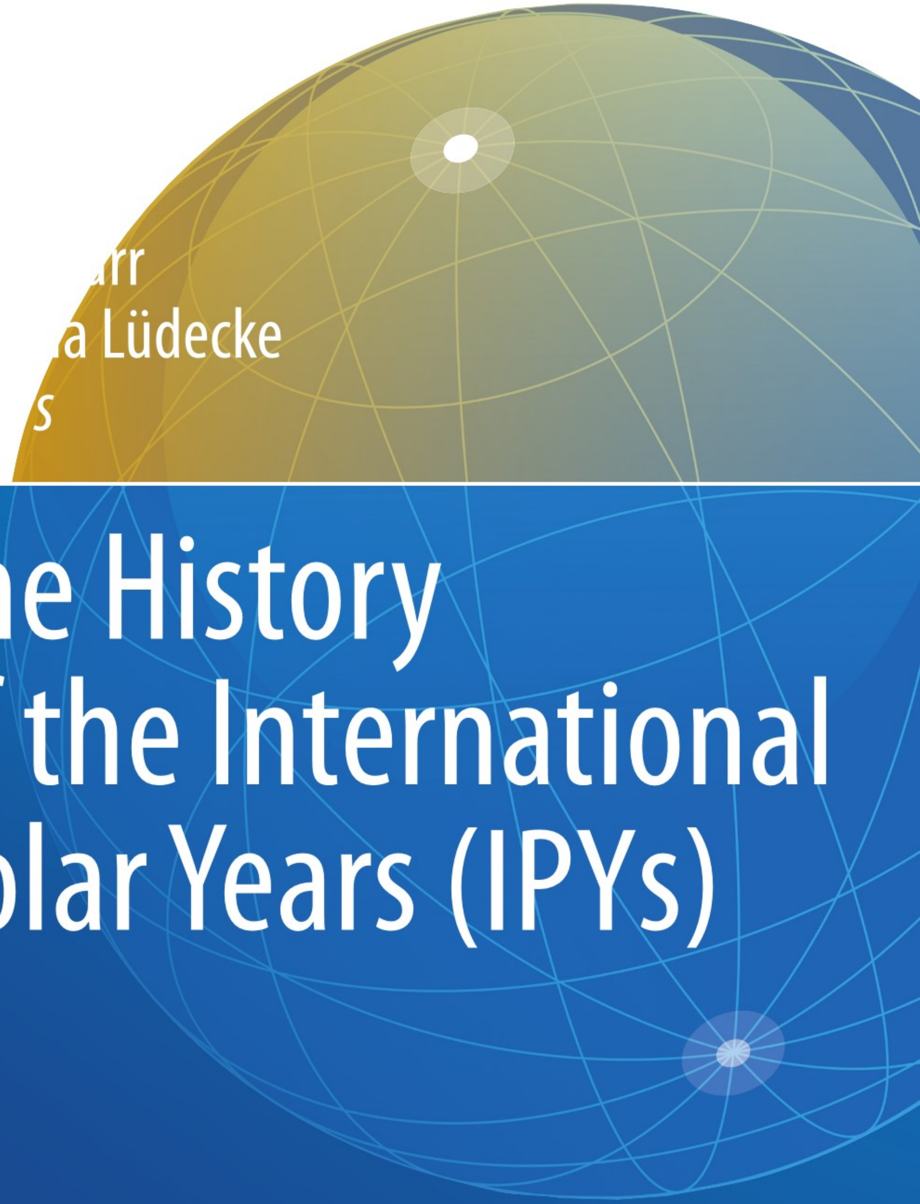


arr
a Lüdecke
s

The History of the International Polar Years (IPYs)

Springer

From Pole to Pole

For further volumes:
http://www.springer.com/series/7132

Susan Barr · Cornelia Lüdecke
Editors

The History of the International Polar Years (IPYs)

Springer

Editors
Susan Barr
c/o Directorate for Cultural Heritage
PO Box 8196 Dep.
NO-0034 Oslo
Norway
susan.barr@ra.no

Cornelia Lüdecke
Fernpassstrasse 3
81373 Munich
Germany
C.Luedecke@lrz.uni-muenchen.de

ISBN 978-3-642-12401-3 e-ISBN 978-3-642-12402-0
DOI 10.1007/978-3-642-12402-0
Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2010928984

Cover design: deblik, Berlin

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface to Series

This first volume of From Pole to Pole introduces a series of volumes on the results of, in particular, environmental research during the International Polar Year 2007–2008. In fact, this book series represented one of the earliest internationally endorsed Projects of the 4th IPY, and it now presents and synthesizes one of the first substantial products. This ambitious project represents successful combinations of vision, initiative, and energy by key individuals and their international colleagues.

The Pole to Pole series shares several characteristics with the 4th IPY. It will cover a wide range of scientific disciplines, from geology to biodiversity to atmospheric chemistry. IPY 2007–2008 likewise covers the full range of geophysical, biological and social sciences because a comprehensive understanding of polar science in a global setting demands the broadest scientific participation. This book project emphasizes the necessity and benefit of international collaboration in polar science, a feature it shares with other IPY Projects. The series will also represent a tangible and, I expect, an ultimately successful step forward toward the IPY goal that polar science will achieve global impact.

The first volume of the series focuses, as it should, on the history of IPYs. Achieving the central and original IPY idea, that it requires international coordination and collaboration among many national and institutional partners to realize an improved and renewed understanding of polar regions, has required differing strategies and tactics according to the political, economic, technical, and scientific conditions and expectations extant at the time of each IPY. The history recounted here shows clearly the urgency of this IPY, the necessity of including biological and social sciences, and the key role of outreach, features to be well represented by the contents of subsequent volumes and by the series itself.

Subsequent volumes of the Pole to Pole series will remind us that not only warming and thawing, but also biodiversity disturbance and ecosystem contamination represent forces of change in polar regions. Given the very rapid rates of discovery in polar science, driven at least in part by IPY, any monograph or series of monographs represents an act of deliberate optimism: that the value of this effort at this time will endure. Despite, or perhaps because of, the many alternative but ephemeral scientific reporting mechanisms of this IPY, including blogs, press releases, videos, and scientific and public presentations, a comprehensive assessment of current understanding in print remains vital and essential. The editors of this volume, and the organizers and leaders of the “Pole to Pole” series are to be congratulated on their remarkable contributions to this IPY.

Cambridge, UK
Dave Carlson

Letter from the Editorial Team

The first two International Polar Years both failed to coordinate and distribute their assembled data adequately and to ensure its proper analysis, resulting in a less than satisfactory legacy from what had been considerable international efforts. Recognising this, the Third International Polar Year (International Geophysical Year) made extensive plans to ensure its contributions would be both accessible and used, establishing the World Data Centres as a major new initiative. In the early preparatory stages of the latest International Polar Year (IPY 2007–2009) the importance of providing for the legacy of this demanding international research effort was made clear, with priority being given to planning for well-organised dissemination and coordinated publication of the results, data evaluations and scientific findings. It was with this in mind that we proposed our publication project (IPY Project No. 79) in the form of the book series ‘From Pole to Pole: Environmental Research within the International Polar Year 2007–2009’ with over 50,000 scientists involved in a myriad of projects, there was an obvious need for a guide to the principal findings and the key papers within environmental science fields.

The ‘From Pole to Pole’ book series is intended to serve as a comprehensive publication framework for the documentation of environmental research activities performed during the IPY period. The book series is not intended to be a typical collection of original scientific project publications/chapters in the form of standard monographs. It is rather a bibliographic, science-based information source and a starting point for interested scientists and the public to access condensed information on specific environmental research topics within the IPY activities. The volumes will provide scientifically sound general information on the concepts, findings and scientific motivation of the various relevant research activities and will direct the interested reader to more detailed scientific papers, web-based information and other publications which will provide the detailed data and their analyses. The compilation of citations and references within the book volumes will be an important component for the assessment of progress in each area, and the scientific significance and value will grow as the series develops.

The volumes will also be available in e-book format, which will allow continuous up-dating of references and information sources (including Internet pages and databases) by the editorial team on an annual basis, thus keeping the works topical as a living reference source.

The forthcoming volumes (11 volumes are currently planned) will cover an extensive spectrum of environmental research including adaptation and evolution, geomonitoring, geology, cryospheric processes, polar biodiversity, polar climates, the Arctic and Southern oceans, as well as pollution and atmospheric monitoring. It is expected, that this documentation will provide a comprehensive picture of most of the environmental research performed within the IPY framework.

At the first official stock-taking of the IPY during the Oslo Science Conference (OSC, June 2010) – where the findings and the implications of the research were initially evaluated – it became very clear that the IPY endeavour as a whole had proved to be an unprecedented success for polar research. IPY efforts have contributed to a new and comprehensive understanding of global environmental processes in the cryo-, hydro-, bio-, geo-, atmos- and anthroposphere, from both a social and natural scientific perspective. What was also clear at this largest-ever polar science meeting was that it would require continued efforts to make sure that the results of the IPY research would be easily available and properly documented for future research and evaluation processes.

This book series aims to make an important contribution to that documentation process. The editorial team is not only looking forward to assisting in the development of those volumes already planned, but also invites colleagues and experts to propose other topics not yet covered as potential volumes in the series 'From Pole to Pole: Environmental Research within the International Polar Year 2007–2009'.

With this first volume on the history of the International Polar Years (edited by Susan Barr and Cornelia Lüdecke), our concept has finally begun to be realised. We congratulate the volume editors wholeheartedly for an excellent historical overview of the scientific work and implication of IPY research activities during the past, and look forward to working with the volume editors and Springer Verlag to publish the remaining titles in this new series.

Aas, Norway	Roland Kallenborn
Naples, Italy	Guido di Prisco
Cambridge, UK	David Walton
Oslo, Norway	Susan Barr

Contents

Contributors

Susan Barr Directorate for Cultural Heritage, PO Box 8196 Dep., NO-0034, Oslo, Norway, susan.barr@ra.no

Jorge Berguño Instituto Antártico Chileno, Ministry of Foreign Affairs, Santiago, Chile, jberguno@inach.cl

Rip Bulkeley Exeter College, Oxford, UK, rip@igy50.net

Dave Carlson International Programme Office, International Polar Year, Cambridge, UK, ipy.djc@gmail.com

Klaus Dodds Politics and Environment Research Group, Royal Holloway, University of London, UK, k.dodds@rhul.ac.uk

Aant Elzinga Department of Philosophy, Linguistics and Theory of Science University of Gothenburg, Sweden, aant.elzinga@theorysc.gu.se

Irina Gan Institute of Antarctic & Southern Ocean Studies, University of Tasmania, Australia, igan@postoffice.utas.edu.au

Louwrens Hacquebord Willem Barents Polar Institute, University of Groningen, Netherlands, L.Hacquebord@rug.nl

Adrian Howkins Colorado State University, USA, Adrian.Howkins@colostate.edu

Julia Lajus Center for Environmental and Technological History, European University at St Petersburg, Russia, jlajus@eu.spb.ru

Cornelia Lüdecke Institute of History of Science, Mathematics and Technology, University of Hamburg, Germany, C.Luedecke@lrz.uni-muenchen.de

Natal'ya Georgievna Sukhova St. Petersburg Branch of the Institute for the History of Science and Technology named after S.I. Vavilov of The Russian Academy of Sciences, Russia, ngsukhova@mail.ru

Erki Tammiksaar Centre for Science Studies, Estonian University of Life Sciences, Tartu, Estonia, Erki.Tammiksaar@zbi.ee

Chapter 1
The First Three Polar Years – A General Overview

Rip Bulkeley

The first general physical property of the earth that our ancestors began to understand, in the third century BC, was its roughly spherical shape. The second, about 1,800 years later, was its magnetic field. In both cases the scientists were able to construct small models of the phenomenon, and to measure and map local portions of it. By the eighteenth century AD both the surface of the earth and its magnetic properties were being mapped in some detail.

From the beginning, investigators needed to work in teams. A medieval surveyor had assistants to hold the surveying poles much like today. But there could be problems with collating measurements from distant locations and observers. For geographical map-making they were straightforward. Common frames of reference, datum points, and scales of measurement were necessary before two maps could be joined into one. But even when the instruments were built differently they were all being applied to a homogeneous medium – to light waves reflected off the 3-D land surface.

Measuring the earth's magnetic field was not so easy. The mariner's compass came into use in the twelfth century, and by the seventeenth century scientists were aware that the magnetic field varies slightly in strength and orientation from place to place. For navigational purposes it became important to measure the variations across great distances. There were two complications. First, the earth's magnetic properties were found to vary over time. And second, different instruments could not be relied on to take exactly the same measurements unless they were built side-by-side. That was because the magnetic field is not just a planet-wide phenomenon, but also has random local components. In the 1830s, Carl Friedrich Gauss (1777–1855) and Wilhelm Weber (1804–1891) discovered how to build and use instruments that would all measure the earth's primary magnetic field in the same way. They could then form one of the world's first networks of geophysical observers, the Göttingen Magnetic Association, with a plan for simultaneous measurements at different places. It was not *the* first network, because meteorologists, geodesists, and

R. Bulkeley (✉)
Exeter College Oxford, UK
e-mail: rip@igy50.net

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_1,

astronomers, whose work has geophysical aspects, had begun cooperating in the eighteenth century.

By the 1840s, ships' officers around the world were sending meteorological and other observations to Matthew Fontaine Maury (1806–1873), director of the US Naval Observatory, to help him compile his masterpiece *The Physical Geography of the Sea*. In 1853, Maury convened the world's first international maritime-meteorological congress in Brussels,[1] and 20 years later the International Meteorological Committee (today the World Meteorological Organization) was founded. A similar body already existed for geodesy, and others soon followed. It was also Maury who, in 1861, circulated the first ever proposal[2] for a coordinated international programme of observations in Antarctica, of the sort that was later called a polar year.[3] (He actually wanted it to continue over several years.)

During the nineteenth century scientists studying the physics of the earth came to see that the north and south polar regions were of particular interest because of their unusual climate and the presence of phenomena like the auroras. By the 1870s expeditions for polar exploration were expected to observe and measure a multitude of physical events and processes, from meteors to variations of gravity. But although they often had multinational crews and scientific staff, they tended to be launched in a spirit of international rivalry, either as expressions of, or as reactions against, the European imperialist policies of the day. Expedition leaders often vacillated between the aims of science and territorial goals like the North Pole and the North-West or North-East Passages, especially while these had not yet been achieved.

Two Austro-Hungarian military officers, Karl Weyprecht (1838–1881) and Julius von Payer (1841–1915), led a nominally private expedition to the Arctic starting in 1872. The venture lasted over 2 years and proved extremely arduous, with the loss of one of its members and the ship. The salvaged specimens and scientific results were disappointing. Weyprecht concluded that nationally-focused and often short-lived expeditions were an ineffective way to study such extensive phenomena as the circulation of Arctic sea ice, which was his own special interest. Unaware of Maury's earlier proposal for the Antarctic, he began campaigning for ship-borne expeditions to be replaced with a multinational network of land-based Arctic observatories, or

---

[1] WMO counts the meeting in Leipzig 1872 as the 1st conference of meteorologists. Maury's meeting was something special with nothing before and nothing similar after.

[2] Maury's plan was published in Russian in 1861 and in English in 1862, but because he left the Naval Observatory (to serve under the Confederate Government) immediately after circulating it, it attracted almost no attention. The subsequent initiators of the Polar Year, Neumayer and Weyprecht, probably did not know of his plan and did not refer to him. Among other things Maury stated that: "The advantages and facilities for Antarctic exploration are inconceivably greater now than in the days of Cook and others. They are greatly enhanced by the joint system of national co-operation for the purpose of searching out the mysteries of the sea, now recognized and practiced by all maritime nations. In this beautiful and beneficial cooperation, officers of the different nations have learned to pull and work together for a common good and a common glory. This habit would be carried to the South Pole by co-operation among the different nations concerned in sending out vessels for exploration there" (Maury 1862: 71).

[3] Wexler H. (1962: 7).

geophysical stations. Even without being at high latitudes they could take useful measurements over an extended period and pool them for scientific assessment.

1.1 The First Polar Year, 1882–1883

Weyprecht's plan was accepted in principle by the International Meteorological Congress and an International Polar Conference in 1879. In May 1881, shortly after his early death, it was announced that a Polar Year (IPY-1) would begin in 1882. Scientists from 11 countries ran 12 expeditionary stations in the Arctic or sub-Arctic and two in the sub-Antarctic for about 13 months from 1 August, 1882. Thirty-five new or existing magnetic and meteorological observatories around the world also took part. In keeping with previous scientific practice, and as Weyprecht had emphasized, the subjects and timing of observations, the instruments to be used, and the rules to be followed in reducing and publishing the data were closely coordinated by an international committee based in St Petersburg. This was particularly important because communication with polar stations would be limited or impossible.

Most of the expeditions followed these arrangements to the letter, but not everything went according to plan. After losing their ship in the Kara Sea the Dutch expedition had to work in a sea-ice camp for 10 months; a Danish expeditionary ship was trapped nearby for the same period. One of the American expeditions ended in disaster when 19 of its 25 members starved to death after its relief ship failed to get through. Even successful expeditions suffered from lost or damaged instruments and other hazards.

Results from the expeditions were published nationally. Some included non-geophysical material from biological or anthropological investigations. Polar Year observations from the 35 non-polar observatories were not compiled and no overall bibliography was published. In line with current practice, the findings of each expedition or each participating scientist were left to make their own way in the community of knowledge.

1.2 The Second Polar Year, 1932–1933

As Weyprecht had predicted, IPY-1 did not answer all the questions that it addressed. But science never stands still. By 1898 Kristian Birkeland (1867–1919) was suggesting a new theory of the aurora and planning an expedition to take better measurements of it.[4] In 1905 Henryk Arctowski, who had served as a geologist on the recent *Belgica* expedition in Antarctica, called unsuccessfully for another Polar Year to be held in 1907, 25 years after the first, but this time with its focus mainly in Antarctica.[5] By 1919, the structures of international science had been reorganized

---

[4] Birkeland, Kr. (1898).

[5] Arctowski, H. (1905).

under the International Research Council, and the theoretical insights of Vilhelm Bjerknes (1862–1951) were about to transform meteorology.

Nor did IPY-1 put an end to rivalry between national polar expeditions. If anything, the prominence of competitive exploration in the Arctic and Antarctic between the 1890s and 1920s may have caused scientists to feel that their sort of polar discovery was being neglected again. In 1926 Leonid Breitfuss (1864–1950), an émigré Russian zoologist and oceanographer working at the Berlin Zoological Museum,[6] suggested that a Second Polar Year (IPY-2) should take place 50 years after the first. In December 1927 Vice Admiral Hugo Dominik (1872–1933), director of the Deutsche Seewarte (German Marine Observatory) in Hamburg, made the proposal official (see Chap. 6). It was accepted by the International Meteorological Conference in 1929 and a Commission for the Polar Year held its first meeting in Leningrad in 1930.

