dialogue at the moment. Because it has to transcend particular viewpoints, this becomes the objective perspective, at least to the actor (Mead 1934: 155–156). Taking the role of the generalized other was the essence of rationality for Mead. In sum, while mind emerges from self-conscious behavior enabled by intangible symbols and taking the attitude of particular others, mind's "full measure" involves the more distanced process of constructing generalized others where self-reflection and self control are guided by impersonal but nevertheless socially formed standards. The fact that cognition gives control rather than some kind of experiential "connectedness" with reality is an important tenant in the pragmatism shared by Mead and Dewey. Symbols actually serve to separate the inseparable and stop the unstoppable. The experiential essence of time is unbroken, continuous passage. Cognitions (and thus, mind) artificially break this unbroken duration into static seconds, minutes, hours, and days, etc. This artificial rupture allows us to stop time dead in its tracks when we say, "Columbus discovered America in 1492." This is clearly a case of the mental in contrast to the actual, however advantageous it may be to the human capacity for thought. Likewise, we separate the inseparable when we break the lived experience of water down into hydrogen and oxygen and their relation in the term H_20.

Minded Distance as a Lever for Control in Therapeutic Practices

We have seen that mindedness involves "taking the attitude of the other" and responding to your own on-coming gestures as we would anticipate others would do and using this anticipated response to guide our developing lines of communication. Full mindedness involves depersonalized external evaluations and viewing one's action from these objective standards. Ironically, as I have noted, this self-consciousness which largely comprises a linguistic mind (the distinctive capacity that makes us human) is usually ignored by behavior modification approaches based on the capacity for conditioning which we share with any mammal.

There are two practices that can change the synaptic structures of the brain. One is the combination of volition and agency. The other is the involved in the cognitive process of taking the attitude of the generalized other and the self-awareness this enables.

The latter allows for the "decentering" from self that makes possible that "sanity within insanity" captured in some of the letters from Zelda Fitzgerald to her husband, Scott while she was patient in a mental hospital:

> God! the point of view of sanity, normality, beauty, even the necessity to survive is so utterly arbitrary. Nobody has ever understood- or understand what they have experienced until they have achieved a detachment that renders them incapable mind if I were not insane" (Bruccoli and Fitzgerald 1991:465).

This insight into her own state of mind could have been fleeting, but it clearly demonstrates an area a metaphorical space – that is sanely observing its own insanity. Such a statement has to come from an abstract but important perspective in consciousness that is free from the scourge of psychological distress.

In a chapter called "Your Suffering is Not You," Jon Kabat-Zinn (1990:320–321) describes a process very akin to Mead's reflexivity and Zelda's capacity for objective self-awareness. Rather than trying to ignore psychological pain, Kabat-Zinn recommends "full mindfulness" of it. In doing so he describes with rare concreteness the phase of self-consciousness from which Zelda speaks and that Mead identifies as a perspective.

Strange as it may sound, the intentional knowing of your feelings in times of emotional suffering contains in its self the seeds of healing. . .the part of you that can know your feelings, that sees clearly what they are, that can accept them in the present no matter what they are, while they are happening in their full undisguised fury. . . that awareness itself has an independent perspective that is outside of your suffering. It is not battered by the storms of the heart and of the mind. The storms have to run their course; their pain has to be felt. But they actually unfold differently when cradled in awareness (Kabat-Zinn, 1990: 320–321, emphasis added).

Neuroplasticity and the Power of Mental Force

Important as Mead's discussion about taking the attitude of the other turns out to be, it is not an empirical argument for mind over body. The development of this evidence comes from the work of Jeffery Schwartz on patients suffering from obsessive–compulsive disorder. Neuroplasticity refers to changes in the brain's neuronal circuitry originating from minded volitional behavior. Schwartz's telling work with human patients attests to the causal power of the mind to forge this plasticity of the brain. Interestingly, his work was presaged by animal studies to which we now turn.

The Tale of the Silver Springs Monkeys

The story of experimentation on macaque monkeys in Silver Springs, Maryland, in the late twentieth century is recounted in Schwartz and Begley (2002), Begley (2007) and Doidge (2007). It is highly unpleasant from the perspective of a concern for animal rights as will be evident enough. Their story is relevant because in a number of ways it gave reason to believe that motivation and volition in humans could, with time and proper redefinitions, cause new neuronal circuits to develop cellular matter. The principles learned challenged the widely held belief that motivation could not change neuronal structures. Although Mead's insistence that any trace of self-consciousness in other animals is open to debate, it is clear that we share volition, desire, and attention with other species. Without question, self-consciousness and role-taking play a more important role for humans. At the same time, volition and intentional behavior may be seen as a shared capacity between humans and monkeys and, as will be shown there is much about monkey brains that also applies to human brains.