After some hesitation due to the world economic crisis, IPY-2 went ahead from August 1932 with financial support from the Associations of Meteorology and Terrestrial Magnetism within the International Union of Geodesy and Geophysics (IUGG), and from the Rockefeller Foundation. About 45 countries took part and 60 expeditions or special stations were organized. The coverage was worldwide rather than polar; the president of its commission, Dan La Cour (1876–1942), wanted to call it a “World Year”(Fig 1.1).[7]

IPY-2 added new subjects, including hydrography, clouds, and the ionosphere; new infrastructure, with radio communications and air transport; and new instruments such as the radiosonde. A radiosonde is a balloon-borne instrument package

Fig. 1.1 Soviet IPY-2 Station at 4,169 m on the Fedchenko Glacier in the Pamir Mountains (Soviet IGY Bulletin, # 2, 1957, 101)

---

[6] Lüdecke, C. (2001).

[7] Laursen, V. (1959: 223).

that takes meteorological readings automatically and transmits them by radio to a home station. But in IPY-2 it was still an experimental and unreliable technology.

The compilation and analysis of IPY-2 observations were restricted first by the economic situation and then, from the mid-1930s, by the rapid spreading of armed conflict across the world. A striking achievement was the series of daily synoptic weather maps of the northern hemisphere produced by the Deutsche Seewarte; only 15 days were lost due to the war. But because many observations were not published, the Danish Meteorological Institute (DMI) offered to store copies or original records of the data, to include them in its final catalogue of IPY-2 material, and to make them available to qualified investigators. In May 1954 the Soviet Academy of Sciences recovered lost IPY-2 magnetograms from Copenhagen. Thus, the DMI became the first World Data Centre, before the title was invented, and remains so today.

1.3 The International Geophysical Year, 1957–1958

The origins of the International Geophysical Year (IGY) are discussed elsewhere (see Chap. 9). This section will focus on its distinguishing features, of which size was the least important. Its name was suggested by Johannes Egedal (1891–1965), a meteorologist at the DMI who had taken part in IPY-2 and was moved by the same dissatisfaction with the “polar” tag that had previously been expressed by La Cour. This was given practical effect by focusing IGY observations along the equator and on four north-south meridians of longitude, as well as in the Arctic and Antarctic. Some of that balance was lost, however, because the new year-round geophysical stations on the Antarctic mainland were of great scientific and popular interest. They were also costing about half the total IGY budgets of the committees that maintained them. Most Antarctic IGY expeditions had material or financial help from the United States.

The IGY was planned to run from 1 July 1957 to 31 December 1958. It actually started a week early, in response to solar flares, and was extended for a year as the International Geophysical Cooperation. IGY committees were formed in 66 countries or colonial territories, but one, at the Peking Academy of Sciences, dropped out at the last minute. A further 33 countries or territories took some part without IGY committees, through their membership of the World Meteorological Organization.[8] Land-based stations, often for several disciplines and many of them newly built, were used at 2,456 locations. About 22% belonged to the US and 9% to the Soviet committee. At its height, about 100,000 scientific and a similar number of support personnel worked for the programme. A widely accepted guesstimate of the overall cost is US $2 billion, equivalent to $14.3 billion in 2006.

Scientists preparing the IGY had almost 7 years to do so, three times as long as the previous Polar Years. Dozens of international and countless national planning meetings took place. They developed a programme of thirteen scientific disciplines, each with its own informal steering committee and a detailed manual. About half

---

[8] World Meteorological Organization (1956).

were for branches of solar-terrestrial physics. A third of the IGY committees took some part in all or nearly all disciplines; the rest were more selective. Meteorology was the most subscribed; glaciology and rockets and satellites were least, for lack of access to their subjects.

Central coordination was provided by a busy calendar of “world days,” but arrangements were also made to call extra periods of intensive observation in response to solar activity, by means of a dedicated telegraphic network. Special care was needed to connect this to the Antarctic by radio, often under difficult conditions.

A major innovation was the creation of a threefold system of World Data Centres (WDCs), divided between the United States, the Soviet Union, and a group of European and Pacific countries. All IGY observations had to be sent to at least one WDC, which was then obliged to copy them to the others. They were made available to all scientists. With several modifications and an extension to include the People’s Republic of China, the system remains in use today.

IGY manuals, conference reports, tables of data, catalogues, and scientific papers were published in 48 volumes from 1958 to 1970 as the *Annals of the IGY*. Leading committees also published national IGY results series.

Using IGY data, scientists achieved several major advances, including a new understanding of the extent of the earth’s atmosphere, gained from tracking the first artificial satellites, the discovery of the Van Allen radiation belts, and the first calculation of the total volume of Antarctic ice. But by no means all the disciplines found their IGY data equally useful.

Lastly, it has sometimes been said that the IGY was as free from politics as was possible in the Cold War. Even so, it was subjected to more direct and indirect political interference than either of its predecessors, especially when it came to its Antarctic expeditions and the launching of its scientific satellites.

References

Arctowski, H. 1905: *Projet d′une exploration systématique des régions polaires*, Brussels: Vanderauwera.

Birkeland, Kr. 1891: Sunspots and Auroras: A Message from the Sun (Norwegian), Verdens Gang, 16 September.

Laursen, V. 1959: The Second International Polar Year. *Annals of the International Geophysical Year* 1: 211–234.

Lüdecke, C. 2001: Leonid Ludwig Breitfuß (1864–1950) in Deutschland – Chronist der Polarforschung und die Umstände des Verkaufs seiner Bibliothek nach England, *Polarforschung* 71 (3): 109–119 (published 2003).

Maury, M.F. 1862: Letter to Lord Lyons, April 1861. Report of the Thirty-first Meeting of the British Association for the Advancement of Science held at Manchester in 1861. Pt 2, Notes and Abstracts of Miscellaneous Communications, pp 65–72. London: John Murray.

Mill, H.R. 1905: *The Siege of the South Pole*. London: Alston Rivers.

Wexler, H. 1962: Dedication to Matthew Fontaine Maury. In: H. Wexler, M.J. Rubin, J.E. Caskey (eds) *Antarctic Research: The Matthew Fontaine Maury Memorial Symposium*, pp 1–3. Honolulu: American Geophysical Union.

World Meteorological Organization, 1956: *International Geophysical Year 1957–1958: Meteorological Programme*, pp 60–61. Geneva: WMO.

Chapter 2
The International Polar Year 1882–1883

Erki Tammiksaar, Natal'ya Georgievna Sukhova, and Cornelia Lüdecke

2.1 Introduction

During the nineteenth century in the western world knowledge production was centred in North America and Europe including Russia, while Asia and Africa were not considered. Economical progress was accompanied by the establishment of national weather services and the development of systematic data collections. The Göttingen Magnetic Association (1836–1841) paved the way for international co-ordinated scientific work, when an international network of altogether 53 magnetic stations was established all over the world. On special days, called "term days", readings of magnetic parameters should be made every 5 min at exactly the same time for the period of 24 hours. The British "Magnetic Crusade" to search for the magnetic pole of the southern hemisphere in the early 1840s was initiated in this context. Concerning maritime meteorology, a conference at Brussels in 1853 promoted the collection of meteorological data from ships, and the establishment of weather services all over the world was another remarkable milestone of scientific endeavour. The institutionalization of both disciplines – meteorology and oceanography – led to international arrangements concerning standard measurements and observing time. Traditionally, in all observatories investigations of the terrestrial magnetism were

---

E. Tammiksaar (✉)
Centre for Science Studies, Estonian Univeristy of life Sciences, Tartu, Estonia
e-mail: Erki.Tammiksaar@zbi.ee

N. Sukhova (✉)
St. Petersburg Branch of the Institute for the History of Science and Technology named after S.I. Vavilov of The Russian Academy of Sciences, Russia
e-mail: ngsukhova@mail.ru

C. Lüdecke (✉)
Institute of History of Science, Mathematics and Technology, University of Hamburg, Germany
e-mail: C.Luedecke@lrz.uni-muenchen.de

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_2,

made together with meteorological measurements. “Although there is only a weak relation between both phenomena, one is used to considering them as related.”[1]

The Arctic region was seen as the home of the low-pressure areas (cyclones), which often resulted in very violent storms in the inhabited countries of the Far North.[2] In the early 1870s, time was ripe to initiate a new international enterprise. To improve weather forecasting and to solve open questions in understanding meteorological features only international co-operation would help. It was clear that much more information from high latitudes was needed. During the first International Meteorological Congress in Vienna in 1873, meteorologists standardized methods of observation and analysis and made arrangements about the use of the same units of measurement and a single set of symbols.[3] They also decided about publication and exchange of results. Finally, they discussed the best completion and extension of the existing network and they recommended the establishment of meteorological stations in the north polar regions especially on Svalbard.[4] Already at that time, Georg von Neumayer (1826–1909), hydrograph of the Prussian Admiralty in Berlin, additionally pleaded for stations in the southern hemisphere.

Neumayer could realize part of this idea temporarily during the observation of the transit of Venus on 9 December 1874, when about 50 expeditions were sent out, among them two German expeditions to Kerguelen and Auckland Island in the Southern Indian Ocean, which also took meteorological data for a couple of months south of 50° S.[5]

Although a German *Commission for the Assessment of Questions Concerning Polar Research*, consisting of 13 members including Neumayer, recommended the establishment of a closed network of stations around the Arctic Ocean,[6] it was the German lieutenant Carl Weyprecht (1838–1881) serving in the Austro-Hungarian Navy who mobilized the scientific community after the return of the Austro-Hungarian expedition (1872–1874) to the Russian Arctic. The consequence of his experiences combined with Neumayer’s ideas finally led to the first International Polar Year, which was a big international field experience in the Arctic in 1882–1883. Its history has been treated in several scholarly writings.[7] Regardless of the great number of existing data on the First Polar Year, the archival documents and literary data discovered lately enable a considerable extension of the knowledge of the history of this international event.

---

[1] Wild (1874:49).

[2] Corby (1982:213).

[3] Bericht (1873).

[4] Bericht (1873:64–65).

[5] Lüdecke (2004:55).

[6] Krause (1992:287–291, 305).

[7] Rykachev (1889), Breitfuss (1930), Vize (1931), Klado (1957), Taylor (1981), Baker (1982), Corby (1982), Paseckii (1983), Barr (1985, 2008), Lüdecke (2002), Andreev et al. (2007).

2.2 The Organization and Effectuation of the Polar Year

The famous Austro-Hungarian expedition of Carl Weyprecht (Fig. 2.1) and Julius Payer (1841–1915), which discovered Zemlya Frantsa Iosifa, but lost its ship, took place in 1872–1874. Its importance in the history of polar exploration did not consist only in the discovery of an up to that time unknown large archipelago in the Arctic Ocean. Thanks to the results of the investigations during the expedition, Weyprecht understood the need for systematic and synchronous observations in polar regions that could only be realized through international collaboration, since single expeditions, according to Weyprecht, required enormous means, but did not give the scientific results expected.

After having presented an account of the results of his expedition on 18 January 1875[8] Weyprecht informed the Academy of Sciences of Vienna of his idea, and on 18 September of the same year he put the idea forward at the conference of German naturalists and physicians at Graz.[9] Already before the conference, at the beginning of July, Weyprecht had sent his manuscript concerning *Grundzüge der arctischen*

Fig. 2.1 Carl Weyprecht (1838–1881), German lieutenant serving in the Austro-Hungarian Navy (Nordenskiöld, 1882)

---

[8] Weyprecht (1875a).

[9] Weyprecht (1875b).

Forschung[10] (Fig. 2.2) to several scientists in Germany and different countries of Europe to enlist support for his idea.[11]

Before reporting officially on his project, he wanted to learn the opinions of the scholars who knew well the peculiarities of the weather conditions in the polar regions, and to get sufficient support from the researchers so that the countries could not simply give up the idea of participating in the project.[12] Having made his idea officially public at Graz (see Table 2.1), Weyprecht's report was published in German.[13]

Weyprecht's general idea was summarized later in the German motto: *Forschungswarten statt Forschungsfahrten* ("Research observatories instead of research voyages").[14] In autumn 1875, Weyprecht sent the published German version of the report and unpublished manuscripts in Italian, French and English to the representatives of different countries, including the members of the International Meteorological Committee. The committee, consisting of nine leaders of European observatories, was set up during the First International Meteorological Congress in Vienna in 1873. In his *Grundzüge*... and the report at Graz, Weyprecht mentioned five locations in which, in his opinion, observations should be carried out (Novaya Zemlya at 76°N, Spitsbergen at 78°N, the eastern or western coast of Greenland between 76°N and 78°N, to the north or east of the Bering Strait at 70°N and in Siberia at 70°N (Lena delta[15]) (see Table 2.2).[16] Discussing Weyprecht's plan in London on 21 April 1876, the committee considered it necessary to increase the number of stations. Observations were recommended to be performed in Spitsbergen, in Alta in Finnmark (Norway), at the mouth of the Lena River and in the Novosibirskyie Ostrova/New Siberian Islands (both Russia), Point Barrow (Alaska), Boothia Felix (Canada), Upernavik (northwest coast of Greenland), and on Pendulum Island (east coast of Greenland) (see Table 2.2).[17]

Taking into account the suggestions of the International Meteorological Committee, other scientific institutions and scientists of different countries,

---

[10] A copy of this manuscript is deposited in Bundesarchiv, Abteilung Potsdam (Weyprecht July 1875. Grundzüge der arctischen Forschung. Manuscript. Bundesarchiv, Abteilung Potsdam, RKA 1.500, Bl. 167–175, unpublished, cited after Krause 1992:288). We are thankful to Dr. Krause for the manuscript he sent to us. A comparative analysis of this text with Weyprecht's report at Graz (Weyprecht 1875b) gives no reason to doubt (as concerns, e.g. the sites of planned polar stations) that Weyprecht had structured and revised his "Grundzüge ..." on the basis of the reactions of the researchers before reporting at Graz. He had changed the title of his report replacing "Grundzüge der arktischen Forschung" with "Grundprinzipien der arktischen Forschung".

[11] One of these letters was received by Baltic German scientist Karl Ernst von Baer (Weyprecht 10 July 1875. Letter to K. E. v. Baer. Universitätsbibliothek Giessen, Handschriftenabteilung, Nachlass von Baer. Bd. 20, unpublished).

[12] Krause (1992:306).

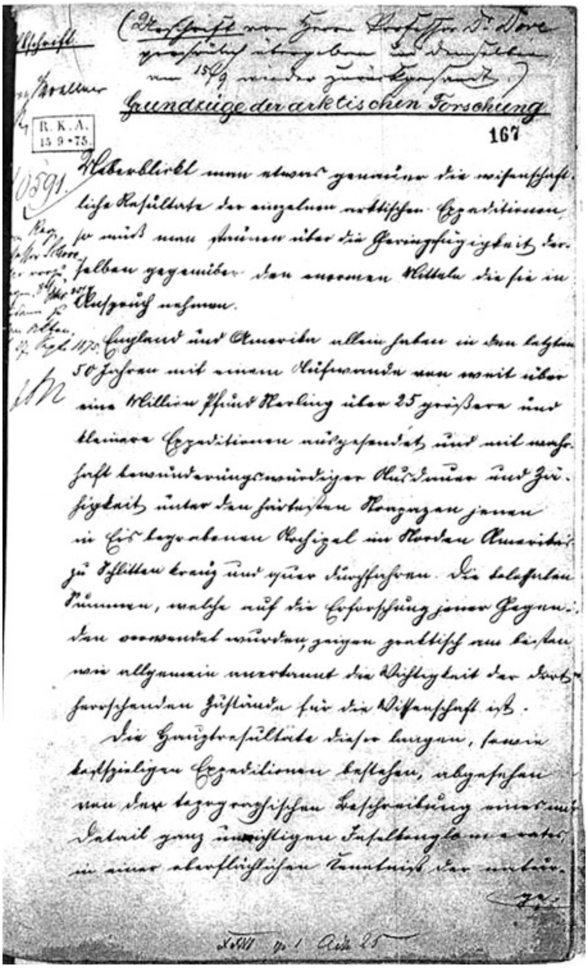
[13] Weyprecht (1875b, c, d).

[14] Heidke (1932:81).

[15] Weyprecht July (1875:174v).

[16] Weyprecht (1875b:41).

[17] Report (1876:11); Protokolle (1876:11).



Abschrift

(Abschrift von Herrn Professor Dr. Dove persönlich übergeben und derselbe am 15/9 wieder zurückgesandt.)

R. K. A.
15 9 · 75.

Grundzüge der arktischen Forschung

167

10591.

Ueberblickt man etwas genauer die wissenschaftliche Resultate der einzelnen arktischen Expeditionen, so wird man staunen über die Geringfügigkeit derselben gegenüber den enormen Mitteln die sie in Anspruch nahmen.

17. Sept. 1875.

England und Amerika allein haben in den letzten 50 Jahren mit einem Aufwande von weit über eine Million Pfund Sterling über 25 größere und kleinere Expeditionen ausgesendet, und mit wahrhaft bewunderungswürdiger Ausdauer und Zähigkeit unter den härtesten Strapazen jenen in Eis begrabenen Archipel im Norden Amerika's zu Schlitten kreuz und quer durchfahren. Die bedeutenden Summen, welche auf die Erforschung jener Gegenden verwendet wurden, zeigen deutlich am besten wie allgemein anerkannt die Wichtigkeit der dort herrschenden Zustände für die Wissenschaft ist.

Die Hauptresultate dieser langen, teuren kostspieligen Expeditionen bestehen, abgesehen von der topographischen Beschreibung eines im Detail ganz unwichtigen Inselkonglomerates, in einer oberflächlichen Kenntniß der natür-

Fig. 2.2 Front page of Carl Weyprecht's "Grundzüge der arctischen Forschung". (Weyprecht July 1875. Grundzüge der arctischen Forschung. Manuscript. Bundesarchiv, Abteilung Potsdam, RKA 1.500, Bl. 167–175, unpublished)

Table 2.1 Weyprecht's fundamental principles (translation after Baker 1982:227)

(1) Arctic exploration is of the greatest importance for knowledge of the laws of nature
(2) Geographical discovery carried out in these regions has only a serious value in as much as it prepares the way for scientific exploration as such
(3) Detailed Arctic topography is of secondary importance
(4) For science the Geographical Pole does not have a greater value than any other point situated in high latitudes
(5) If one ignores the latitude, the greater the intensity of phenomena to be studied the more favourable the place for an observational station
(6) Isolated series of observations have only relative value

Table 2.2 Development of network of stations in the northern and southern hemisphere during the 1st International Polar Year

Date	Northern Hemisphere											Southern Hemisphere				
End of June or beginning of July 1875[a]	Spitsbergen 80° N lat.	In Siberia in the Lena mouth (70° N lat.)		East from Bering Strait (71° N lat.)	West or east coast of Greenland (76–78° N lat.)	Novaya Zemlya (76° N lat.)										
September 1875[b]	Spitsbergen 78° N lat.	In Siberia 70° N lat.		North or East from Bering Strait 71° N lat.	West or east coast of Greenland 76–78° N lat.	Novaya Zemlya 76° N lat.										
January 1876[c]	Spitsbergen ca 80° N lat.	Siberian coast near Lena mouth ca 71° N lat.	New Siberian Islands	Maguire at Pt Barrow	Upernavik West Greenland	Novaya Zemlya ca 76° N lat.		Station on the east coast of Greenland	Station in Norwegian Finnmark was important							
21 April 1876[d]	Spitsbergen	Lena mouth	New Siberian islands	Point Barrow	Upernavik			Pendulum Island	Alta (Finnmark)		Boothia Felix (Canada)					
30 September 1877[e]	Spitsbergen	North coast of Siberia Lena mouth	New Siberian islands	Maguire at Pt Barrow	West coast of Greenland	Novaya Zemlya		East coast of Greenland (ca 75° N. lat	Finnmark near Nordkapp				Cap Horn	Kerguelen or MacDonald Islands	One group of islands south of Aukland	
1–5 October 1879[f]	Spitsbergen	Lena mouth		Point Barrow	Upernavick	Novaya Zemlya	Jan Mayen or east coast of Greenland		Finnmark (Nordkapp)		One point in American Arctic archipelago			Kerguelen island	Balleny Islands	South-Georgia
Autumn 1881																
April 1882[g]	Spitsbergen (Sweden)	Lena mouth (Russia)	Dickson Harbour (The Netherlands)	Point Barrow (USA)	Godlhaab (Denmark)	Novaya Zemlya (Russia)	Jan Mayen (Austria)	Pendulum Island (Germany, not yet confirmed)	Bossekop (Norway)	Sodalkylä (Finland, not yet confirmed)	Great Slave Lake (England and Canada	Lady Franklin Bay (USA)	Cap Horn (France, not yet confirmed)			South-Georgia (Germany)
August 1882[h]	Spitsbergen (Sweden)	Lena mouth (Russia)	Dickson Harbour (The Netherlands)	Point Barrow (USA)	Godthaab (Denmark)	Novaya Zemlya (Russia)	Jan Mayen (Austria)	Cumberland Sound (Baffin Island east Canada)	Bossekop (Norway)	Sodalkylä (Finland)	Fort Rae (Great Slave Lake, England and Canada	Lady Franklin Bay (USA)	Cap Horn (France)			South-Georgia (Germany)

[a] Weyprecht, C. 1875a: Grundzüge der arctischen Forschung. Bl. 174v.

[b] Weyprecht, C. 1875b: Der Vortrag “Grundprinzipen der arktischen Forschung”. In: Frischauf J, Graber V, Klemensiewicz R (eds) Tageblatt der 48. Versammlung Deutscher Naturforscher und Aerzte in Graz vom 18 bis 24 September 1875, Leuschner and Lubensky, Graz pp 41.

[c] Weyprecht and Wilczek to the Russian Geographical Society, January 1876. Universitätsbibliothek Giessen, Handschriftenabteilung, Nachlass von Baer. Bd. 38, Bl. 60v; St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 71, l. 9v.

[d] Proposal of the International Meteorological Committee during his meeting in London 21th April 1876. In: Wild, H., Scott, R. H. 1881. “Anhang 1B”, Bericht über die Verhandlungen des Internationalen Meteorologischen Comités, Versammlung in Bern. Hamburg, 11–12.

[e] Weyprecht, C., and K. Wilczek 1877: Entwurf des Arbeitsprogrammes einer internationalen Polarexpedition. Mitt aus dem Gebiete des Seewesens 5(11):507.

[f] Bericht 1880b: Bericht über die Verhandlungen und die Ergebnisse der internationalen Polar-Konferenz abgehalten in Hamburg, 1.–5. Oktober 1879. Hamburg, p. 10.

[g] Wild, H. 1882: Mittheilungen der Internationalen Polar-Commission. Kaiserliche Akademie der Wissenschaften, St. Petersburg, 74–75.

[h] Bericht, 1881: Bericht über die Verhandlungen und die Ergebnisse der 3. internationalen Polar-Konferenz abgehalten in St. Petersburg in den Tagen vom, 1. bis 6. August 1881. Kaiserliche Akademie der Wissenschaften, St. Petersburg, 272–273.

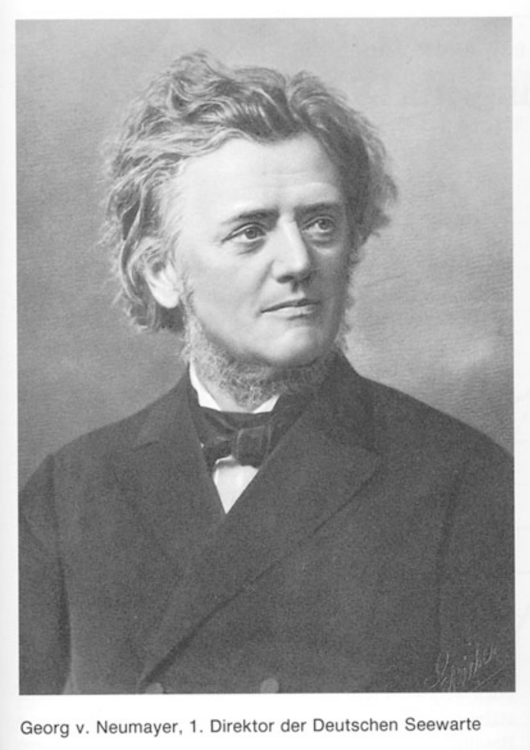


Fig. 2.3 Georg Neumayer (1826–1909), director of the Deutsche Seewarte in Hamburg (Heise 1993:21)

Weyprecht and his friend and patron Graf Hans Wilczek (1837–1922) compiled a detailed programme of the activities of an international polar expedition (*Entwurf eines Arbeitsprogrammes einer internationalen Polarexpedition*) on 30 September 1877 for eight stations in the Arctic zone.[18] According to Neumayer, who had been director of the German Maritime Observatory in Hamburg since 1876 (Fig. 2.3), stations should also be set up in the southern hemisphere – close to Cape Horn, at Kerguelen or MacDonald Islands, and on one of the islands south of the Auckland Islands.[19]

Weyprecht intended to present the programme at the International Meteorological Congress that was scheduled to meet in Rome in the same year. In addition to the organization activities of the polar year, and dependent on the financial aid from Graf Wilczek, observations were planned to be carried out in Novaya Zemlya, where Weyprecht and Wilczek personally decided to travel.[20]

Unfortunately, the well-elaborated project by Weyprecht, which had drawn great interest, met with ill success. Because of the political events (war in the Balkans),

---

[18] Weyprecht and Wilczek (1877:507), Wilczek and Weyprecht (1877).

[19] See also Bericht (1881b:12), Lüdecke (2002:13).

[20] Weyprecht and Wilczek (1877:497), Wilczek and Weyprecht (1877).

the meteorological congress in Rome was postponed until April 1879. By that time, Weyprecht's plan was more or less forgotten,[21] and he therefore decided to leave other countries aside if they would not join the programme, and to realize his own plan and travel to Novaya Zemlya in 1880.

Weyprecht did not know that his great plan had been discussed in Utrecht on 18 October 1878 during the meeting of the Permanent Meteorological Committee, which was in charge of the organization of the 2nd International Congress of Meteorologists in Rome. The Committee under the presidency of Christoph Hendrik Diederik Buys-Ballot (1817–1890), director of the Dutch Meteorological Institute in Utrecht, decided to send the proposal to Henrik Mohn (1835–1916), director of the Meteorological Institute of Norway in Christiania (Oslo), in order to receive his comments on the project.[22] In respect of the congress in Rome the Committee stated that Weyprecht's plan "will be of the greatest importance for the advancement of meteorology and enhancement of our knowledge about earth-magnetism, and [the Committee] therefore recommends on behalf of science the general participation in this enterprise. How can the Congress on its part contribute to the success of the latter?"[23] After the receipt of Mohn's report, Neumayer was also asked for his comments for preparing a final decision in 1879.

Before the realization of this changed plan, Weyprecht went to Rome where he gave an enthusiastic speech on the last day of the Congress on 22 April 1879.[24] He focused on the expediency of organizing an international polar expedition, during which members should carry out synchronous observations in various stations for a full year, following the same programme. Weyprecht also told about his intention to found a station in Novaya Zemlya and called the members of the Congress to convince other countries to follow his example. The participants of the meteorological congress considered the plan of Weyprecht and Wilczek very important, but they had neither enough time nor the mandates of their countries to discuss the matter in great detail. As Weyprecht did not want to delay the preparations for his expedition, a special meeting was scheduled to take place in Hamburg in October 1879 already.[25] On behalf of the bureau of the International Meteorological Committee invitations were sent to the participants of the conference in Rome, among them Neumayer, by then a member of the Committee, scientific societies, observatories and personally to several scientists in various countries. Only scientists entitled by their governments or societies to set up polar stations should be invited to the so-called polar conference (Table 2.3).

No more than nine persons (representing eight countries) gathered in the building of the German Maritime Observatory in Hamburg on 1 October 1879, namely: Buys-Ballot; captain Niels Henrik Cordulus Hoffmeyer (1836–1884), director of

---

[21] Hellwald (1881:906).

[22] Protokolle (1879:4).

[23] Protokolle (1879:28).

[24] Bericht (1880a:20–21, 81–82).

[25] Bericht (1881b:11–12).

Table 2.3 International Polar Conferences (Wild 1882)

1–5 October 1879	Hamburg (Chair: Neumayer) 9 directors of meteorological services or institutes 1881–1882 best time due to maximum magnetic activity
7–9 August 1880	Bern (Chair: Neumayer) 8 directors, guest Wild Participation of 4 stations secured Start postponed for 12 months Neumayer's resignation, Wild new chair
1–4 August 1881	St Petersburg (Chair: Wild) 10 directors Participation of 8 stations secured Final programme Navy and merchant ships included
17–24 April 1884	Vienna (Chairs: Wild and Neumayer) 20 directors and expedition leaders Analysis of data Publication of results
3 September 1891	Munich (Chair: Wild) 13 directors and guests Discussion of results Collection of data at the Central Physical Observatory at St Petersburg Disbanding of Polar Commission

the Meteorological Institute of Denmark in Copenhagen; Elenthère Mascart (1837–1899), director of the Central Meteorological Bureau in Paris; Henrik Mohn (Oslo); Georg Neumayer; Robert Lenz (1833–1903), professor of physics at the University of St Petersburg, representing the Russian Geographical Society; August Wijkander (1849–1913), professor of physics of the Chalmers Institute, representing the Swedish Academy of Sciences; naval captain Georg Freiherr von Schleinitz (1834–1910) representing the Naval Ministry of Prussia and Lieutenant Carl Weyprecht. Those present set up the International Polar Commission and elected Neumayer as its president. It is interesting to note that besides Buys-Ballot and Neumayer, also Mascart and Mohn were at the same time also members of the International Meteorological Committee.[26]

The International Polar Commission discussed the programme of Weyprecht and Wilczek, made necessary amendments, and a working group of Weyprecht, Mohn and Wijkander set up a programme of future investigations of the international polar expedition. In order to obtain reliable observational data, it was decided that at least eight stations were required in the Arctic zone of the northern hemisphere. According to Weyprecht, the stations were to be set up in the highland of Finnmark, in Spitsbergen, Novaya Zemlya, in the delta of the Lena River and Upernavik of the western coast of Greenland. In addition, the following sites were pointed out for polar stations – Point Barrow, Jan Mayen Island or the eastern coast of Greenland

---

[26] Rapport (1882:5).

and the islands of the Canadian Arctic.[27] Additional stations on the southern hemisphere should be established on South Georgia, Kerguelen, Auckland or Campbell Islands and on Balleny Islands, if a landing would be possible. The countries which would organize observations there, however, were not determined. It was decided that observations would start in autumn 1881.

Weyprecht's proposal was accepted diversely by scholars. Some of them supported it, others were sceptical. Also governments reacted differently. Russian scientists approved the idea immediately and were given the required means, as well as the Danish and Norwegian researchers. At first the American, Canadian and English researchers were not interested in the project. German, French and Dutch scientists did not have necessary funds for establishing the stations, Swedes were hesitating, while the Italians completely refused to participate in the joint investigations.

Thus, the situation proved rather unfavourable and required solution. When a meeting of the International Meteorological Committee was planned to be held in Bern in summer 1880, it was decided that the Second International Polar Conference would also be organized there to discuss further steps such as the question of observation instruments and methods to be used. It took place on 7-10 August 1880 just before the meteorologists met.[28] It appeared that only four countries – Russia, Denmark, Norway and Austria – had finances for setting up stations. Due to this fact and in accordance with the proposal of the Russian member of the Polar Commission, it was agreed that observations should not start in 1881 (as was decided in Hamburg), but in autumn 1882. Also the need of drawing further attention of the governments of other countries in order to explain the importance of giving finances to this undertaking was discussed. The meeting in Bern culminated in the election of the Swiss meteorologist Heinrich Wild, President of the International Meteorological Committee, member of the St Petersburg Academy of Sciences and director of the Central Physical Observatory at St Petersburg (Fig. 2.4) to replace Neumayer as chairman of the International Polar Commission.

When the International Polar Commission was set up in Hamburg with Neumayer as president, its relationship to the International Meteorological Committee remained unclear, partly due to the circumstance that the congress in Rome failed to adopt a unique position concerning geomagnetic observations in Weyprecht's plan. Some of the members participating in the discussion considered it not to be the responsibility of the meteorological congress.[29] As it appears from a letter Neumayer wrote to Wild, the International Meteorological Committee had avoided the performance of geomagnetic observations and did not evaluate geomagnetism as a scientific discipline as much as it deserved.[30] This led to the decision

---

[27] Bericht (1880b:1–13).

[28] Bericht (1880c:1–8).

[29] Bericht (1880a:81–82).

[30] Neumayer 26 January 1880. (Letter to Wild. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 72, l. 16–19., unpublished).

Fig. 2.4 Heinrich Wild (1833–1902), director of the central physical observatory at St Petersburg and president of the International Meteorological Committee (Wild 1913)

that geomagnetic observations would be carried out by the Polar Commission in the framework of the polar year, while the elaboration of the methods of meteorological observations and the testing of the instruments would be carried out with the help of the meteorological committee.[31] Another reason for the discord between the Committee and the Commission consisted of the fact that the International Polar Commission had declared itself independent, while the Meteorological Committee regarded it as a temporary sub-commission of the Committee which would not acquire a formal competency until all its members would be backed by their governments.

Wild had not been present in Hamburg, but he was aware of the results of the conference through the records of the Hamburg session Lenz and Neumayer had sent him. In his opinion, as the president of the International Meteorological Committee, the commission had set to work too early as several countries had not yet confirmed their participation. He was convinced that the "independent" Polar Commission could not count on the help of the committee. Wild considered it necessary to share his thoughts on this concern with Neumayer in a confidential letter. He preferred

---

[31] Bericht (1880b:8).

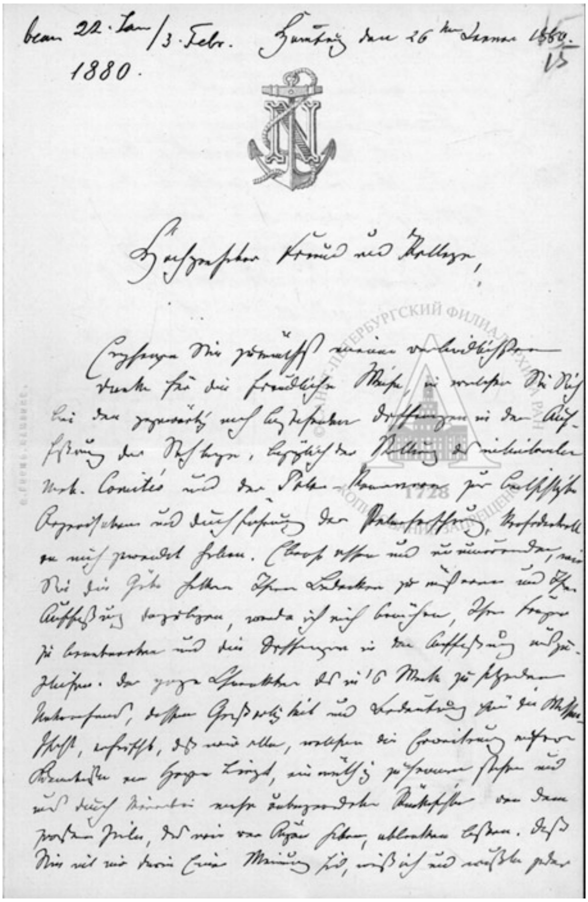


Fig. 2.5 Georg Neumayer's letter to Heinrich Wild from 26 January 1880 including an explanation of the considerations why the polar commission had decided to start the organization of the International Polar Year independently of the International Meteorological Committee (Neumayer 26 January 1880)

that the organization of magnetic as well as the meteorological observations would be subordinated to the same institution in order to avoid variances inhibiting the realization of the undertaking.[32]

In his reply Neumayer explained to Wild why it had been decided to set up an independent Polar Commission in Hamburg (Fig. 2.5).[33] According to Neumayer, a temporary commission would not be prepared to make itself wholly responsible for the organization of polar investigations. Besides, he considered it to be important to start preparations for polar investigations without delay, in order not to waste valuable time that the establishment of a permanent Polar Commission would require.

---

[32] Wild 19 January 1880. (Letter to Neumayer. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 72, ll. 20–26v, unpublished).

[33] Neumayer 26 January 1880.

In Neumayer's opinion, it would be possible to join the work of the Polar Commission at any time when a nation decided to participate in the expeditions. As the International Meteorological Committee gave little attention to geomagnetic observations, the Polar Commission decided to take the responsibility for the organization of these observations. That is why Neumayer considered the necessity of including naval officers working with earth-magnetism (e.g. Schleinitz) and also researchers such as Wild. At the end of the letter Neumayer emphasized that although the objectives of the International Meteorological Committee and the International Polar Commission were different, he thought that only the respect for the views and positions of each other would make it possible to realize the "wonderful and important to science undertaking" put forward by Weyprecht.

Neumayer's position did not convince Wild. Therefore, on behalf of the International Meteorological Committee, on 24 February 1880, Wild sent an official letter to the Polar Commission in which he refused to cooperate in the organization of polar stations.[34] In the first-half of 1880, the campaign concerning the participation in the investigations of polar regions by Neumayer had not been as successful in different countries as expected. The circulars of the Polar Commission were read, but new countries were not added.