The conviction that neuronal circuitry in the matured human brain was fixed for life was created by Charles Sherrington in 1895. He operationalized "volition" as the intentional behavior of very hungry (starved) monkeys wanting food. The sensory nerves of some monkeys were severed in one arm, but the motor nerves remained intact; when offered food the monkey would not use that arm even though they had the motor equipment to do so. The motor nerves that move muscles were completely unharmed and available even though the nerves allowing feeling were not. Therefore, it was assumed that sensory feedback (feeling in the limbs) was vital to the ability for motor movement – no feeling, no movement. Even when Sherrington tied up the monkey's good arm, the monkey would not use the feelingless, "deafferented" arm to grasp food put in front of it. It was as if the arm were nonexistent in the monkey's cognitive system even though he was very hungry.

Sherrington's thesis went unchallenged as late as the mid-1950s despite findings as early as 1909 by a German researcher named H. Munk that under certain conditions it was possible to induce a hungry monkey, with its good arm restrained, to use its nerve-severed, "deafferented" arm to feed. This was only possible if the halting and uncoordinated attempts with the bad arm were immediately rewarded consistently over time until the monkey learned to use it again. Unfortunately Munk's findings went unnoticed until 1957 when Edward Taub ran across them.

Taub was a psychologist who ran a lab close to Silver Springs near NIMH in Bethesda, Maryland. Following Munk's lead he tested the hypothesis that deafferented monkeys retained the latent capacity for purposeful behavior in these limbs – but only if the monkeys were forced to use them and only if they were routinely and immediately rewarded. Taub's efforts to test this resulted in a damaging lawsuit for animal abuse and consequential negative impact on his professional reputation. However, he did succeed in demonstrating that under tightly controlled conditions monkeys could be made to use their numbed and allegedly incapacitated arms. Certainly, the monkeys did not use the arms on their own, but they could be forced to do so if they were motivated by near starvation. They were also conditioned to use their numb arm in order to avoid intense electric shock if they failed to try. As a result, Taub argued that Sherrington's long accepted thesis had to be qualified: although sensation was normally needed for voluntary, purposive movement, the need was not ironclad law. Under the conditions Taub imposed, feeling was not necessary for initial success at movement, and with further conditioning monkeys almost fully recovered the use of their damaged arms.

These crucial findings had to come after the death of the monkeys. An autopsy showed that new neuronal paths had been created by their extreme motivation and conditioning. These new paths allowed the eventual effective use of their feeling-deprived limbs. The somatosensory cortex controlling feeling from the body to the "cognitive" prefrontal cortex had been literally rezoned. The deafferented zone was no longer empty. Instead of receiving sensory input to the arm from the somatosensory cortex, the supposedly empty zone in the cortex had been replenished over the years by neuronal axons from the face! The monkeys' consistent attempts to use their bad arms had rewired their feelings in a way legitimately described as "massive cortical reorganization" (Schwartz and Begley 2002: 159). The monkeys had been able to feel again. This suggested that human neural wiring did not have to stop at early adolescence as neuroscientific dogma insisted at the time.

One of the anomalies of Taub's studies was that monkeys with the nerves of both limbs somatically severed eventually learned to move their arms out of necessity, whereas monkeys left to their own devices and with only one limb disconnected did not. That is, with lesions only half as extensive, these monkeys seemed simply to forget the feelingless arm because they could use the other one.

Knowing that it was possible for the monkey to be forcefully trained to use it, Taub coined the term "learned disuse" and in 1992 (after he was reinstated into his profession) he applied his forced conditioning procedure to human stroke patients whose arms were paralyzed. Unable to use the harsh methods he applied to his monkeys, Taub would put the patient's good arm in a sling and their good hand in an oven mitt – anything within the law to make sure they were motivated to use their "useless" arms. They also had to use their paralyzed arms to do the strenuous exercises, Taub put them through. The results of what he called constraint-induced therapy were the same as with the monkeys – scans of his rehab patients' brains indeed demonstrated the cortical remapping and thus the neural plasticity of the adult brain as the patients learned to reuse their limbs.

Applications to Humans. As reported by Begley (2007: 122) the crowning achievement of constraint-induced therapy was reported in 2006 when 21 stroke patients who had experienced their paralysis for an average of 4.5 years received Taub's therapy 6 h a day for 10 days. Twenty controls were also given strength training but nothing that targeted their useless arms. At the end of 2 weeks Taub's group had shown large improvements that held up 2 years later. For a larger study involving Taub with similar results see Wolf et al. (2006). Other studies reveal that the brain area producing movements of the affected arm almost doubled in size. Areas recruited to take the place of damaged neuronal structures can be in areas close to the damage or can even come from the opposite hemisphere of the brain. Clearly, the human brain throughout the aging process is not as immutably hard-wired as scientists had thought. (See for example, Taub 2004 and Taub et al. 2006.)