In the end Neumayer probably realized that the "independence" of the Polar Commission from the International Meteorological Committee proved not as useful as several members of the Polar Commission had hoped. But it was beyond Neumayer's power to change the situation after Wild's official refusal. On the other hand, Wild realized that for the same reason he was also unable to exercise influence on the work of the Polar Commission. They both seemed to understand that their opposite views prevented the realization of Weyprecht's idea. To guarantee the success of the promising project, Wild decided to accept Neumayer's suggestion and join the Polar Commission. The approval of the idea by Neumayer is to be learned from his letter to Wild of 4 May 1880.[35]

Now Neumayer understood that Wild's campaign for polar investigations would be more successful than his own and he decided to step down from the presidency of the Polar Commission in favour of Wild. He also recognized Wild's principle of a one-man leadership. Due to this Neumayer withdrew from the position in Bern on 8 August 1880. He informed the Meteorological Committee of his decision as follows: "Finally, I am writing to inform the Committee that for various considerations, partly expressed in the Minutes [little international activity in the organization of polar stations], I made a resolution to relinquish my duties of president. Mr. Wild, president of the International Meteorological Committee, who was already

---

[34] (Wild 24 February 1880. Letter to the International Polar Commission. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 70, l. 3–4v, unpublished).

[35] (Neumayer 4 May 1880. Letter to Wild. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 72, ll. 5–5v, unpublished).

an elected member of the Polar Commission in the last session, was unanimously appointed president of the Commission, in the meeting of August 9th."[36]

Wild took up the work with great enthusiasm. He applied to the governments of various countries, which until that day had not taken part in the discussion of the problem of Arctic observations, with a request to support international collaboration. However, until the beginning of 1881 the situation did not change remarkably. Only four countries had agreed to establish the stations. Then Wild decided that they would be limited to the existing stations. In a circular, he informed the other members of the Commission of his decision and requested their opinions.[37] Robert Lenz, the chairman of the Polar Committee of the Russian Geographical Society, answered immediately. He supported the proposal and stressed that the "undertaking" should not be given up and promised that the station set up by the Geographical Society at the Lena delta and its branch at the mouth of the Kolyma[38] would be ready to start observations in autumn 1882.[39]

Wild hoped that setting up one more full polar station in Russia would inspire other countries to establish further stations, which he probably had discussed with Lenz. In his opinion, the problem of a too sparse network of stations could be solved if Weyprecht and Wilczek would give up their idea of carrying out observations in Novaya Zemlya. On 16 March 1881,[40] he wrote to Weyprecht: "Would it be possible that you both go to Point Barrow[41] and then Russia would have Novaya Zemlya? I think that it would not be difficult at all for Russia to regard Novaya Zemlya as its own. The Grand Duke Konstantin [President of the Russian Geographical Society]

---

[36] Rapport (1882:39).

[37] (Wild 2 February 1881**.** Letter to members of the International Polar Commission, Circulaire of the International Polar Commission, no 11. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 68, l. 39, unpublished)**.**

[38] The Geographical Society planned to organize a branch station in Novosibirskyie Ostrova. However, the Russian Geographical Society received information on the intention of Adolf Erik Nordenskiöld (1832–1901), who had returned from his famous trip along the coast of Eurasia on the *Vega*, to go to an expedition in order to investigate this archipelago. Then it was decided in the Russian Polar Commission that the branch station would be set up in the delta of the Kolyma (Lenz 2 February 1881: Letter to Wild, Circulaire of the International Polar Commission, no 12. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 70, l. 5–5v, unpublished).

[39] (Lenz 2 February 1881: Letter to Wild, Circulaire of the International Polar Commission, no 12. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 70, l. 5–5v, unpublished).

[40] All Russian dates are given after the new calendar.

[41] Wild's proposition to Weyprecht to go to Point Barrow became evident from their correspondence. Weyprecht wrote that as the participation of the Americans in the project of the polar year was not clear, they had to decide who would go to Point Barrow, otherwise there would be a big gap in observation results because of the great distance between the Lena delta and the western coast of Greenland (Weyprecht 5 January 1881. Letter to Wild. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 74, l. 2, unpublished).

recently hinted at that to me. But, before I can do anything in this matter, I would like to know your attitude . . ."[42]

On 29 March 1881, Weyprecht died suddenly, but Wilczek did not stop planning. In April he telegraphed Wild that to guarantee the realization of "our undertaking" he was ready to send an expedition to the island of Jan Mayen or to Greenland. Wild published this information in the Circulaire of the International Polar Commission No 14 on 1 May 1881, adding the information from the Russian Geographical Society that in connection with Wilczek's decision, they planned to set up a full station on Novaya Zemlya.[43] During April and May, the Americans, French and Dutch announced that they were setting up stations and at the end of June, Sweden also decided to join the international polar expeditions.[44] Thus, the resolutions of the first international polar conferences, at least, were fulfilled and in his consecutive circular Wild informed the members of the Polar Commission that the third conference for final preparations would take place in St Petersburg in August 1881, as already decided upon in Bern.[45]

On 1–4 August 1881 six meetings of the third polar conference were held at the Central Physical Observatory in St Petersburg. Neumayer and Schleinitz were not present because the German government had not given money for setting up the stations, thus they considered that they did not have the mandates.[46] The Polar Commission, however, was increased on account of the new members – representatives of the countries which had now decided to establish their stations: Wilczek, Emil Edler von Wohlgemuth (1843–1896) (head of the future Austro-Hungarian station on the island of Jan Mayen) and Nikolai Danilovich Yurgens (1847–1898) (the head of the future Russian station in the Lena delta).

At the opening of the conference the participants paid homage to the recently departed Weyprecht. Wild informed on the new activities and the participating countries. Methods, time and periodicity of observations, as well as the instruments required were defined in order to guarantee analogous results. To ensure a sufficient number of data for a comparative analysis, it was decided to apply to the observatories of all zones of the earth, also to request marine administrations to ask the captains of military and marine ships to organize observations in accordance

---

[42] (Wild 16 March 1881. Letter to Weyprecht. Österreichisches Staatsarchiv, Nachlass Weyprecht, B/205:1–3, Bl. 317v, unpublished).

[43] (Wild 1 May 1881. Letter to the International Polar Commission, Circulaire of the International Polar Commission No 14. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 70, l. 9–10, unpublished).

[44] (Wild 6 April 1881, 3 May 1881, 15 May 1881. Letters to the International Polar Commission, Circulaires of the International Polar Commission no 13, 15, 16. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 70, l. 7–8; 11; 12–12v; 14–15, unpublished).

[45] (Wild 1 May 1881. Letter to the International Polar Commission, Circulaire of the International Polar Commission No 14. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 70, l. 9–10, unpublished).

[46] Bericht (1881b:1–14), Lüdecke (2002:16–17), Krause (2007:31).

with the programme of the polar year. The Russian member Lenz informed that the Geographical Society was going to establish a station in Novaya Zemlya, using the existing station of the Society for Life Saving at Sea at Malye Karmakuly.[47] As Russia and the United States of America were going to build two stations, there were all in all eight stations to be set up.

In the end, Wilczek suggested publishing the *Communications from the International Polar Commission* (Fig. 2.6). Wild agreed to publish 1,000 copies under his editorship at the expense of the St Petersburg Academy of Sciences,[48] while the members of Polar Commissions of different countries had to guarantee the means for editing the proceedings.[49]

Regardless of the intensive work of the third polar conference, a number of problems remained unsolved. For example, a person able to guide the observations in Novaya Zemlya was found in Russia only in February 1882, and only in March was the Russian Geographical Society given the funds for setting up the station there.[50] Only after that, could the Society ask the Society for Life Saving at Sea to be allowed use their polar station. In February, the Dutch applied to the Russian government for permission to set up a station on Dickson Island, near the Yenisey delta. In March, England and Finland informed that they had decided to participate in the observations. Only then could the realization of Weyprecht's plan of the international polar expedition become feasible.

The International Polar Year took place from 1 August 1882 to 31 August 1883. It was the first international experiment designed not only to serve the improvement of navigation and the understanding of climate, but also of the solar–terrestrial relations. Observations were performed at 14 stations – 12 of them in the northern

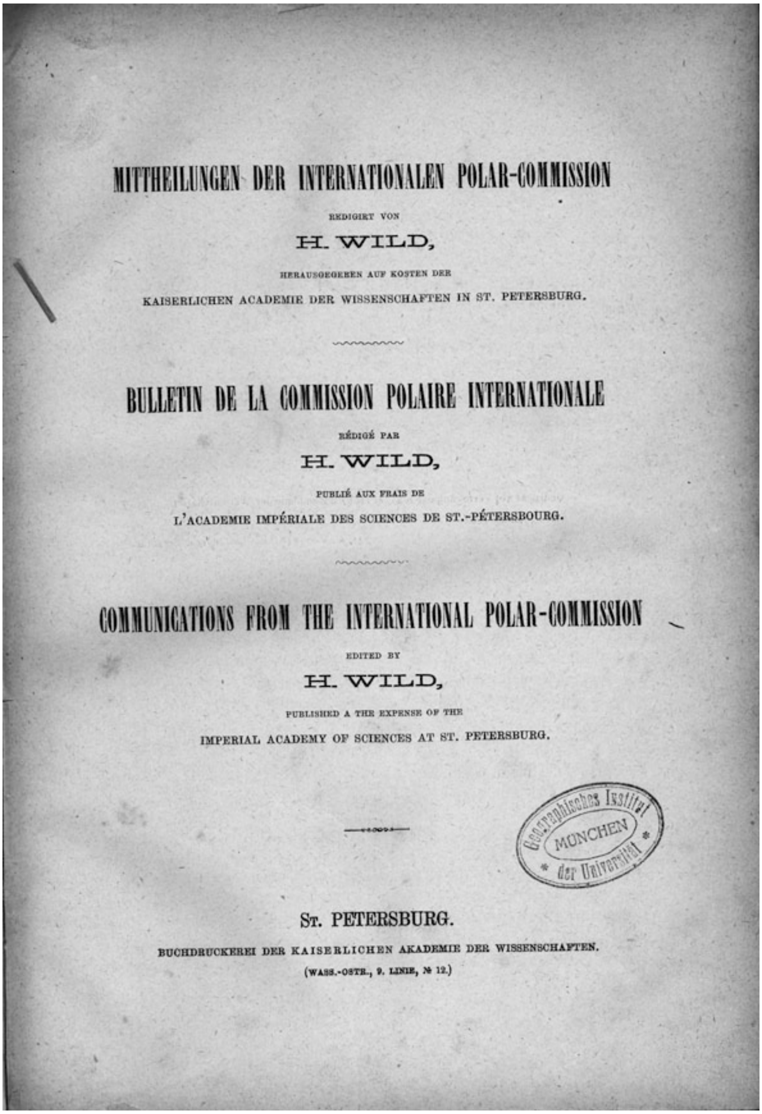
---

[47] Bericht (1881a).

[48] On the title page, the name was given in three languages – in German: *Mittheilungen der Internationalen Polar-Commission*, in French: *Bulletin de la Commission Polaire Internationale* and in English.

[49] Wild 28 September 1881. Letter to the International Polar Commission, Circulaire of the International Polar Commission No 19. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 70, l. 17–18, unpublished. In *Mittheilungen der internationalen Polar-Commission* there were: articles on the history of the polar year, instructions for observations, information on the courses of different expeditions and reports on the results of the observations, some circulars of the Polar Commission and records of its meetings taking place after the polar year. The articles were published in German, English and/or French, and in seven parts: the first in 1882 and the last in 1891. Before that the first chairman of the commission Neumayer and later Wild regularly sent the members of the commission information in the form of special circulars on the events in different countries connected with the establishment of polar stations. There are 50 numbers of circulars from 1879 to 1891. Many of them were not published in *Mittheilungen* as they were addressed only to members of the commission.

[50] (Lenz 8 March 1882. Letter to Wild, Circulaire of the International Polar Commission, no 26. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 70, l. 28, unpublished).



MITTHEILUNGEN DER INTERNATIONALEN POLAR-COMMISSION
REDIGIRT VON
H. WILD,
HERAUSGEGEBEN AUF KOSTEN DER
KAISERLICHEN ACADEMIE DER WISSENSCHAFTEN IN ST. PETERSBURG.

BULLETIN DE LA COMMISSION POLAIRE INTERNATIONALE
RÉDIGÉ PAR
H. WILD,
PUBLIÉ AUX FRAIS DE
L'ACADEMIE IMPÉRIALE DES SCIENCES DE ST.-PÉTERSBOURG.

COMMUNICATIONS FROM THE INTERNATIONAL POLAR-COMMISSION
EDITED BY
H. WILD,
PUBLISHED A THE EXPENSE OF THE
IMPERIAL ACADEMY OF SCIENCES AT ST. PETERSBURG.

ST. PETERSBURG.
BUCHDRUCKEREI DER KAISERLICHEN AKADEMIE DER WISSENSCHAFTEN.
(WASS.-OSTR., 9. LINIE, № 12.)

Fig. 2.6 Front page of *Mittheilungen der internationalen Polar-Commission* (Wild 1882)

hemisphere and 2 in the southern hemisphere. Arctic stations were located at Point Barrow and Lady Franklin Bay (USA), Fort Rae on the coast of Great Slave Lake in northeast Canada (UK), Cumberland Sound at Baffin Island on the eastern coast of Canada (Germany), Godthaab on the western coast of Greenland (Denmark), Cape Thordsen in Spitsbergen/Svalbard (Sweden), Bossekop in northern Norway

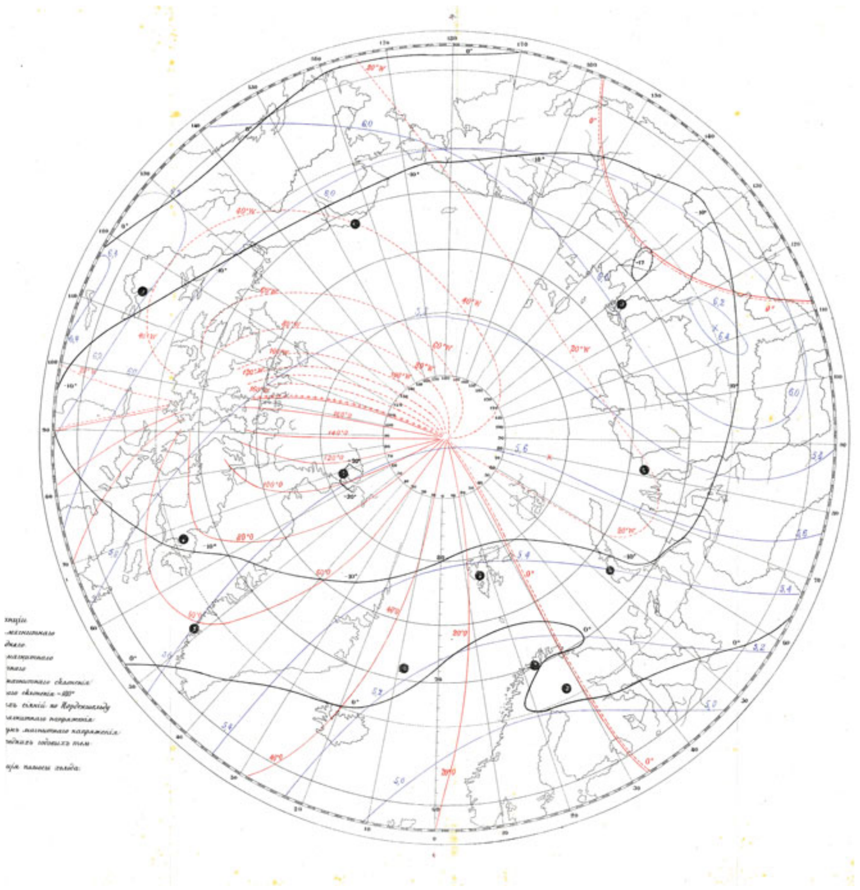


Fig. 2.7 The location of the observation stations of the International Polar Year in the Arctic. From Rykachev (1883)

(Norway), Dickson Island (The Netherlands), Jan Mayen (Austria–Hungary) and at Sodankylä (Finnish Lapland) (Fig. 2.7).[51] The Dutch expedition could not land on Dickson Island as the expedition ship was beset by ice in the Kara Sea, and then subsequently observations had to be performed on sea ice.

---

[51] The base map of the polar stations was compiled in 1881 at the request of the polar commission of the Russian Geographical Society and printed in Gotha in 1882 (Wild 15 June 1882. Letter to the International Polar Commission. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 70, l. 36–37, unpublished). This map was used for the registration of the investigation results of the International Polar Year by researchers of different states taking part in it (eg. Rykachev 1883; Neumayer 1901).

Auxiliary meteorological stations were organized by the German Naval Observatory at Moravian mission stations on the east coast of Labrador in – from south to north – Hoffenthal, Zoar, Nain, Okak, Hebron and Rama.[52]

Additionally, Norway sent a one-man expedition to Kautokeino some 100 km south of Bossekop for further auroral studies, which also provided ethnographical data of the local Sami. Another one-man expedition was supported by the American Signal Service to the Hudson's Bay Company post at Fort Chimo (Ungava Bay, Hudson Strait). Besides meteorological data, a natural history collection and especially the ethnographical investigations became very valuable.

Due to Neumayer's commitment two additional stations were maintained in the southern hemisphere, at South Georgia in the sub-Antarctic zone (Germany) and on Cape Horn in Chile (France) (Fig. 2.8). A summary of all expedition reports is given in Barr (1985).

In addition, observation data were received from 33 meteorological and magnetic observatories, from the observers of minor observation stations and amateur observers from different countries of the world.[53] Although this was "big science", referring to investments and operations with budget - consuming logistics, the instruments belonged to a "small science" category because rather simple ground-based methods were still in use.[54] The expedition technique was similar to the transit of Venus expedition with overland journeys as in Russia, Norway or Finland or by ship as the French expedition aboard the *Romanche*. They could use existing huts as in Godhavn, Bossekop or Labrador or they carried prefabricated huts with them as the German expeditions. The expedition members consisted of civilians and/or military staff.

Synchronous hourly observations of meteorological elements had to be taken of temperature, sea temperature at the surface and at each 10 m of depth, air pressure, humidity, wind direction and speed, clouds, precipitation and weather as well as daily minimum and maximum temperatures.[55] Magnetic observations of the absolute declination and inclination as well as of the variation of declination, inclination and horizontal intensity were to be taken hourly, while the Göttingen Civil Time had to be adopted for synchronization of magnetic measurements on term days. Term days were defined on the 1st and 15th of each month (exception 2nd instead 1st January 1883) with measurements every 5 min during 24 hours, starting on 1 August 1882 at midnight until 15 August 1883. Magnetic term hours with measurements every 20 seconds during 1 hour on each term day should start on 1 August 1882 at 12 noon. The next term hour started with a 1 hour delay (15 August 1882 start at 1 p.m.). Finally, aurora had also to be observed and the co-ordinates of the station astronomically determined.

---

[52] Barr (1985:199–205), Lüdecke (2005:129).

[53] Protokolle (1884:271).

[54] Lüdecke (2004).

[55] Wild (1882:8–12).

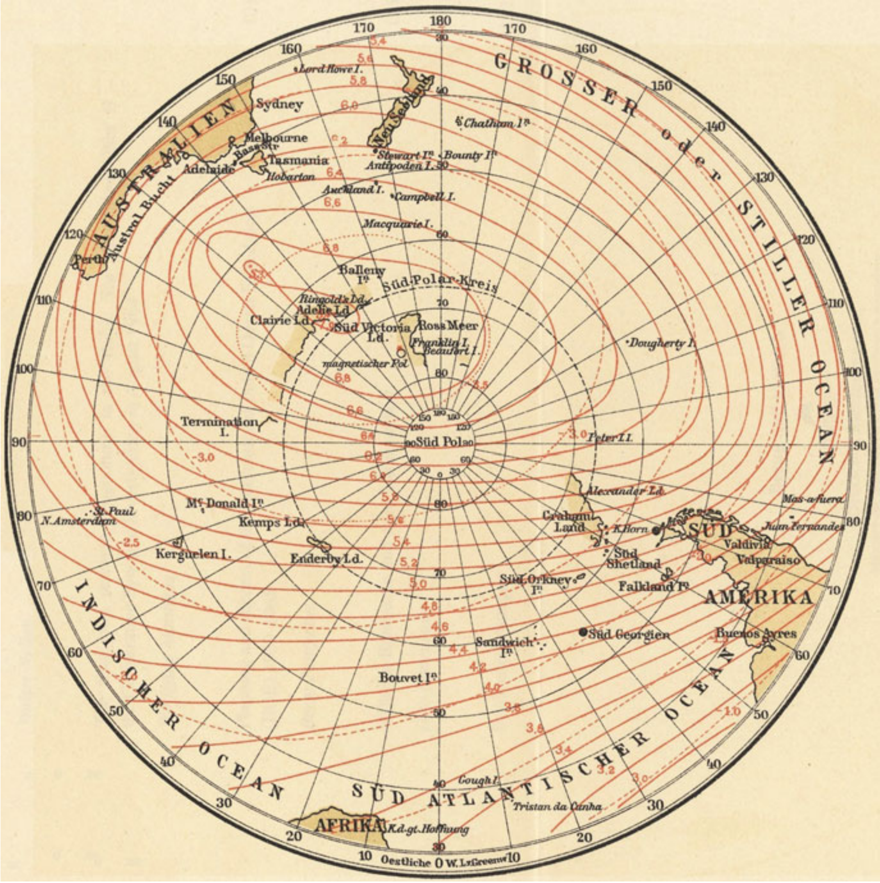


Fig. 2.8 Observing stations in the Southern Hemisphere during the International Polar Year (1882–1883) and the 3/4 isodynamic lines for the year 1880 (Neumayer 1901)

Optional observations concerned variation of temperatures with height, temperatures of the surface and at several depths of soil, snow and ice, as well as solar radiation, evaporation during all seasons, and melting of ice during summer. To determine the variation of the magnetic field, absolute simultaneous measurements of the three components of the magnetic field were needed. Measurements of the galvanic earth currents would throw light on the connection of terrestrial magnetism and polar lights. Various hydrographical observations of currents or physical properties of sea water and sea ice should be added to the programme. Finally, air electricity, astronomical and terrestrial refraction, gravity, movement of glaciers were also of interest among others.

As a result, the enormous material obtained during the International Polar Year was diverse concerning not only meteorological and magnetic phenomena of the polar countries. In April 1884, at the initiative of Wild, the 4th International Polar

Conference was held in Vienna in honour of Weyprecht. In addition to the members of the commission, the heads of all stations had also been invited. At the conference, unified methods of processing the magnetic and meteorological data, as well as the ways of their publication were discussed.[56] An instruction was published in German, French and Russian.[57] It was decided that the materials of the observations would be published during the following year at the expense of the countries that had established the stations.[58] The term of 1 year, however, appeared unreal for processing the data – the first papers including the results of meteorological and magnetic observations were issued in 1885 (for example in Russia)**.** During the 1st Ordinary Conference of Directors of Offices and Observatories, which had been organized by Fritz Erk (1857–1909, assistant at the Bavarian Meteorological Central Station) in Munich on 3 September 1891, the members of the International Polar Commission gathered for the last time before it was dissolved.[59] According to Neumayer's initiative they discussed how to generalize the data obtained. Keeping this in view, two special (meteorological and magnetic) committees were founded on the basis of the International Polar Commission, which had to carry on the work and invite other researchers to take part in it. In Munich, the St Petersburg Academy of Sciences was thanked for the great job done in the organization of investigations during the Polar Year. The Russian Academy of Sciences offered to deposit the manuscripts of all the polar expeditions. Besides, Neumayer drew the attention of colleagues to the importance of the extension of investigations in the Antarctic areas.

The publication of the results through 1898 provided the first meteorological data set describing the climate of the Arctic, but the value of such a short measuring period was rather limited.[60] Readings had only been taken at ground level and the meshes of the network had been too wide to construct daily synoptic charts for weather forecast or to analyse the dynamics of the polar atmosphere. Referring to earth-magnetism, two of the 12 biggest magnetic storms before 1954 were recorded in the Arctic on 17 November and 20 December 1882. In the end it was very much regretted that there was no summarizing publication of the meteorological and magnetic results.

In the publications devoted to the first International Polar Year, its importance as the first successful attempt at collaboration by different countries in the field of scientific research is usually stressed.[61] Several authors, however, have pointed out that numerous scientific questions put forward by Weyprecht could not provide answers

---

[56] Programm (1884).

[57] Instruction 1884: St Petersburg: Department of the Archives of the Academy of Sciences of Russia, 210, op. 2, No 70, l. 60, 71, 89–90, 109–111, 118–118v, 146–147, unpublished.

[58] Circulaire 23 March 1891: Circulaire of the International Polar Commission, no 48. St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 70, l. 146–147, unpublished.

[59] Protokoll (1891:349–354).

[60] Baker (1982:282).

[61] Vize (1931), Corby (1982), Barr (1985); Lüdecke (2002).

during one year as they needed long-time observations and to this the data obtained was of quite limited value.[62] Weyprecht certainly understood that the study of all scientific problems concerning the polar zone required much more time. The observations had to be regarded as the first step in the history of international co-ordinated investigations in the polar areas. This view Weyprecht had put forward already in his letter to the Russian Geographical Society.[63] The idea of a longer observing period was also important to Wild, who had tried to convince the participants in 1883 to continue the observations for one more year. Many other scientists understood the necessity, but the politicians were not interested in any further financial support and so the Polar Year had to be finished after 365 days.[64]

The question of the importance of the polar year data to the science of the end of the nineteenth century requires special studies. At present, only a few papers can be mentioned. A book by the Russian meteorologist Mikhail Aleksandrovich Rykachev (1840–1919) was published including generalizations of the meteorological observations during the polar year.[65] Unknown up to that day, this work presented data on the cold poles and high pressure areas in the Arctic as well as a low-pressure area over Iceland, and also some data on the general temperature distribution in the northern hemisphere. Rykachev also used data on the freezing of waters at the mouth of the Lena River in his book about freezing times in the Russian rivers.[66] The material of the observations of the Russian polar stations was also used in the papers of other collaborators of the Central Physical Observatory in St Petersburg and of the Commission for the study Yakutsk ASSR in the 1920s.[67]

Under the supervision of Erk, then director of the Bavarian Meteorological Central Station in Munich, his assistant Sebald Bernhard Ehrhart (born 1871), analysed temperature and pressure data of the Polar Year for his dissertation published in 1902.[68] He published meridional maps of monthly pressure and temperature for January and July 1883. In the Arctic the isotherms of January 1883 show great details, such as the influence of the Gulf Stream in the Far North never seen before (Figs. 2.9 and 2.10).

Neumayer used the results of the magnetic observations in new maps of the distribution of magnetic phenomena in *Atlas des Erdmagnetismus*[69] published in *Berghaus' physikalisher Atlas* (3rd edition, 1892). The cloud data of the Polar Year can be found in the International Cloud Atlas by Hugo Hildebrand Hildebrandsson

---

[62] Vize (1931:12), Barr (1985:206).

[63] Berger et al. (2008: 446).

[64] E.g., Rykachev (1883:31).

[65] Rykachev (1889).

[66] Rykachev (1886).

[67] Komarov (1926), Shostakovich (1927), Shtelling et al. (1926).

[68] Ehrhart (1902), see also Lüdecke (2007).

[69] Neumayer (1891).

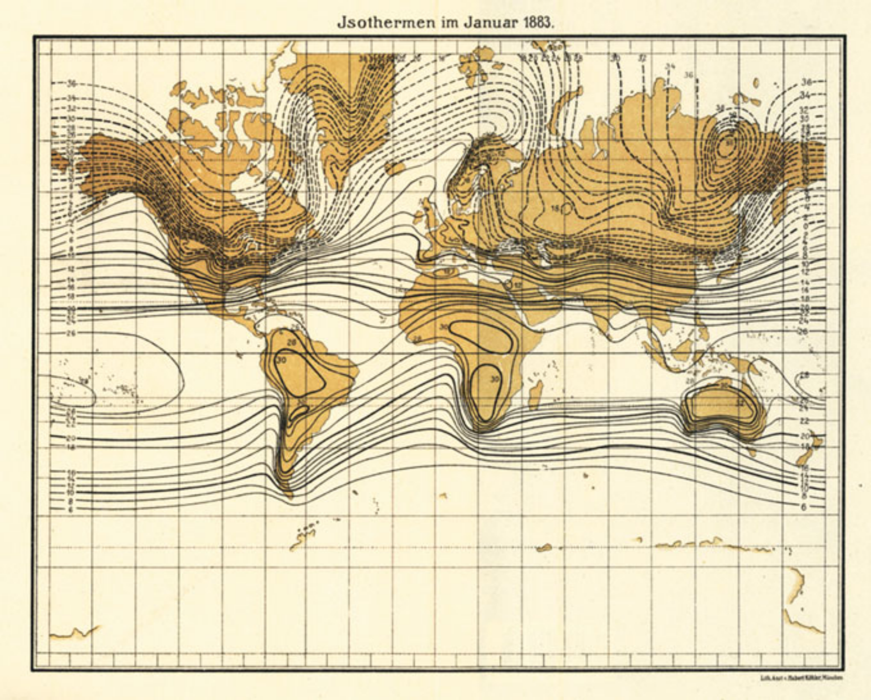


Fig. 2.9 Isotherms of January 1883 constructed from 799 stations in the northern hemisphere, 125 stations in the southern hemisphere and 101 data points in the Atlantic Ocean (Ehrhart 1902a)

(1838–1925).[70] In modern time data from the first International Polar Year were used by the American scientists Kevin Wood and Dmitry A. Streletskiy.[71]

To a more or less extent, scientists of different countries made use of the botanical, zoological, ethnological and geological data collected by the expeditions taking part in the polar year. All data contributed to the knowledge at the end of the nineteenth century as the polar regions then were mostly not investigated. Although the first International Polar Year (1882–1883) only represented "small science" concerning instrumentation, it represented a milestone of international co-operation in science and appeared to be the precondition for the organization of the 2nd Polar Year taking place in 1932–1933, which had a greater scope than the previous one. Looking back to the Polar Year, Neumayer said: "This acting in combination of nations is suitable to consolidate peace among them and to arouse the competition on a field ennobling mankind."[72]

---

[70] Hildebrandsson et al. (1890, 1896).

[71] Wood, Streletskiy (2008).

[72] Neumayer (1901: 454).

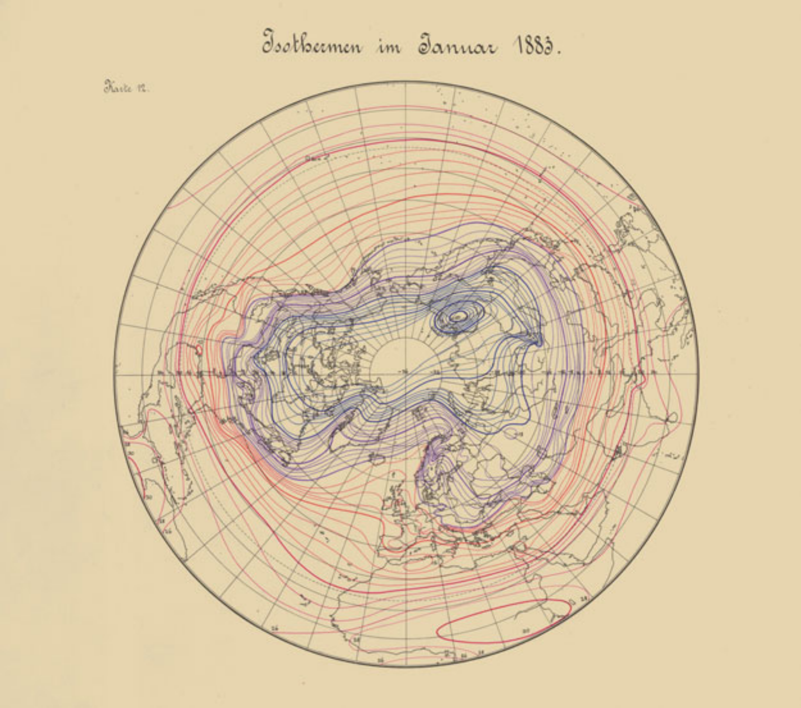


Fig. 2.10 Unpublished circumpolar chart of isotherms of January 1883 constructed by Ehrhart SB 1902b: Die Verteilung der Temperatur und des Luftdruckes auf der Erdoberfläche im Polarjahre 1882/1883, Karten-Atlas. Archive of the Meteorological Institute, Ludwig Maximilians University, Munich, unpublished.

Acknowledgement The part of the chapter written by Erki Tammisaar was supported by the Estonian Science Foundation grant no 7381 and grant Nr. SF0180049s09 of the Ministry of Education and Science in Estonia.

References

Andreev, A.O., M.V. Dukal'skaia, and S.V. Frolov 2007: *Mezhdunarodnyi Polyarnyi God.* Sankt-Peterburg: AANII.

Baker, F.W.G. 1982: The First International Polar Year, 1882–1883. *Polar Record* 21(132): 275–285.

Barr, W. 1985: *The Expeditions of the First International Polar Year 1882–83*. Calgary, AB: The Arctic Institute of North America, Technical Paper No. 29.

Barr W. 2008: *The Expeditions of the First International Polar Year, 1882–83*. New edition Calgary, AB: The Arctic Institute of North America.

Berger, F., B.P. Besser, R.A. Krause 2008: Carl Weyprecht (1838–1881) Seeheld, Polarforscher, Geophysiker. Wissenschaftlicher und privater Briefwechsel des österreichischen Marineoffiziers zur Begründung der internationalen Polarforschung. Wien: Österreichische Akademie der Wissenschaften.

Bericht 1873: Bericht über die Verhandlungen des Internationalen Meteorologen-Congresses zu Wien 2.–16. September 1873. Protokolle und Beilagen. k.k. Hof- und Staatsdruckerei, Wien.

Bericht 1880a: Bericht über die Verhandlungen des Zweiten Internationalen Meteorologen-Kongresses in Rom vom 14. bis 22. April 1879. Hamburg: Friedrichsen.

Bericht 1880b: Bericht über die Verhandlungen und die Ergebnisse der internationalen Polar-Konferenz abgehalten in Hamburg, 1.–5. Oktober 1879. Hamburg: Hammerich & Lesser.

Bericht 1880c: Bericht über die Verhandlungen und die Ergebnisse der 2. internationalen Polar-Konferenz abgehalten in Bern in den Tagen vom, 7. bis 9. August 1880. Hamburg: Hammerich & Lesser.

Bericht 1881a: Bericht über die Verhandlungen und die Ergebnisse der 3. internationalen Polar-Konferenz abgehalten in St. Petersburg in den Tagen vom, 1. bis 6. August 1881. St. Petersburg: Kaiserliche Akademie der Wissenschaften.

Bericht 1881b: Bericht über die Verhandlungen des Internationalen Meteorologischen Comités. Versammlung in Bern vom 9. bis 12. August 1880. Hamburg: Hammerich & Lesser.

Breitfuss, L. 1930: Das internationale Polarjahr einst und jetzt. *Arktis* 3: 14–30.

Corby, G.A. 1982: The First International Polar Year (1882/1983). *WMO Bulletin* 31(3): 197–214.

Ehrhart, S.B. 1902a: *Die Verteilung der Temperatur und des Luftdruckes auf der Erdoberflächeim Polarjahre 1882/1883*. Inaugural Dissertation. Stuttgart: Vereins-Buchdruckerei.

Ehrhart, S.B. 1902b: *Die Verteilung der Temperatur und des Luftdruckes auf der Erdoberflächeim Polarjahre 1882/1883*, Karten-Atlas. Archive of the Meteorological Institute, Ludwig Maximilians University, Munich, unpublished.

Heidke, P. 1932: Das zweite Internationale Polarjahr 1932/1933. *Annalen der Hydrographie und Maritimen Meteorologie* 60(3): 81–93.

Heise, G. 1993: Strukturen und Aufgaben der Deutschen Seewarte als Reichsinstitut. In: P. Ehlers, G. Duensing, and G. Heise (eds) *Schiffahrt und Meer. 125 Jahre maritime Dienste in Deutschland,* pp 19–21. Herford, Berlin, Bonn: E.S. Mittler und Sohn.

Hellwald von, F. 1881: *Im ewigen Eis. Geschichte der Nordpol-Fahrten von den ältesten Zeiten bis auf die Gegenwart*. Stuttgart: Cotta.

Hildebrandsson, H.H., W. Köppen, and G. Neumayer 1890: *Internationaler Wolken-Atlas*. Hamburg: Gustav W. Seitz Nachf.

Hildebrandsson, H.H., A. Riggenbach, and L. Teisserenc de Bort 1896: *Atlas International des Nuages*. Paris: Gauthier-Villars.

Kertz, W. 1983: Georg von Neumayer und die Polarforschung. *Polarforschung* 53(1): 91–98.

Klado, T.N. 1957: Pervyi mezhdunarodnyi poliarnyi god. Vestnik istorii mirovoi kul'tury 4: 132–140.

Komarov, V.L. 1926: Vvedenie v izuchenie rastitel'nosti Yakutii. In: *Trudy Komissii poizucheniyu Yakutskoi ASS Respubliki*, p 1. Leningrad: Akademiya Nauk SSSR.