Nursing the Self Back into the Driver's Seat in Obsessive Compulsive Disorder

While Taub began applying what he had learned to stroke patients, Jeffery Schwartz applied Taub's finding to patients suffering from obsessive–compulsive disorders (OCD). As important as Taub's work was, his therapy was not centered in the use of one's mind as a causal force. One advantage that OCD patients possessed for Schwartz's research purposes was that many were highly intelligent. More than anyone else, they knew perfectly well the folly of their compulsions. In other words cognitive distortion was not an intrinsic part of the disease (Schwartz and Begley 2002:17). They knew nothing dreadful would happen if they did not follow the rituals of their compulsions, be it skipping cracks in sidewalks, washing hands continually, or counting cans in the pantry.

They also possessed the sane calmness of recognizing the insanity of their compulsions. It was just that certain parts of their brains would not let them feel the convictions of their cognitions. The mind said one thing and the brain's emotionally driven limbic system said another. Wentworth and Ryan (1992) description of feelings that overpower our minds as "ego-alien" is particularly appropriate here. According to Schwartz and Begley (2002:77) the notion of "bare attention" in Buddhist meditation involves the same act of viewing one's ego-alien experience as a calm, clear-minded outsider. The point of Schwartz's therapy was to use the cognitive distancing inherent in the reflexive process as a wedge to eventually gain control over the body.

Before Schwartz's work on OCD started, the reigning behaviorist therapies for the disorder ignored voluntaristic processes where the patient initiated the action and used his or her own volition to change his obsessions. One such approach was called exposure and response prevention (ERP). The prevention part begins with the patient ranking objects or situations triggering their OCD by the level of distress they cause. The therapist then exposed the patient to their fears. For a mild example, the patients might have to wipe their hands on toilet seats. The prevention was that they were not allowed to wash their hands despite over-riding impulses to do so. The therapist and patient would then wait until the intensity of the urge returned to preexposure levels. Needless to say, exposure to some of the more intense levels listed by the patient would make a normal person extremely distressed. Although effective for some patients, 20–30% of them never completed the program. Since it involved a therapist standing over the patient for long periods of the day, it was not an answer for the vast majority of sufferers. To Schwartz the approach was not only callous, but it ignored everything he knew about human agency (Schwartz and Begley 2002: 2–5).

In stark contrast to ERP strategies, he relied on the patient's own human capacities of reflexivity wherein the patient uses full mindfulness to stand calmly outside of the experience and observe the impulses from the perspective of the detached observer – as if she or he were someone else. One way to convince patients of the latter was to teach them about the brain parts that malfunctioned in their problematic episodes and to show them the images from actual PET scans reflecting the disorder. Two areas of the brain become overactive in OCD patients and this is clearly visible in the scans. These areas involve the lower part of the prefrontal lobes and the stratium which is located deep in the brain forward of the ears. Taken together they comprise a "worry circuit" (Begley 2007: 138). Over activity in these circuits produce ego-alien convictions of foreboding as a matter of body chemistry regardless of one's cognitions otherwise.

Seriously depressed patients find it hard to believe that such an overwhelming conviction of gloom could exist without any real veracity. The very fact that they feel so bad becomes clear evidence of their culpability and hopelessness. It is very difficult for them to see such powerful forces as the result of arbitrary chemical imbalances with no real meaning. Extreme social constructionists may have the same difficulty in understanding this determinate force. Witnessing actual images of the over-activity in these specific parts of their brains helped patients to reinterpret their feelings as consequences of chemistry rather than their personal identities. One woman looking at her PET scan voiced this explicitly by exclaiming "that's not me its my OCD!" In this way patients came to deconstruct their overpowering feelings as "the electronic detritus of brain circuitry" (Begley 2007: 140).

This helped them to realize as Kabat-Zinn suggested that they were "more than their pain" and in this case more than the grey matter of their brains. Mind, comprised of extra-sensory communicative process, was free of the senses. The essential part of Schwartz's therapy was to get all of his patients to just that point of observing their emotional convictions from a detached standpoint "above the fray" of their bodies. This offered them the perspective on themselves that maximized their "sanity within insanity." Impulses to wash became interpreted as "not really them." In Mead's terms, patients were rejecting their obsessive identities and constructing another one independent of their disorder.

Program Implementation. In the first part of Schwartz's four-step method of therapy referred to as "relabeling," patients were helped to identify their compulsive urges as quickly and clearly as possible. Rather than interpreting their tendencies as an authentic desire to wash, they were encouraged to concentrate on the fact that the need was an illusion, no matter how powerful, caused by a "brain wiring problem or a biochemical imbalance lacking true information and content." As described above, the major goal in the first step is to see these "glitches from a rogue neurological circuit as separate from their will and their selves." (Schwartz and Begley 2002:82). Relabeling is a refusal to take OBC symptoms at face value. Cognition, however, can be relatively superficial since it implies a mere change in how something is identified in a larger placement scheme.