Krause, R.A. 1992: *Die Gründungsphase deutscher Polarforschung, 1865–1875* (Berichte zur Polarforschung, 114). Bremerhaven: Alfred-Wegener-Institut für Polar– und Meeresforschung.

Krause, R. 2007: Das erste Internationale Polarjahr (IPY) 1882/1883: Die Entwicklung der Beteiligung Deutschlands. *Polarforschung* 77(1): 17–36 (published 2008).

Lüdecke, C. 2002: Das 1. Internationale Polarjahr (1882–1883) und die Gründung der Deutschen Meteorologischen Gesellschaft im Jahr 1883. *Historisch-meereskundliches Jahrbuch* 9: 7–24.

Lüdecke, C. 2004: The First International Polar Year (1882–83): A Big Science Experiment with Small Science Equipment. *History of Meteorology* 1,154–63. www.meteohistory.org/2004proceedings1.1/pdfs/06luedecke.pdf; Accessed 25 October 2006.

Lüdecke, C. 2005: East meets west: Meteorological observations of the Moravians in Greenland and Labrador in the 18th century. Proceedings 22nd International Congress of History of Science, Beijing, 24–30 July 2005. *History of Meteorology* 2, 123–132. http://www.meteohistory.org/2005history of meteorology2/09luedecle.pdf, accessed 25 October 2006.

Lüdecke, C. 2007: Über die globale Verteilung von Luftdruck und Temperatur am Beispiel des 1. Internationalen Polarjahres 1882/1883. 10 Seiten. DACH MT 2007, Hamburg.

http://meetings.copernicus.org/dach2007/download/DACH2007_A_00400.pdf, Accessed 22 November 2007.

Neumayer, G. 1891: Atlas des Erdmagnetismus, published in: H. Berghaus, Physikalisher Atlas, Abt. IV, Gotha: Justus Perthes 3rd edition.

Neumayer, G. 1901: *Auf zum Südpol! 45 Jahre Wirkens zur Förderung der Erforschung der Südpolarregion 1855–1900*. Berlin: Vita Deutsches Verlagshaus.

Nordenskiöld, A.E. 1882: *Die Umsegelung Asiens und Europas auf der Vega*. Leipzig: Brockhaus, Bd. 2.

Paseckii, V.M. 1983: *Razgadki taina zhdet*. Leningrad: Gidrometizdat.

Programm 1884: Programm der Verhandlungen der vierten internationalen Polar-Konferenz in Wien, am 17. April 1884. St. Petersburg: Kaiserliche Akademie der Wissenschaften.

Protokoll, 1891: Protokoll der Schluss-Sitzung der internationalen Polar-Commission in München am 3. September 1891. Mitteilungen der internationalen Polar-Commission 7, 349–354.

Protokolle 1876: Protokolle der Verhandlungen des permanenten Comités, eingesetzt von dem ersten Meteorologen-Congress in Wien 1873. Sitzungen in London, 1876. Leipzig: Engelmann.

Protokolle 1884: Protokolle der vierten internationalen Polar-Conferenz zu Wien 17.–24. April 1884. Mitteilungen der internationalen Polar-Commission 6.

Rapport 1882: *Rapport du Comité météorologique international. Réunion de Berne. 1880*. Paris: Gauthier-Villars.

Report 1876: Report of the Permanent Committee of the first International Congress at Vienna. Meeting in London, 1876. London: George E. Eyre and William Spottiswoode.

Rykachev, M.A. 1883: Pervaya mezhdunarodnaya polyarnaya ekspediciya. *Morskoi sbornik* 194(1): 1–31.

Rykachev M.A. 1886: Vskrytia i zamerzania vod v Rossiiskoi imperii. S-Peterburg.

Rykachev MA 1889: Rezultat'y meteorologicheskikh nabliudenii pervoi Mezhdunaordnoi poliarnoi ekspedicii 1882–1883 gg. (Lekciia, chitannye v Kronshtadtskom Morskom sobranii. Sankt-Peterburg: Morskoe ministerstvo.

Shostakovich, V.B. 1927: Materialy po klimatu Yakutskoi Respubliki i sopredelennykh s nei chastei Severnoi Azii. S atlasom iz 25 kart. In: *Trudy Komissii po izucheniyu Yakutskoi ASS Respubliki,* p 6 (1, 2). Leningrad: Akademiya Nauk SSSR.

Shtelling, E.V., Smirnov, D.A., Roze,N.V. 1926: Materialy po izucheniyu zemnogo magnetizma v Yakutii. In: *Trudy Komissii po izucheniyu Yakutskoi ASS Respubliki,* p 2. Leningrad: Akademiya Nauk SSSR.

Taylor, C.J. 1981: First International Polar Year, 1882–83. *Arctic* 34 (4): 370–376.

Vize, V.Yu. 1931: Mezhdnunarondyi poliarnyi god. Molodaya gvardiya, Moskva-Leningrad.

Weyprecht, C. 1875a: Schiffslieut. Weyprecht's Vortrag über die von ihm geleiteten wissenschaftlichen Beobachtungen, gehalten in Wien 18. Januar 1875. Petermanns Mitteilungen: 21:65–72.

Weyprecht, C. 1875b: Der Vortrag, Grundprinzipien der arktischen Forschung. In: J. Frischauf, V. Graber, R. Klemensiewicz (eds) Tageblatt der 48. Versammlung Deutscher Naturforscher und Aerzte in Graz vom 18 bis 24 September 1875, Leuschner and Lubensky, Graz. 38–42. See full text in English at: http://www.scar.org/ipy/

Weyprecht, C. 1875c: Die Erforschung der Polarregionen. Mittheilungen der kais. und königl. geographischen Gesellschaft in Wien N.F. VIII, 18: 357–366.

Weyprecht, C. 1875d: Grundprincipien der arctischen Forschung. Mittheilungen aus dem Gebiete des Seewesens 3: 505–514.

Weyprecht, C., K. Wilczek 1877: Entwurf des Arbeitsprogrammes einer internationalen Polarexpedition. *Mitteilungen aus dem Gebiete des Seewesens* 5(11): 497–507.

Wilczek, L.C., and C. Weyprecht 1877: Programme of Work of an International Polar Expedition. W. Stein, Vienna. See full text in English at: http://www.scar.org/ipy/

Wild, H. 1874: Jahresbericht. *Repertorium für Meteorologie* III: 49.

Wild, H. 1882: Mittheilungen der Internationalen Polar-Commission. St. Petersburg: Buchdruckerei der Kaiserlichen Akademie der Wissenschaften.

Wild, R. 1913: Lebenserinnerungen. Die Stadtbibliothek, Zürich, ZK 1641.

Wood, R., and D.A. Streletskiy 2008: Soil and Permafrost Temperature Data Obtained During the First International Polar Year, 1882–1888. In: D. Kane, K. Hinkel (eds) Proceedings of the Ninth International Conference on Permafrost, University of Alaska, Fairbanks, June 29–July 3, 2008. University of Alaska Fairbanks, Fairbanks. Vol. 2, 1957–1962.

Chapter 3
The Expeditions of the First International Polar Year

Susan Barr, Louwrens Hacquebord, Erki Tammiksaar, and Natal'ya Georgievna Sukhova

3.1 Introduction

Susan Barr

When reading through the accounts of the various IPY-1 expeditions, one is easily struck by the great variation in the courses of each expedition. These reports were originally published in five different languages and each one gives a thorough description of the execution of the specific expedition, including details that for many of us are of far more interest than the meticulously noted scientific observations.

Some of the expeditions struggled to even reach their starting point – or to get back home again afterwards. Adolphus Greely's American expedition to Lady Franklin Bay was the most dramatic and ultimately disastrous of the 12 Arctic expeditions. Although the station was established without trouble, and ran for two whole years with great success, the relief expedition came nowhere near fetching the 25 men in the summer of 1883. The men had to attempt to make their own way southwards through the ice-filled strait between Ellesmere Island and Greenland. They ended up in a dire condition in "Starvation Camp" on Pim Island, and only seven of them were alive when help finally arrived at the end of June 1884. One of these died soon after.

On the other hand, the Russian expedition to ostrov Sagastyr' in the Lena Delta did not suffer such a gruesome fate, but it took them from December 1881 to August 1882 just to reach the site of their station, travelling overland from St Petersburg by train, sledge, carriage, river barge and steamer – a journey worth a book of its own.

Yet another experience of unplanned travel belongs to the Dutch expedition whose ship, the *Varna*, got locked in the ice in the Kara Sea and spent the IPY

S. Barr (✉)
Directorate for Cultural Heritage, PO Box 8196 Dep, NO-0034 Oslo, Norway
e-mail: susan.barr@ra.no

Summaries of these in English are collected in Barr, William 2008. See also Baker 1982.

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_3,

there instead of at their chosen site of Dickson, near the mouth of the Yenisey. At the end of December 1882 the men moved into a prefabricated house on the ice, since the *Varna* was leaking badly, and towards the end of July she sank. The men made their way by sledge and boat to the Russian mainland, bringing with them all the observations and reports they had made for the IPY programme. Several of the accounts give a good illustration of how different the ice conditions in mid-summer were in many of these areas in 1882–1883 compared with those of today.

Other expeditions again had a relatively uneventful IPY, but still their reports contain a wealth of interesting facts about their experiences, equipment, observations, extra-scientific work that came in addition to the IPY programme and connections to local populations where there were such.

3.2 The Austro-Hungarian Station on Jan Mayen

Susan Barr

As described in the previous chapter, Lt Karl Weyprecht (1838–1881) in the Austro-Hungarian navy played an important role in the creation of the first International Polar Year.[1] Austria–Hungary was therefore in the forefront when expedition planning started. Weyprecht unfortunately died of tuberculosis in 1881 at the age of 42 and it fell to his friend Graf Hans Wilczek (1837–1922) to take the responsibility for choosing the expedition participants. It was also Wilczek who financed much of the expedition. He was honoured by having his name placed on the valley next to the IPY station: Wilczekdalen.

Jan Mayen was at this time a deserted island unclaimed by any nation. Alone in the middle of the Norwegian Sea, it measures 54 km by 2.5–15 km with the widest part being completely taken up by the volcanic cone of Beerenberg stretching 2,277 m over the sea. Dutch whalers had established summer stations on various beaches in the early seventeenth century, but they were long gone and only ruins remained when the Austro-Hungarian expedition arrived on 12 July 1882. Weyprecht and Wilczek had originally chosen Novaya Zemlya as the site for the Austro-Hungarian station, but in order not to disturb Russian plans, the destination was changed to Jan Mayen. Wilczek described the island in his memoirs as “the most accessible so far north and at the same time the place where electrical and magnetic phenomena most clearly can be observed”.[2]

The group to be left on land for a year consisted of 14 men aged between 20 and 38 and led by naval lieutenant Emil von Wohlgemuth (1843–1896), the eldest in the group. Four other officers, a doctor, and eight assistants with such skills as carpenter, cook, sail maker, and mechanic completed the 14 while the ship *Pola*, which delivered them to and later fetched them from the island had a crew of 70.

---

[1] This account is based on Barr (2003).

[2] Wilczek (1934:148).

Fig. 3.1 The crew of the Jan Mayen IPY station. Emil von Wohlgemuth at middle front (Wohlgemuth 1886)

Wilczek had a positive impression of the ability of sailors to live closely together in cramped conditions, work outside in all kinds of weather and obey strict routines and as expected the 13 months on Jan Mayen passed with only minor problems. This was not least due to the careful and detailed preparation which went into the consideration of everything from living quarters, to food, to leisure activities, to work load, and Wohlgemuth's detailed report was meant to serve as an example for other later expeditions to follow if wished. The whole provision and equipment list of around 1,200 articles was published in the report to this end. As Weyprecht had stated, the leader of such an expedition had to be able to form an opinion on the quality and quantity of everything from sewing needles to astronomical instruments, from meat powder to ovens and roofs.

Provisions for two years were taken in case it proved impossible to fetch the group in 1883 and loading of the *Pola* was carefully thought out so that the most important items for an emergency stay on the island could be unloaded first, together with the materials that would be needed first on arrival. Wohlgemuth noted that "Therefore that puzzle had to be solved, to pack everything on top so that the whole cargo hold did not have to be emptied!"[3] With regard to landing conditions at Jan Mayen, Wohlgemuth received the following rather negative description from the captain Wille onboard a Norwegian scientific expedition to the area in 1878: "You have, sir, got the most unfavourable of the Weyprechtian stations. You may have to sail around the island for a month without being able to land. If you are not suitably clothed and get soaked through in your normal clothes, you can most certainly end up with pneumonia, since the water temperature is no higher than 1–2°C. However,

---

[3] Wohlgemuth (1886:25).

science is a strange lady, she finds amongst her multitude of admirers always enough of those who are prepared for any kind of dangerous event for her sake".[4] As it was the *Pola* attempted to reach Jan Mayen in May, but met the ice 120 nm away and had to return to Tromsø in north Norway. On 25 June they were back and managed to work the ship slowly towards the island. On the 27th they spotted the "enchanted island",[5] but Wille's depressing words held true and the *Pola* sailed backwards and forwards in the vicinity of Jan Mayen until they finally could anchor in the bay Engelskbukta on 12 July.

A good site for the station was found in Maria Muschbukta at the foot of the "bird mountain" Vogelberg (Fugleberget) and beside the valley Wilczek Thal (Wilczekdalen). During the 13 months on the island, the expedition created the first reasonably accurate map since the whaling period, and named many of the features. When Jan Mayen became Norwegian in 1929 most of these names were kept, but given a Norwegian language form. The station was erected in an impressive tempo, thanks both to the careful planning beforehand and the military working schedule of 04:00–20:00, more or less regardless of the weather. The only death during the entire expedition happened on 15 July, when a sailor on the *Pola* succumbed to tuberculosis and was buried near to the station. The grave and massive cross of drift logs can still be seen today.

The main station houses were prefabricated and shaped like upturned boats, a form that was expected to withstand strong winds and driving snow and sand in the best possible way. The instrument houses and storage buildings were aligned together with the living quarters along the foot of the slope and with a beach full of driftwood in front. The report shows that most circumstances were foreseen and prepared for, while any surprises were soon sorted out with creative solutions. The living quarters were divided into sections for officers and ratings, as was usual for most polar expeditions of the time – the Norwegians excepted – and the careful insulation and ventilation made them as comfortable as could be expected. Two dogs, sheep and a cock and hens were installed in their quarters and the scientific observations could start at the appointed times.

Pola left Jan Mayen on 16 August and already early in September there was enough snow for a skiing competition. The group made good use of the island during their stay, attempting a climb up Beerenberg and exploring the whole island for mapping and leisure purposes. They experienced some volcanic effects, with fumaroles and small earthquakes, skated on the frozen lagoon and hunted birds and foxes. When the outside temperature reached –19°C it was +6°C inside – satisfactory by any polar expedition standards. Christmas and New Year were celebrated as they should be. The International Congress had obviously expected lively New Year celebrations as the 2nd and not 1 January 1883 was the designated first observation day of the year. The sun was under the horizon from 17 November to 25 January and the hens started laying again on 12 April. Two polar bears were seen in the

---

[4] Quote from a manuscript in the Norwegian Foreign Ministry archives.

[5] Wohlgemuth in a manuscript in the Norwegian Foreign Ministry archives.

course of March, but although one was shot and injured, both got away. The spring also meant more exploring, but the constantly changing weather conditions – from frozen ground to wet rain and back again – made travel overland strenuous, and the wind and currents were dangerous for sea travel in small boats. The iron deposits in the ground disturbed the compasses and the famous Jan Mayen fog delayed mapping attempts. Wohlgemuth could report that the period early August 1882 to late July 1883 had had 1869 hours of fog, 1249 hours of rain, 1002 hours of snow and 920 hours of drifting snow. From September to February there were only 438 hours of light breeze or perfectly calm weather. The average in this period was 7.9 m/s wind and for days and weeks at a time they could not take a step outside without supporting themselves with crampons and walking poles. Keeping well-ventilated and temperate living quarters in this climate was a tribute to the planning and Wohlgemuth described the buildings as "a model for a way to build polar houses".[6]

It was obviously Wohlgemuth's aim that all the expedition's experiences should benefit future polar expeditions. Thorough descriptions are given of the clothing, footwear, sleeping bags, provisions, menus, hygiene (a tub bath at least once a month for all) and even the shape of buttons in order to facilitate opening and closing clothes in the cold. More than 70 reindeer skins had been bought in north Norway, but mostly they were too warm to be used. Tents, sledges, a wheeled cart and three boats assisted transport around the island and for fetching water or ice from the lagoon at the far end of Wilczekdalen. Alcohol was a part of the daily rations: wine and rum, with watered down cognac and coffee with alcohol for longer trips. In the summer, plants containing vitamin C (probably scurvy grass *Cochlearia officinalis* and mountain sorrel *Oxyria digyna*) were collected and helped to keep scurvy at bay, although the varied diet anyway kept the men healthy.

In addition to mapping, the expedition tried to collect at least one specimen of each animal (foxes) and bird, including eggs, they found on the island. They also investigated the remains of the seventeenth (17th) century whaling stations and graves and erected a cross to the memory of the deceased whalers.

The Polar Year station was left in excellent condition when the *Pola* relieved the expedition at the beginning of August 1883 (Fig. 3.2). A good deal of equipment, a large amount of coal and canned food for four persons for 1 year were left for any future expeditions to the island. In addition to the fact that all the men had survived the 13 months in good health and relative comfort, they had also carried out an extensive and detailed research programme. They had enthusiastically covered both the obligatory and voluntary programmes and thoroughly explored all sides of the environment of Jan Mayen. The island was mapped to the scale of 1:100,000, and this map was the best available until the Norwegian Polar Institute produced its 1:100,000 map in 1958.

---

[6] Wohlgemuth (1886:73).

Fig. 3.2 The Jan Mayen station photographed in 1892 by Charles Rabot

3.3 Denmark's Station at Godthaab, Greenland

Susan Barr

Denmark's commitment to establishing an IPY station on the west coast of Greenland had been understood from early on. Together with Austria, Norway and Russia, Denmark had made this clear at the Bern conference in 1880 (see Chapter 2). Godthaab (now Nuuk) was a natural choice since a meteorological and auroral observation station had already been in activity from 1865 to 1880.[7] In addition Godthaab lay close to the zone of maximum auroral activity and, not least, it was already an established settlement with all the logistical and social support this could give.