When this reinterpretation results in an emotional shift away from self-identification with the obsession toward a realization that it does not reflect the true self, the patient is entering the second stage referred to as Reattribution. This involves the felt attribution of the OCD compulsions to the non-self. It is emotional insight. Relabeling blends imperceptibly into reattribution wherein the patient is hit with the realization that she is more than her disease. It is the "That's not me!" response of the patient looking at the PET scan of her brain during an episode of OCD. Both stages reinforce each other making possible the patients' mental clarity about who they really are.

The third stage is Refocusing. Here mere cognition and more substantive emotional realization come together in the actual implementation of the will to change behavior. The purpose here is not to banish the anxiety and dread involved, but to substitute an adaptive course of action in place of carrying out the OCD compulsion. This is obviously the hardest part of treatment pitting mind and its "independent space" against body and brain. Biologically, patients were beginning the task of creating a "good" neuronal circuit from a bad one. Here diversion from the compulsive behavior could be physical activity such as needlepoint, gardening, woodworking, or taking a walk. This stage characterized by behavioral empowerment was helped by a 15-min rule that at first set a reasonably finite length of time before giving into a compulsive urge. This was not a period of passive waiting but of active adaptive behavior. Often this was enough time for the compulsion to diminish and for the patient to gather some degree of confidence in moderating, if not completely subduing, their obsessions. According to Schwartz and Begley (2002: 85) refocusing reinforces the insight that active will is separable from passive brain processes.

The last step of Schwartz's training program for placing mind over matter was defined as Revaluing – a deeper form of Relabeling he says. This step seems to incorporate the others with special attention to "mindful awareness" as emphasized in Theravada Buddhist Philosophy. It is also described it as "wise attention" enabling the quick recognition of OCD thoughts as senseless and false.

Findings. Schwartz exposed 18 patients with moderate to severe symptoms to 10 weeks of the initial four-step program. They were PET-scanned twice to see if the positive behavioral changes were correlated with predicted changes in the brain parts associated with OCD. Twelve of the patients improved significantly and their brain scans showed significantly diminished metabolic activity in the particular parts that were over-active in OCD. This was the first evidence that a self-directed, purely mindful, drug-free therapy, designed to "change the way patients thought about their thoughts" had the power to change brain chemistry in a well-defined brain circuit (see Schwartz et al. 1996; Schwartz and Begley 2002:90).

Since 2002 there have been a number of successful replications of his general principles by others in a wide variety of maladies, such as cerebral palsy, aphasia, and depression. This establishes a significant degree of "external validity" for the work put forward on mind-formed plasticity by Sperry, Taub, and Schwartz among others.

Changing the Circuits of the Brain in Depression

NIMH organized the most thorough evaluation of major treatment approaches to depression in 1989. Begley (2007: 143) attributes the perception of the blanket superiority of medication to the incomparable capacity of high-profit drug companies to promote their products.

Four therapies were evaluated: (1) cognitive-behavior wherein patients learn to think about their thoughts differently and to change their tendencies toward negativity, (2) interpersonal approaches centered on relationships and conflicts, (3) drug therapy using a popular antidepressant, imipramine, and (4) a placebo. In the most severe cases of depression, the antidepressant demonstrated the greatest improvement with the two psychotherapies in the middle and the placebo last. In mild to moderate cases of depression the two psychotherapies were equal to drug treatment.

However, considering that the rate of relapse in treated depression is 50%, a more relevant evaluation would necessitate a study of treatments and recidivism. On the average, a patient with a serious case of depression will suffer four major episodes later on. The first evidence that mindfulness training along the lines suggested by Kabat-Zinn and Schwartz could reduce relapse rates in patients suffering from three or more episodes was reported by a group of Cambridge researchers (Teasdale et al. 2000 and Begley 2007: 146). Teasdale, like Schwartz, thought that patients could escape repeated depressive episodes by learning to use the power of the mind to relabel their depressive thoughts "simply as brain events rather than absolute truths." Thoughts and emotions, they learned, do not reflect reality.

In a study of 145 patients who had at least one major episode of depression in the past 5 years, half were given 8 weeks of mindfulness therapy. Sixty six percent of those patients remained relapse-free after 1 year compared to only 34% of the other patients who received "treatment as usual." Obviously to have this amount of relapse is disconcerting, but the difference in treatment effects is still impressive.

A significant question remained about the various effects of different kinds of therapy on the brain itself. Mayberg et al. (2006) hypothesized that when depression subsided, whatever the treatment, fMRI scans would show that activity in the cortex increased and activity in the limbic system, the seat of emotions, decreased (mind over embodied emotion). When she had the opportunity to test this hypothesis on 27 patients, she found differently.