The Naval Ministry chose the group of six men who were to participate in the expedition to establish a temporary geophysical observatory for meteorological, geomagnetic and auroral studies. The observatory itself was, however, to be operated through the Danish Meteorological Institute (DMI). The natural leader was Adam Frederik Wivet Paulsen (1833–1907), professor of physics at the Royal Copenhagen Technical High School. He had a leading career within his profession and not least through the DMI. The brilliant works of Danish professor Hans Christian Ørsted (1777–1851), the "discoverer" of electromagnetism, had initiated a strong interest in geomagnetic and auroral research in Denmark. Founded in 1872 the DMI was given the task of making geomagnetic surveys in Denmark and to monitor the daily variation of the magnetic declination. These tasks were conducted by Paulsen who later became director of the DMI (1884–1907). The weather observing stations in Denmark were requested to also report the occurrences of aurora.

---

[7] Stauning (2004).

Thus, the IPY expedition headed by Adam Paulsen was a continuation of an already established area of study in Denmark.[8]

The other participants were mathematician L. Petersen, astronomer lt.cmdr C. Ryder, doctor M. Hastrup, civil engineer and chemist C. Pedersen and mechanic T. Niergaard. The group sailed from Copenhagen on 17 May 1882 on the regular Royal Greenland Trading Company route to Godthaab. It took 4 weeks to reach the settlement at the mouth of the 130 km long Godthaabsfjord. The local Greenlanders helped the men to erect the five prefabricated buildings on a small hill (26 m) overlooking the settlement. The site had been carefully chosen because the hill was composed of almost pure gneiss with low iron content which would have disturbed the magnetic measurements.[9] In addition, there was the fact of the continuous measurements of air pressure, temperature, wind and weather that had already been carried out for more than 20 years and which were available for comparison. During the year the maximum temperature was measured at 15°C in August 1883 and the minimum at –24.4°C in February the same year (Fig. 3.3).[10]

Adam Paulsen tried to estimate the heights of auroras near Godthaab by using triangulation on simultaneous observations of the lower border of auroral arcs from two observatories separated by 5.8 km.[11] This was not attempted by the other IPY-1 stations. Heights were estimated for 22 auroras and were found to range from 0.6 to 68 km. Now it is known that these results – amongst the first of their kind – were wrong, since auroras are never observed by reliable techniques below 60 km.

Fig. 3.3 The Danish station at Godthaab (L'Institut Météorologique de Danemark 1889–1893)

---

[8] Stauning (2002).

[9] Højlund Nielsen (2008).

[10] Barr (2008:263–265).

[11] See, e.g. Paulsen (1884).

Adam Paulsen also observed the deflections of a compass needle during auroral activity and discussed the existence of horizontal as well as vertical electrical currents associated with auroras. He combined the auroral investigations into an auroral "ray" theory where he postulated that the auroral emissions were created by excitation of air molecules by invisible "cathode rays" emitted from a negative electrode in space – a result not far from modern auroral concepts since two years later J.J. Thomson (England) discovered that the cathode rays were actually electrons. In fact, auroras are mainly produced by energetic electron bombardment.[12]

As with the Finnish expedition at Sodankylä, the Danes tried to artificially create aurora by sending an electric current through an insulated cable to a lightning rod attached to a telegraph pole erected on the top of the highest nearby mountain. It did not work.

The observations were discontinued on 31 August 1883 and the group made ready to be fetched by the Royal Greenland Trading Company ship. This was, however, delayed by bad weather and they were not fetched before 2 October. The return voyage was stormy, bordering on the hazardous, for three weeks and then, ironically enough, the ship was delayed by calm weather before finally arriving at Copenhagen on 3 November. The wintering was most probably comfortable and relatively uneventful, but unfortunately this side of the Danish IPY expedition does not seem to have been recorded.[13]

3.4 The Finnish Stations

Susan Barr

It was at the Second Polar Conference in Bern in 1880 that Finland began to see itself as a stakeholder in Weyprecht's suggested International Polar Year.[14] At this meeting the delegates emphasised the importance of a station in Lappland, but adequate resources to establish this were not immediately available in Finland. A full-scale magnetic-meteorological observatory had been in operation in Helsinki since 1838, but it could not take on the task until substantially increased funding and an administrative change early in 1881, which turned it into the Central Meteorological Institute, opened the way. Professor N.K. Nordenskiöld (1837–1889) became the new director.

3.4.1 Sodankylä

In addition to Nordenskiöld, a leading figure of the Finnish IPY activities was Selim Lemström (1838–1904), professor of physics at the University of Helsinki. He was particularly interested in the aurora studies part of the IPY programme.

---

[12] Stauning (2002).

[13] Barr (2008:266).

[14] The main sources for this chapter are Barr (2008) and Nevanlinna (1999).

Nordenskiöld and Lemström attended the International Polar Commission meetings in St Petersburg in August 1881 and thereafter worked for the realisation of a Finnish IPY station. Sodankylä in Finnish Lapland, about 100 km north of the Arctic Circle, was their chosen site. Due to the warming effect of the Gulf Stream the area is included in the boreal region, but with regard to stratospheric meteorology, Sodankylä can be classified as an Arctic site. There is frequent occurrence of auroras and magnetic storms in the area and, not least, Sodankylä was in the north-south line of two other IPY stations: Bossekop in Norway and the Swedish station at Kapp Thordsen on Spitsbergen. Since the meteorological conditions in Sodankylä are continental while the climates of Bossekop and Spitsbergen are mainly oceanic, the planned meteorological observations were expected to provide interesting comparisons.[15]

The IPY programme was a large task for the Finnish scientific community to take on, but the importance of participating in a new, more active and international era in geophysics was also recognised. The Finnish Society of Sciences, the Central Meteorological Institute and the University of Helsinki shared the scientific responsibility while the Finnish state provided the finances through a special grant for the two-year–period, 1882–1884. Of the designated sum 85% went to the Sodankylä observatory and the Kultala auxiliary station (see under), while the remaining 15% went to the Meteorological Institute in Helsinki. Although the official programme was to run from 1 August 1882 to 31 August 1883, the expedition was not ready to start observations at Sodankylä until 21 August.

From 1809–1917 Finland existed as an autonomous Grand Duchy within the Russian Empire. It was therefore up to the Government, or Senate, to petition the Tsar – the Grand Duke of Finland – with regard to credit for the sum of money needed. Lemström could then inform the president of the International Polar Commission, Professor Wild, that Finland was indeed a part of the IPY. Wild responded by inviting Lemström on to the Commission. Wild also offered assistance in training the Finnish observers and Ernest Biese, S. Dahlström, K. Granit, A. Petrelius and N. Sundemann attended a course for several weeks at the Pavlovsk Observatory. They could also here see the equipment, which was gathered together for the Russian expedition to take to Novaya Zemlya.[16]

As in Norway, the IPY group did not have to establish themselves in a deserted Arctic waste. Sodankylä was a small village in northeast Finland situated in woods beside a river. The area was inhabited by both Finns and northern Sámi, each with their own language. It took the IPY group from mid-July to 6 August to reach the village from Helsinki – twice as long as they had expected. The IPY station they then erected consisted of four small wooden buildings for observations concerning meteorology, absolute magnetism, and two types of magnetic variation instruments

---

[15] Nevanlinna (1999:16).

[16] Barr (2008:273).

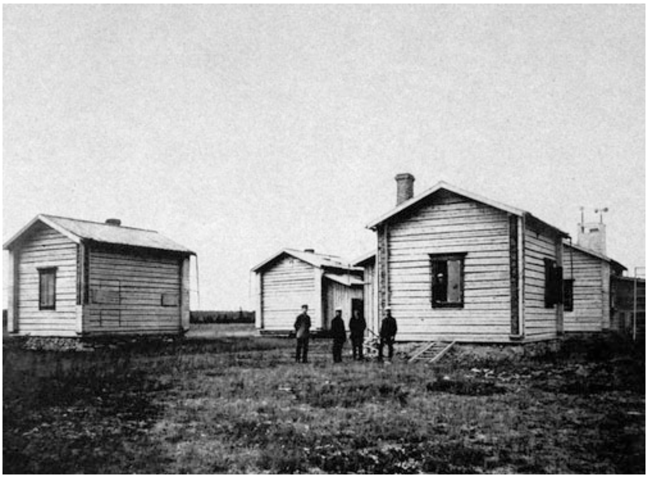


Fig. 3.4 The Finnish station at Sodankylä (Lemström and Biese 1886–1898)

(Fig. 3.4). The men themselves presumably lived in the village as living quarters are not stated in the report .[17]

In addition to the official programme, the group made other observations such as soil temperature, freshwater evaporation rates and river temperature measurements, studies of the flora and fauna of the surrounding area, and aurora height studies which were synchronised with those of Sophus Tromholt in Kautokeino in Norway (see that section). A special experiment was made to try to produce aurora artificially with the help of a "discharging apparatus". This was placed on the top of the 548 m high hill Oratunturi, some 20 km from Sodankylä and was intended to produce a flow of electricity from the atmosphere to earth.[18] The experiment was described thus in the Popular Science Monthly[19]

> The enterprise [that Lenström had conducted earlier] being successful from the first, the experiments were resumed during the Finnish Polar Expedition of 1882, and were renewed twice on two different peaks, called respectively Oratunturi and Pietarintunturi. Oratunturi, rising more than five hundred metres above the level of the sea, is situated in latitude 67 21′, near the village of Sodankylä. Near the topmost height of the mountain was placed a long copper wire, so bent upon itself as to form a series of squares within squares, having a total surface of nine hundred square metres, supported by insulated posts. Tin points or nibs bristled out from this connecting net at distances of half a metre apart, and the whole was connected by an insulated wire running along on stakes with a galvanometer fixed in a cabin at the foot of the peak. The galvanometer was connected with the earth by the other extremity of its own circuit. Nearly every night after the installation of the apparatus, a yellow-white light illuminated the points without anything like it appearing on the heights in the neighbourhood, while the needle of the galvanometer by its motions betrayed the

---

[17] Barr (2008:274).

[18] ibid.

[19] Popular Science Monthly.

> passage of an electric current. The light was analysed in the spectroscope, and gave the greenish-yellow ray that characterises the aurora borealis. The intensity of the glow and the deviations of the needle, moreover, varied continually. In the mean time the hoar-frost, which was deposited on the wires quickly destroyed the insulation, and rendered an experiment of any duration almost impossible. The numbness of the fingers of the operators, induced by the cold, added to the difficulties of the study.

3.4.2 Kultala

In addition to the Sodenkylä station situated at 67° 25′N, 29° 36′E, a temporary auxiliary station was established for the winter at Kultala 68° 30′N, 26° 46′15″E on the Ivalo River. This was close to the Pietarintunturi hill, which was included in the artificial aurora experiment described over. Buildings belonging to a government survey station were adapted for use as an observatory and three-bedroomed living quarters, and a discharging apparatus was installed on the top of Pietarintunturi. The apparatus was connected up on the evening of 29 December and was a great success: "the Finnish scientists were dumbfounded by the spectacle of a brilliant auroral streamer rising from the mountain top".[20]

3.4.3 An Extra Year

These aurora experiments were a main reason why the Tsar accepted the recommendation from prominent scientists, via the Finnish Senate, to approve funding for a further year's studies at both stations. The programme was reorganised to favour aurora studies over the meteorological and magnetic observations. Lemström returned to Sodankylä from Helsinki on 16 September 1883 together with Biese, Granit and Petrelius. Students U.B. Roos and A. Heinrichs made up the group. The station buildings at both sites were modified to suit the new emphasis on the aurora studies, and Kultala was occupied again during the winter 1883–1884. Lemström and his wife, together with Granit and Roos, manned the station at Kultala, with Mrs Lemström taking a full part in the observing work.[21] One gathers from the fact that Lemström was willing to extend the Polar Year and to take his wife along that the stay in the north of Finland presented no particular hardships.

3.4.4 Results

In addition to these two IPY stations, four other existing stations elsewhere in Finland contributed to the Polar Year by carrying out the prescribed meteorological observations. William Barr notes that

> One can only regret that Lemström's general account of the activities at Sodankylä and Kultala is so brief. Clearly, despite their late start the Finnish scientists made an extremely

---

[20] Heathcote and Armitage (1959:40) quoted in Barr (2008:276).

[21] Barr (2008:277)

> valuable contribution to the program of the First International Polar Year, and it is extremely tantalizing that the details of the everyday routine of the wintering and of the challenges and frustrations associated with their exciting pioneering auroral studies do not appear to have survived in any readily available form.[22]

However, Lemström and Biese published in 1887 the scientific results of the geophysical observations from 1882–1884 in three thick volumes. The magnetic data collected both from these two stations and others during the Polar Year much increased the knowledge of basic features of geomagnetic storm behaviour. It was, amongst other things, found that magnetic storms begin nearly simultaneously all over the Earth. The data from Sodankylä has been shown to be very suitable for the study of geomagnetic activity in the time-scale of a day or more.[23]

Sodankylä has remained an important geophysical station to the present time. One of EISCAT's (European Incoherent Scatter Scientific Association) scientific radar receiver stations is located outside the town, at the site of Sodankylä Geophysical Observatory, an independent department of the University of Oulu. The urban area around the observatory is known as *Tähtelä*, which translates as "Place of Stars", although the observatory does not look at stars.

3.5 The French Station at Cabo de Hornos – Cape Horn

Susan Barr

The Académie des Sciences in France had been informed of Weyprecht's vision for an international scientific effort in Arctic observations in a letter as early as 1876 and it was under the direction of the Académie that France entered into the scientific cooperation, with the Secretary of the Navy bearing the operative responsibility. The bill allocating funding for the expedition was passed in May 1882.[24]

The Cape Horn area was chosen as being an auspicious site for the station to observe the Transit of Venus (cf. the German South Georgia station). In addition to this and to the IPY programme itself, the scientific work was to encompass oceanographic and other marine investigations to be carried out throughout the year by the transport vessel, which was to remain in the area. The shore group was also to be one of the largest of the IPY contingencies; there were six scientists/observers and 15 other men with various supporting jobs. The leader of the group was naval 1st ltn Edmond-Jean-Léopold Courcelle-Seneuil (1846–?), while the overall expedition leader was captain of the transport vessel the *Romanche*, Louis-Ferdinand Martial who commanded a crew of 111 men. In addition to the marine work they were also to engage in studies of geography, hydrography and natural history on and around the Cape Horn archipelago. The *Beagle* voyage 1831–1836 under the command

---

[22] ibid.

[23] Nevanlinna (1999:17).

[24] Information mainly from Barr (2008) and from Scientific American Supplement.

of Captain Robert FitzRoy and with Charles Darwin onboard had made extensive studies of the same area, but the subject was by no means exhausted. The *Romanche* was modified for the stay around Cape Horn with, amongst other necessities, steam radiators and cast-iron stoves.

For accommodation onshore five prefabricated huts were taken, consisting of frame structures with double walls. Provisions (including wine and livestock), clothing and equipment were ample, and the observers were trained before leaving at the Central Meteorological Bureau. The departure from France on 17 July was too late for the expedition to make the official IPY programme starting date of 1 September. As with the German South Georgia expedition, a stop was made at Montevideo to adjust the chronometers and replenish supplies and coal before proceeding further south. A week was spent here during which a French naturalist, M. Lebrun asked to join the expedition for a while and was granted permission. Captain Martial then decided to head straight for Bahia Orange (Orange Bay), 50 km from Cape Horn, which had been described as a good anchorage by Captain FitzRoy of the *Beagle*.

Tierra del Fuego was sighted on 5 September and the following day the anchor was dropped in Bahia Orange. Despite its southerly latitude, the area supported trees and bushes in the more sheltered spots and, not least, native human habitation. A site for the station was found which was protected from the prevailing westerly winds and on the 7th a group of 15 local Yámana Indians arrived in dugout canoes to inspect the new arrivals. The French had an impression of a poor, ill-equipped group with insufficient clothing and food. In fact the only clothing each adult wore was an otter skin over one shoulder, while the children were completely naked. On 6 October a Yámana Indian named Yakaif who spoke good English (there was a mission station in the region, at Ushuaia) was recruited to act as interpreter whenever needed.

Fig. 3.5 The site of the French station at Bahia Orange, now marked by a brick post with the dates Sept 1882–Sept 1883. Photo Denis Chevallay

Owing to the already late start of the IPY programme, the first observations were taken onboard the ship while the shore station was prepared. In spite of persistent rains and the difficulties of the situation, by 22 October the greater part of the station was completed, being more or less “fastened, as it were, to the flank of a steep hill”,[25] covering 450 m^2 and resting upon 200 wooden piles made from local timber. The buildings consisted of a magnetic observatory, an astronomic observatory, a room for atmospheric chemistry, another for the tide gauge which was situated at the end of a 28 m long jetty, photographic laboratory, barometer room, the dwelling house and a store hut for food and equipment, together with a small natural history laboratory.[26] Sheds for the poultry, cows and 16 sheep were also erected. The establishment of the station had taken 35–40 men 45 days of hard work.[27] Violent squalls, rain and sleet, together with the deep and damp moss covering of much of the area, made the situation slightly unpleasant, but during rare fine periods surveying of the surrounding area was started. The shore expedition was given the use of a steam launch to extend their radius. *Romanche* left the station on 28 October to continue its own programme of work.

The observations for the IPY programme were made regularly from 26 September 1882 to 1 September 1883. In addition numerous natural history specimens were collected from the area. The apparatus employed by the expedition for the registration of the magnetic elements had been devised by M. Mascart, director of the Central Meteorological Bureau, and the magnetic pavilion of wood and copper was placed at about 16 m from the nearest building, near the sea and protected from severe weather by the station hill. The interior was lined with felt on all sides, in order to keep the temperature as stable as possible. M. Mascart’s apparatus proved to be adequate in recording the rapid and slight perturbations of the magnet. Comparisons between the magnetic and atmospheric perturbations gave no result. There was, however, little stormy weather and no auroral displays. This latter phenomenon, according to the English missionaries, is rarely observed in Tierra del Fuego.[28] On 17 November 1882, a severe magnetic disturbance occurred, lasting from 12 midday until 15:00, which in 3 hours changed the declination 42′. The same perturbation was felt in Europe, thus giving a basis for comparison of the observations in the two hemispheres.

An impressive comet was seen on 29 September and again on 5 October. This was the same one that was spotted by the German South Georgia expedition members. Named the Great September Comet (C/1882R1) it was seen at South Georgia from 29 September until 11/12 December. This comet can only be seen every 672 years.

The doctor/naturalist, Paul-Daniel-Jules Hyadès (1847–1919) made 107 samplings of freshwater and marine sediments. Amongst them, only ten were well-preserved regarding the biological material as they were fixed with osmic acid

---

[25] Scientific American Supplement.

[26] ibid.

[27] Barr (2008:322).

[28] ibid.

instead of alcohol and/or phenolic acid used for the others. These ten samples were later transmitted for study to various French specialists of botanical (algae) and zoological groups and more particularly to A. Certes, a well-known protistologist. From this material, Certes (1889) described several new Protozoa, and two new nematodes.[29] Hyadès also did anthropological studies, including taking plaster casts of Yámana faces. Towards the end of November Hyadès was fetched to Ushuaia by the mission schooner in order to help with the outbreak of measles in the area. He was joined by the doctor from *Romanche* which also happened to arrive and they were able to bring the outbreak under control. The *Romanche* then returned to Bahia Orange to check on the situation at the station before again setting off for more surveys and studies in the wider area.