Cognitive-behavioral therapy reduced-over activity in the frontal cortex, which is seen as the seat of cognition including constant cogitations and ruminations. Paxil increased activity in the frontal cortex, but cognitive-behavioral therapy increased activity in the hippocampus. The hippocampus is involved in emotional aspects of memory without which learning cannot take place. Paxil lowered this activity. Cognitive-behavioral therapy produced a pattern opposite to that of antidepressants. Learning has a priority in cognitive therapies that it does not have in drug therapies. They found that cognitive therapy works from the top-down, while drugs work from the bottom up. Cognitive-behavioral therapies tend to decrease endless ruminations, while increasing new patterns of learning (Goldapple et al. 2004). Although this study involved a small number of patients, the findings imply that training in mindedness behavior may produce fundamentally different thought patterns from those produced with drug therapy and could reduce those patterns which lead to recidivism.

To summarize, the results produced by Schwartz and others strategies support the conclusion that consciousness and mindful volition is an emergent from the brain and cannot be explained by the brain's material substance. This is especially true for his OCD patients, but may well be true in depression. The materialistic position would insist that the brain is changing itself and that there is no need to posit a separate, nonmaterial entity called mind to explain these changes. Mental force, according to Schwartz, needs the brain to express itself, but mind is nonetheless a qualitatively different emergent that can act independently from, and actively upon, the cells from which it arose. The direction of causation relating brain and mind must be bidirectional according to Schwartz and Begley (2002: 95).

Conclusion

The purpose of this section has been limited to describing a convergence between several leading neuroscientists and G.H. Mead's view of mind as an irreducible reality – and thus a necessary concept – in the analysis of human behavior. By describing current evidence for mind as a causal force in brain plasticity, its emergent reality was thereby supported. Whereas previous arguments for the reality of mind were general and complex, the evidence brought together by Schwartz and Begley (2002) is relatively straightforward. Mead understood that the human cortex as indispensable to the existence of mind and selves, but neuroscience in his lifetime was not advanced enough to be useful to him (Mead, 1934:1–2; 236). The discussion describing Sperry's more recent notion of emergence has contributed some detail as to how and why mind is a necessary factor in the organization of the self and the tangible brain (see also Gazzaniga's 1988 argument in this regard.)

It was, of course, Mead who argued specifically for mind's social nature but even here, neuroscience has painted a rich picture of the social nature of the brain as a whole. For example, Brothers (1997: xii) concludes that while material brains obviously exist as individual entities, a functioning brain is dependent on other brains and the broader symbolic structures that allow them to mindfully communicate. Central also to the neuroscience argument for our social natures is the human capacity to construct theories of each others' minds which has obvious overlap with Mead's role-taking (Cacioppo et al. 2002).

Additionally, several other issues run through the lines of this essay. One issue has to do with agency. Mead's concept of role-taking remains one of our few voluntaristic alternatives to behavior modification models based on deterministic conditioning; it places emphasis on the actor's own "reasons" and semiotics rather than external conditioning and determinate "causes." The minded practices central to the success of the therapies described above are rooted in processes that define our humanity and are critical to the stress on agency in symbolic interaction.

Fuchs (2001) contends that agency can be seen as a residual category resulting from unexplained variance in structural processes-in short, agency is an attribution than can be made by observers when structural predictions fail; it then becomes a default explanation. But, as empirical examples of agency, the successful efforts of the patients above do not appear to be "unexplained residuals." The four-staged program implementation provides a substantial description of the patients self-healing. They are clear examples of actors who transcend mere words into a more active practice where word-formed thoughts lead them to more substantive deeds (Lyng and Franks 2002). The change of synaptic structures according to one's intentions involves a tangible reality that is more than a verbal exercise and more than attributions made by observers.

The other related issue running as a subtext herein has to do with reductionism. In the last part of the twentieth century many sociologists associated neuroscience with the crude reductionism of bio-sociology. Granted, Sir Francis Crick (1994) insisted that the emotions, thoughts, and desires comprising lived experience and consciousness were merely the biochemical and synaptic activity of the tangible brain. But it is equally true that reductionism raises serious problems for many leading figures in neuroscience. Though reductionist, "bottom up" models are often preferred as research strategies, it cannot be said that on a theoretical level neuroscience as a whole is reductionistic in Crick's sense

The common sense notion of determinacy has the great appeal of promising simplistic mental closure to understanding the natural world. Because of this, it may always be influential regardless of evidence otherwise. Currently in the public world of application, behavior modification approaches still win the day. Deterministic frameworks ignore the viewpoint of symbolic interaction and, as Schwartz insisted, the very capacities that define our humanness. Theoretically minded symbolic interactionists could benefit from the dialogue in neuroscience that transcends the simplistic deterministic/free-will dichotomies that block progress in understanding agency (see Dennett 2003).

The technical work of neuroscience makes available important evidence for the causal force of mindedness for our material brains and lives.

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Chapter 11
Conclusion

There is a school of thought which says that authors should write their conclusions before they write the body of the book. In my case this was out of the question because although I knew what I was going to write about, I had no idea of where it was going to lead. These conclusions will fill in the gaps about some of the arrival points. There was one place, however, where I knew I was going and that was the social nature of the brain.

As early as 1997 the neuroscientist Leslie Brothers wrote convincingly about this topic and her work carried us well beyond the contemporary western notions of the isolated brain and the neuroscience of her time. As this book has shown, only 12 years later some of neuroscience has caught up with her. Major themes of this volume include

1. the social nature of human brains, now and in the evolutionary past,
2. an empirically responsible epistemology,
3. how neuroscience supports the priority given to manipulative action by the Chicago pragmatists,
4. a transactional view of the mind/body relationship,
5. emergence as a way out of reductionism,
6. a stress on the concept of agency and voluntaristic action.

The Social Nature of the Brain

If the "higher" element in higher education demands that the knowledge it conveys is beyond that of common sense culture, surely sociologists must become familiar with the confirmations of their subject matter discovered by neuroscientists and then teach them to their students. How can we afford to disregard the social nature of the brain?

In the last page of her book Brothers clearly states her perspective (1997: 146):

> In contrast to contemporary cognitive neuroscience, which views the mind as a kind of closet with entities like emotion, linguistic rules and memory arranged inside, I take mind to be irreducibly transactional. Rather than something packed inside a solitary skull, it is a dynamic entity defined by its transactions with the rest of the world: Like industrial regions,

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> theater districts and shipping ports, minds are best characterized by reference to the larger forms of life in which they play a part. Just as gold's value derives not from its chemical composition, but from public agreement, the essence of thought is not its isolated neural basis, but its social use.

The social nature of the brain has been revealed in many ways in these pages ranging from theories of the brain's evolution and its intelligence to implications for philosophical epistemologies and the sociology of power and politics. There is hardly a field in the liberal arts that neuroscience has not touched in spite of the differences in the goals and methodologies of these fields.

The evolution of the social brain. Another place of arrival that I knew before I started was neuroscience's connection with far distant disciplines such as evolutionary theory and paleontology. I have identified those scholars who see evolution as essential for understanding the brain. The evolutionary fact that hominid's intelligence allowed tool use and crude weapons is well known, but this did not suffice for survival. An equally important weapon which facilitated survival was social organization and the development of the social sensitivity which allows us to anticipate the behavior of others. As a matter of fact, Small (2008: 146) tells us that: "...the social intelligence hypothesis, assumes that the majority of adaptive problems that drove human psychological evolution were posed by other humans and not, say, the needs of the hunt or of tool making."

Neuroscience and Epistemology

The implications of neuroscience for philosophy were a surprise, especially in its contributions to a socially rooted epistemology via the route of work done on mirror neurons. Iacoboni's group has shown an interest in epistemology, philosophy, and sociology which is reflected in these pages. A critical member of their team, Vittorio Gallese, is knowledgeable in philosophy and phenomenology. Lucina Uddin also has been educated in philosophy. This book may encourage sociologists to do the same and let an epistemology open to both sociology and neuroscience inform their work as well.

I have ranged far in order to show how a sociologically informed neuroscience contributes to epistemology. We have seen how the work on mirror neurons has confirmed the priority that Mead and the Chicago pragmatists placed on motor action. In addition, we must recognize that the brain reduces the perceived world to its own terms. The brain's senses are transducers which change the stimuli emanating from the impartial character of the world into only those characters to which it can accommodate. Gazzaniga (1998) is referring implicitly to the brain as a transducer when he notes that rhodopsin, a chemical in the eye, changes light into neural energy and information.

As we have seen, the subjective quale of human sound is extraordinarily different from a scientific explanation of what may cause this quale in the world independent of our experience. The tree falling in the forest does not in itself make a human noise. The brain converts intensities of compressed and rarified air into sound. This sound is as much a result of these compressions as it is a result of the brain which converts this energy into human experience. Science sees "reality" independent of anything human as an electromagnetic spectrum. But our brains can only accommodate minute units of this spectrum. Christian (1977: 198) quotes Buckminster Fuller as saying that what a man can hear, smell, touch, taste, and see is less than a millionth of reality.

The Neurological Supports for the Chicago Pragmatist Priority of Action

Another important example of the relationship between neuroscience and epistemology is the work by the sociologist Lakoff and the philosopher Johnson (1999). They use knowledge from brain studies to develop a theory of language with strong implications for a social epistemology. They challenge the traditional way of looking at concepts as merely symbolic and insist on an empirically responsible philosophy that roots itself in neuroscience. Like the Chicago pragmatists, they stress human motor action on the world. To them, most, but not all of the words and phrases comprising our language and thought are not literal but metaphorical.[1]

This perspective produces major shifts in the understandings we have about the nature of reason. Central to analytic philosophy is the assumption that reason is the transcendent structure of the universe, far removed from earthly action and any thing human. Instead, Lakoff and Johnson place the seat of reason in our experiences with motor action on the impartial world.

They also shed new light on the relationship between language and concepts by demonstrating that reason is largely embodied by the neural structures of our brains. The very categories that make our reasoning possible are examples of this structure. Contrary to those who see language as the exclusive source of carving the world into categories, Lakoff and Johnson show that concepts do not come out of the linguistic blue, but from the way our bodies are built. The brain cannot handle the vast amount of input which acts on it. This input must be reduced severely in order for it to move through smaller pathways. "Each human eye has about one hundred million light sensing cells but only about one million fibers leading to the brain. Each incoming image must therefore be reduced in complexity by a factor of 100" (Lakoff and Johnson).

Consistent with the notion of the brain as a transducer, they reject the notion that color exists in the non-human world. Our bodies and brains have evolved to create color. They identify four factors that make color happen: wavelengths of reflected light, lighting conditions, the color cones of our retinas which absorb light of different wavelengths, and the complex neural paths that are connected to the

[1] Lakoff and Johnson have been wrongly criticized for saying that *all* of out thought is molded by these metaphors.

cones. It is clear that all of these factors impinging on the brain are in constant flux. Because these factors are constantly changing, we never passively see red as a self-contained stimulus which is always red. What our brains do is abstract a stable concept of pure red out of these fluctuations. This process constrains the limits of social constructionism. Our senses and the nature of our brains impose strict limits as to how and what we can conceptualize and categorize. The fact still remains that different cultures stress differences in the significance and boundaries of colors.

Unconsciously and automatically our brains make this simplification. Contrary to analytical philosophy, Lakoff and Johnson conclude that neural beings can never think without relying on embodied concepts understood as neural structure, tied to and constrained by the sensory motor system of our brains. Consistent with Mead and the Chicago pragmatists, they see meaning as being built up as a result of the world's response to our actions. This approach corrects the notion that categories are merely linguistic productions and avoids the "linguistic turn" so popular in the 1990s.

A Transactional View of the Brain/Environment Relationship

But all this means nothing when the brain is deprived of its environment. Its consciousness and knowledge go outward to the world in an intentional fashion. When, in important senses, this does not occur we suffer the hallucinations of schizophrenia, the limitations of autism, and the pain of separation anxiety. The amygdala is no different. It too is geared outward to the dangers and pleasures of the social and physical world. Extra-sensory deprivation tanks cancel sensations and frequently generate conditions allowing for an out of body experience. In order for self-consciousness to exist, we must take the perspectives of others in our social environments.

Damasio (1994) makes a similar point: brain, body, and environment act as one indissoluble ensemble. Mind is derived, not from the brain alone; but it can be understood only in light of the organism interacting with an environment. Even more interesting is the fact that this environment is partially a result of the activity of the organism on it.

Emergence as a Way out of Reductionism

We have seen how Sperry and Mead counterreductionism by suggesting that the mind is an emergent separate from the brain, since under certain conditions it can exert a causal force over neural systems by replacing lost or damaged parts of the motor cortex. Sperry then shows how the mind is connected to the body because the emergent carries parts of the body's past with it. However, he includes another.

The Two Most Challenging Problems for Brain Science

There are two especially challenging problems for neuroscience. First is the problem of how to connect mind and brain. Brothers and others identify the second challenging problem as the failure to develop a theory that meets the particular needs of studying the brain.

Mind and Body as Separate Language Games. Brother's solution to the first problem is borrowed from Wittgenstein's argument that we reify concepts into pictures that simplify things. We then think that they tell us something real about the concepts. At this point Brothers (2002:8) says, "They become illusions." In everyday life, we take the term person to mean a body with a mental life. But Brothers takes this as a neuronist view that the mind can be found in the individual brain. In such a case we bring together the grammar of science with the grammar of everyday linguistic practices and misplace the source of the problem. Thus, in her hands the issue that the plagues philosophers of neuroscience discussed in Chapter 8 is resolved as a false one.

As passages in this volume testify, if one is capable of awe, this emotion is truly appropriate for the human brain. I have quoted Edelman's (2004) calculation that if we counted every synaptic connection in the brain it would take 32 million years to do the count.

A Social Critique of Society. My last surprise was that neuroscience has given us a way to critique society. I have quoted Damasio's statement that we could well become a nation so devoted to abstraction and so wary of emotion that the sociopathic becomes the norm. To come full circle, and in light of some of our present politics, we could well realize Carl Sagan's foreboding, quoted in my preface ". . .of an America . . . in steep decline, unable to distinguish what's true and what feels good, we slide, almost without noticing, into superstition and darkness."

The Seamy Side of Self

With all our sociological attention to the self as a distinctive feature of humanity, I am compelled to make a corrective. This vaunted self which I have described earlier as a unique center of behavioral control, and as enabling us to change the face of the globe, also has a negative side. While Meadian theory and much of neuroscience emphasize self-consciousness, I have also drawn attention to unconscious defense mechanisms which keep important tendencies, such as projection, out of our awareness.

What I have not mentioned before is the arguments by numerous writers that self-deception is woven into our natures by evolution and that it is necessary for social life. For example, Greenwald (1980), in a classic article titled *The Totalitarian Ego* succinctly sums up a wealth of the empirical evidence regarding the ways in which we constantly deceive ourselves. He sees the human ego as a ruthless destroyer of all information that might significantly change it. In this process it protects itself from anything it does not want to hear. The ego or what sociologists would call the self-system is pictured as a thought control center much like a totalitarian political system. Its biases rewrite history to its benefit. As Tavris and Aronson (2007: 70) say:

> Whereas a totalitarian leader rewrites history to put one over on future generations, the totalitarian ego rewrites it to put one over on itself. History is written by the victors, and when we rewrite our own histories we do so as conquerors of nations do: to justify our actions and to make us look good about ourselves and what we did or did not do. If mistakes were made, memory helps us to remember that someone else made them. If we were there, we were just innocent bystanders.

Burton (2004: 196) warns that if the evolutionary account of the brain's tendencies toward self-deception is correct, "human nature stands in the way of human nature." While historically self-deception allowed humans to get by more easily in times of stone axes and arrows, nuclear weapons may be another entirely different matter. Recognizing the fragility of the human self as it has been portrayed in this book, Burton says we are stuck with our dependencies on deception and emphasizes that in order to lie effectively, we first need to lie to ourselves. Ramachandran and Blakeslee (1998) explain the neurological underpinnings for this by referring to Ekman's (1992a, b) studies of the muscles of the human face. A person who is telling a lie will often give this away by producing an unnatural smile and a false tone of voice. These "giveaways" come from the limbic system which controls involuntary spontaneous facial expressions. Since this system is largely unconscious, it is more prone to tell the truth. The cortex is involved in voluntary control where lies are planned and it is this tension between the two brain systems that creates the false smile. (See also Gazzaniga 2008: 103.)

Travis and Aronson (2004: 70) say that " memory smoothes out the wrinkles of dissonance by enabling confirmation biases to hum along selectively causing us to forget discrepant, disconfirming information about beliefs about ourselves that we hold dear." They add that: "Confabulation, distortion and plain forgetting are the foot solders of memory and they are summoned to the front lines when the totalitarian ego wants to protect itself."

Symbolic interaction and the emphasis on lived experience are not equipped to handle this critical but seamy side of the self. Since those describing lived–experienced are not concerned with or able to establish uniformities of human behavior this is no problem for them. However, we should know that underneath such experience is a critical layer that shapes it and our memories of it.

Using a Meadian symbolic interaction perspective, sociologist Jonathan Turner (2002: 173) concludes that the "brain is wired especially on the right side for pattern recognition." As Ralph Turner (1962) pointed out earlier in his theory of role-making, instead of having exact expectations of others as in role-playing, we are prepared to interpret behavior as congruent with the role. We also objectify ourselves in a manner consistent with our self-conceptions. This fits in nicely with the right brain's gift for gestalts.

Interestingly, Ramachandran and Blakeslee (1998) consider self-deceit as a small price to pay for coherence and stability. But Burton's point above, about modern terminology and its implications, raises fears that in the long run, it may not be such a small price after all.

An important source of self-deception comes from memory. This is the foundation for the autobiographical self and is inherently unreliable. Schacter (2001: 228) describes what he refers to as its seven sins. The first three are sins of omission or ways of forgetting. They have to do with the decrease of memory over time: lapses of attention wherein we forget long-term events, lapses of attention such as forgetting one's keys, and the temporally absent "tip of the tongue" experience. The next three sins are those of commission where memory is present but inaccurate. First, misattribution occurs when we attribute our memories to an incorrect source. We may even confuse a dream with a memory from wakeful life. Second, suggestibility has to do with implanted memories that are incorrect. A bizarre case where a man developed memories of having abused his daughters is a dramatic case in point, but suggestibility can also happen in other situations. The third, called bias, refers to the ways that our current beliefs about our past selves are pulled into congruence with our present self-conceptions. The seventh sin is persistence wherein a memory cannot be driven from our minds as in post-traumatic syndromes. Schacter then proceeds to explore the neurological aspects of these different distortions.

Finally, I come to a close. Although I have described the foibles that certainty inflicts on its victims, we have seen that it cannot be helped. The certainty I have in mind at the present is that I have not included all there is to include and not being an expert in neuroscience, that I have made some errors. With this disclosure said, my goal has been to convey to my colleagues the possible links between sociology and neuroscience which inform each other's theory and research and help us develop our new field of neuroso.

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