Yet, another particular project that Hyadès took on was the regular measurement of CO_2 concentrations in the atmosphere.[30] French scientists had raised as early as 1869 the idea of industrial discharges increasing the amount of CO_2 in the atmosphere, and the IPY station in the southern hemisphere was a good opportunity for comparative measurements. The measurements from 31 October 1882 to 1 July 1883 were apparently the first long series of such measurements made in the southern hemisphere.[31] Six more measurements were made on the *Romanche* during the return to Cherbourg. Despite the effort and the interest at the time, however, Hyadès' results were not offered much attention by later scientists.

On 6 December the Transit of Venus occurred and was recorded as far as the weather conditions allowed. *Romanche* was back for Christmas and could hear more of the dreadful weather conditions the station personnel were experiencing, with rain, squalls and storms as dominating features and an all-pervading dampness. Roofs got blown off or damaged by the gales, but they were rapidly repaired by the station personnel.

Romanche returned a final time to Bahia Orange on 20 August to evacuate the station and the observations were stopped on 1 September. The temperature records on the ship showed a maximum during the year of 11.7°C and a minimum of –5.2°C. The mean recorded temperature for the year was 6.68°C. It was the raw dampness that had been the main problem, but despite this the general health had been good. The station was abandoned on 3 September, the buildings by previous agreement being donated to the Mission at Ushuaia. The oceanographic work continued on the voyage back to France and contributed to the record size of the final scientific records from the French expedition, larger than any other IPY expedition. One reason was obviously the fact that a large ship-based expedition worked at the same time as the land station and gathered a large amount of data from both sea and land. In addition, there were extensive natural history reports as well as the optional meteorological observations. The contribution to the ethnography of the area has been emphasised by many as being one of the valuable extra-scientific results of

---

[29] (http://www.victory-cruises.com/cape_horn_patagonian_news3.html)

[30] Baker (2009).

[31] Baker (2009:266).

the French expedition. "On the basis of his studies of the Yámana (in which he was enormously assisted by the efforts and experience of Bridges [head of the Ushuaia Mission]), the medical doctor, Hyadès, along with J. Deniker, produced a monumental, superbly illustrated work on these sea-oriented aborigines of the islands south of Tierra del Fuego (Hyadès and Deniker, 1891)".[32] As at the German station on South Georgia, the French station also recorded the tidal effects of the volcanic eruption of Krakatoa on 17 August 1883 and the recordings of the Transit of Venus and the Great September Comet have been mentioned. Finally, the detailed exploration and surveying carried out by the *Romanche* during the year was "a truly enormous contribution" to geographical exploration and not least a great feat of seamanship.[33] Not least the expedition discovered the Romanche Trench of more than 7,000 m (today measured to 7,760 m), which connects the west Atlantic basin with the east Atlantic basin at the equator.

3.6 The German Stations

3.6.1 Kingua (Clearwater) Fjord, Baffin Island

Susan Barr

Already during the first International Meteorological Congress in Vienna in 1873 Georg von Neumayer (1826–1909), hydrograph of the Prussian Admiralty in Berlin, was interested in the idea of a network of meteorological stations around the Arctic. In addition he pleaded for stations in the southern hemisphere (see Introduction, Chap. 2). The idea of a network of stations was also supported by the German "Commission for the Assessment of Questions Concerning Polar Research", which consisted of 13 members, including Neumayer. Neumayer was the chair of the first International Polar Conference (IPC), which was held in Hamburg in October 1879– and where he was elected first President of the IPC – and was also chair of the second IPC, which was held in Bern in August 1880. Germany, or at least Neumayer, was thus firmly involved in the IPY right from the start.

It was not, however, until late November 1881 that the German government finally decided to make a firm commitment to the IPY and to appoint Neumayer to organise the national participation. As late as mid-December 1881, Neumayer could at last inform Professor Wild of Germany's participation. Swiss meteorologist Heinrich Wild, President of the International Meteorological Committee, had replaced Neumayer as President of the IPC at the Bern meeting in 1880 (see Introduction, Chap. 2). At the same time Neumayer made it clear that there should be simultaneous explorations into the South Polar Regions and that Germany would have one station in the Arctic and one in the near Antarctic. The site for the Arctic

---

[32] Barr (2008:345).

[33] ibid:346.

station was chosen from considerations of completing the circle of already-chosen stations, from being as close as possible to the North Magnetic Pole, and finally by logistic considerations. Information from whalers indicated that Kingua Fjord in Cumberland Sound could expect suitable ice conditions to enable the expedition to be transported both in and out again. This proved to be over-optimistic with regard to the 1883 evacuation.[34]

With a short time before observations should begin on 1 August 1882, the German activities (including the second station on South Georgia and a supplementary expedition to Labrador – see below) were prepared at the German Naval Observatory in Hamburg. At the same time it was agreed that a small station at Port Stanley, Falkland Islands, would be maintained by Captain I.H.M.D. Seemann, resident agent there for the Hamburg shipping company Kosmos. The Baffin Island group was assembled for the first time in Hamburg in early April 1882: they consisted of seven scientists and assistants, and a back-up crew of six men. The leader was Dr. W. Giese. The transport ship was the *Germania*, which had previous polar experience from the Second German Polar Expedition to East Greenland in 1869, having been especially built for that expedition. The original steam engine had been removed in favour of sail power, and this had so far proved adequate during supply trips to the whaling stations in Cumberland Sound. The master, Captain Mahlstede, thus had experience from the relevant area, but this was put on trial during the conditions the IPY expedition was to meet.

The loading of the ship could begin in early June and the result was a ship bordering on the over-loaded, including the prefabricated elements for the station buildings. However, *Germania* left Hamburg on 27 June and made it across to the Davis Strait without particular incident. Within sight of Cumberland Sound she was stopped by ice and prolonged calms and by 13 August it was discussed whether to establish the station at Upernavik on the west coast of Greenland instead, which would be consistent with the given instructions. The next day, however, progress into the Sound was possible and *Germania* anchored off the Scottish whaling station in Kekerten on the 17th. The station staff advised Giese to establish his station in Kingua Fjord and after some bargaining also provided some assistance for finding a suitable site and unloading the ship.

The tidal rip at the entrance to Kingua Fjord proved to be a dangerous trial for the motorless ship, but on the 20 August they finally arrived at what seemed to be a suitable site in Shilmilik Bay. The prefabricated main station building, 13.4 m × 8.5 m, was quickly erected, followed by the earth magnetism observatory hut with the instruments mounted on octagonal stone pillars cemented to square concrete blocks – all brought from Germany – the octagonal absolute magnetism hut, and a rough stone hut for the astronomical observations (Fig. 3.8).

The first Inuit families arrived soon after the Germans and within a short time several more were tenting in the area. In return for provisions, they helped to unload

---

[34] The main sources for this Kingua Fjord account are Neumayer und Börgen (1886) and Barr (2008).

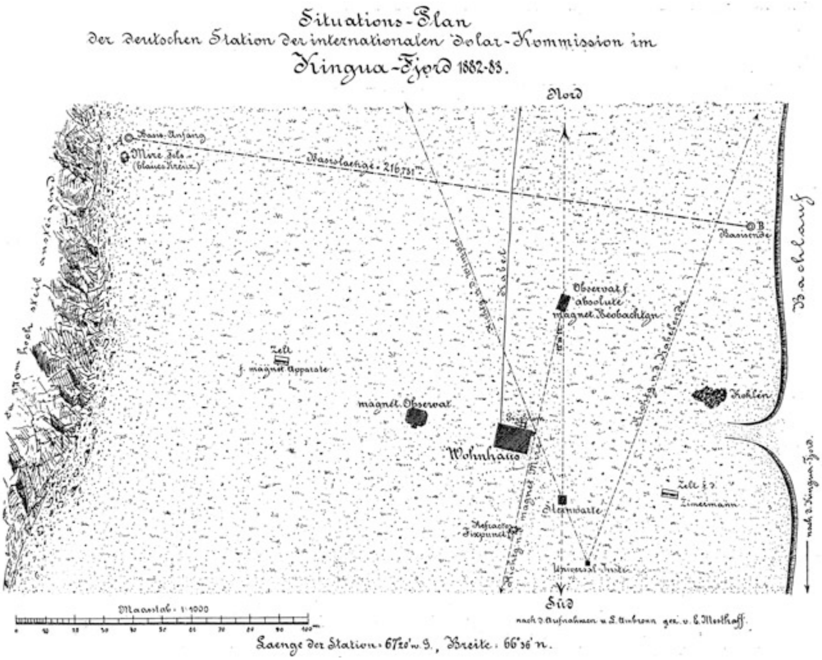


Fig. 3.6 Plan of the German station at Kingua Bay on Baffin Island (Neumayer and Börgen 1886 vol.1)

and erect the station, which was sufficiently ready for occupation by 4 September. One man, Okkeituk, with his family stayed on at the station as interpreter, first living in a caribou-skin tent and later building an igloo. *Germania* sailed for Germany on the 7th and the observation programme was started on the 15th (Figs. 3.6 and 3.7).

Owing to surrounding hills, the station was without sunlight from 30 November to 14 January. The mean monthly temperature for January was –30.8°C and for February –36.2°C. The absolute minimum was –49.4°C on 2 March. It was, however, a dry cold and reasonably bearable. In the spring two topographical surveying trips in the area were made using Inuit dog-sledges, and towards the end of July it was possible to use a boat. By mid-August the men were hoping for the ice to clear from the head of Kingua Fjord ready for the relief vessel, but the outlook was not good. William Barr has the theory that by this time there were obviously very serious frictions within the German group and that three of the scientists were no longer participating in the observing programme,[35] but this has not been verified. Luckily, on 7 September a group from the returning *Germania* arrived at the station. This included Dr. Franz Boas who had travelled with the ship prior to spending a year studying the Inuit of Cumberland Sound. He could relate that the ship lay off

---

[35] Barr (2008:103).

Fig. 3.7 The German station in Kingua Fjord (Neumayer 1891: 60). (Neumayer, G. (Hrsg.) 1891. Die internationale Polarforschung 1882–1883. Die deutschen Expeditionen und ihre Ergebnisse, Berlin, Bd. 1: Geschichtlicher Theil und in einem Anhange mehrere einzelne Abhandlungen physikalischen und sonstigen Inhalts, 362 pp)

Kekerten after having been blocked by ice for a month off the mouth of the Sound. There was, however, no possibility of the ship reaching the station.

Instead the station was evacuated on 12 September by a whaling schooner, the observations having been terminated on the 9th. The *Germania* reached the next day and the return voyage to Germany started on the 16th. After heavy seas in the North Sea, Germany was reached on 16 October and Neumayer came aboard to hear their

Fig. 3.8 Magnetic absolute house at Kingua Fjord (Neumayer and Börgen 1886 vol.1)

news. As W. Barr mentions, Greely and his party were at this time just about to settle into their miserable winter quarters on Pim Island[36] (see this chapter – USA).

The concrete blocks and pillars for instruments can still be seen at the station site, as can the rough stone building for the astronomical observations and an outline of the foundations of the main hut. Others of the stone pillars have been removed to other sites and new uses in the larger district area and there are also oral traditions about the German expedition amongst the Cumberland Sound Inuit.[37] Regarding the Inuit, mathematician and physicist H. Abbes, one of the scientific assistants, made important ethnological records of those who visited the station during the year, including excellent drawings of equipment and igloo design. Other results of the expedition were botanical and geological studies of the area.

3.6.2 South Georgia

Susan Barr and Cornelia Lüdecke

The South Georgia group was relatively large – nine men led by astronomer Dr. Karl Schrader (1852–1930) from Braunschweig, with deputy Dr. Peter Vogel, physics and mathematics professor at the Militär-Bildungsanstalt in München.[38] The other participants were Karl von den Steinen (physician/zoologist), botanist H. Will, engineer and assistent E. Mosthaff, physicist and assistent O. Clauss, mechanic and assistant A. Zschau, and the back-up team, cook, carpenter, sail maker and a sailor/general assistant and their dog Banquo. During April–June 1882 Neumayer and professor Boergen of the Wilhelmshaven observatory tested the instruments that would be used on South Georgia. The expedition participants also practised using the various instruments. In addition to the IPY programme of observations and measurements, the expedition was also to carry out general studies of flora, fauna, geology and tidal movements.

South Georgia had a particular importance during the IPY period since the transit of Venus was to occur on 6 December 1882 and the island was well-placed to observe this. As the occasion was to be used to establish the distance between the Earth and the Sun while Venus passed between the two, the expedition was additionally equipped with special instruments and a cabin with a rotating dome-shaped roof especially constructed for the purpose. This was the only difference in equipment from the German Arctic expedition to Baffin Island. Prefabricated wooden huts were provided for housing and observatories.

The expedition left Hamburg on 2 June 1882. A 3-week stop was made in Montevideo to change ships and to calibrate the chronometer. The opportunity for

---

[36] Barr (2008:105).

[37] Barr (2008:106).

[38] The main sources for this part of the chapter are Barr (2008), Kretzer (year not given), Lüdecke (2008) and (Station diary of South Georgia, unpublished, written by all station members between 20 September 1882 and 4 March 1883 with no entries between 11 January and 17 February 1883 and 19 February and 4 March. In private possession of Oskar Reinwarth, Munich, unpublished).

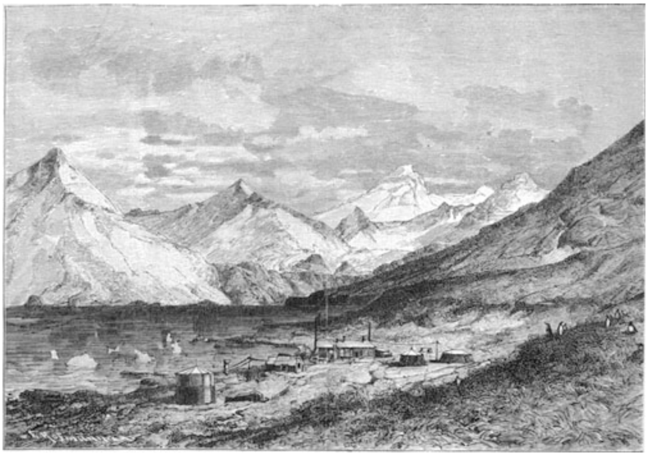


Fig. 3.9 German polar station on South Georgia (Ambronn 1887:273)

a relaxing holiday was also taken, since the expedition was not scheduled to arrive at South Georgia before mid-August. So, in contrast to the privations of transport for some other IPY expeditions, this halfway stop for the German expedition was spiced with tourist trips, balls, dinners and theatres. To supplement provisions at South Georgia, 20 sheep, 3 oxen, 6 goats and 3 kids were purchased. On 23 July they departed aboard the German naval corvette *Moltke*. The onward voyage to South Georgia took 24 days and a message in a bottle was thrown overboard daily in the hope that some would be found and reported so that details of the current in the area could be recorded. They arrived at South Georgia on 12 August, but bad weather near the island caused some uncomfortable and in part dangerous situations and prevented unloading from the ship for a week. From 16–17 August they tried in vain to land in Cumberland Bay, but finally a suitable site was found in Royal Bay. On 22 August a hundred of the 404 crew from the *Moltke* started the unloading and the building of the station after 1–3 m of snow had been cleared from the chosen site. Local peat was used as insulation between the walls of the dwelling house. The foundations of the observatories were dug into 75 cm deep pits, which were then filled with mortar to give the instruments a solid base. This proved insufficient and the pits had to be deepened to 1.5 m. The Transit of Venus observatory was a cylinder-shaped building coated with iron sheets and with a revolving dome built of iron bars covered with canvas. It is prominent on the original photographs of the station (see Fig. 3.9) and the iron remains were also well-visible 100 years later.[39] A shed for the livestock was erected from the paraffin cases.

The *Moltke* left the island on 3 September after the station was more or less completed, and called in on Port Stanley on the way to deliver instruments to Captain Seemann who was to carry through meteorological observations throughout the IPY

---

[39] Headland (1984:60–61).

and send them to Neumayer.[40] On South Georgia the regular observations now commenced. The scientific work was well-organised and allowed the scientists regular free days to explore their surroundings both by water and land as far as possible – a total of 46 major trips were made and important pioneer studies of flora, fauna, glaciology and geology were done, as well as triangulation work for a 1:50,000 map of the spectacular Royal Bay area. This was the first land-based study of South Georgia.[41] During the explorations they found a way to climb Pirnerberg (Pirner Peak) of about 500 m in height, and Sedlmayer Glacier to the south-west, which was named after the owner of the brewery in Munich who donated them a good quantity of beer. The assistants were kept very busy with cooking, cleaning, looking after the livestock, erecting new small buildings, and any other necessary jobs. Harsh storms, which were experienced throughout the year made repairs to the buildings necessary already in September. On 29 September the Great September Comet (C/1882R1) was seen clearly and it remained in sight until 11/12 December. This comet can only be seen every 672 years.

The ample supplies were supplemented with seabird and penguin eggs, some fish, liver from an elephant seal that was killed with some considerable effort, and even with watercress that was grown in sand and manure from the cowshed. As meltwater increased in October, they had to dig a number of drainage channels in the terrain. In addition to their scientific work Will planted an experimental botanical garden, while Zschau started his agriculture between the magnetic observatories (see map Fig. 3.10). Vogel established a small zoological garden with penguins and seagulls during the next months and Clauss played the zitter (cittern) for distraction. On Saturday all the men took a bath, a typical German peculiarity (at the Austro-Hungarian station on Jan Mayen it was at least once a month – see over). Once in a while they had to search for their sheep which escaped from their shed quite often until they were finally locked in.

Despite all this some station members succumbed to polar depression at the end of November with boredom and unhappiness with themselves as the most prominent signs. The Transit of Venus brought a welcome change. It occurred on 6 December and, although the weather was clear for observing, the wind was strong and four men with ropes had to hold down the observatory dome on the windward side. The small Munich refractor and the heliometer worked fine and the greater Fraunhofer telescope was used to observe the entry and the exit of Venus in front of the solar disk (Fig. 3.11).

In December, the temperature was constantly over zero and rain penetrated the roofs of the dwelling house and the variation hut. Time was ripe for the creation of the *Neueste Süd-polar Nachrichten* ("Newest Southpolar News"). In preparation for Christmas Eve an ox was slaughtered and divided in three sections: one part was to be eaten soon and was stored in the shed. Another part was put into boxes and piled up in the snow outside the house, while the third and smallest part was

---

[40] Howat (2009).

[41] Headland (1984:58).

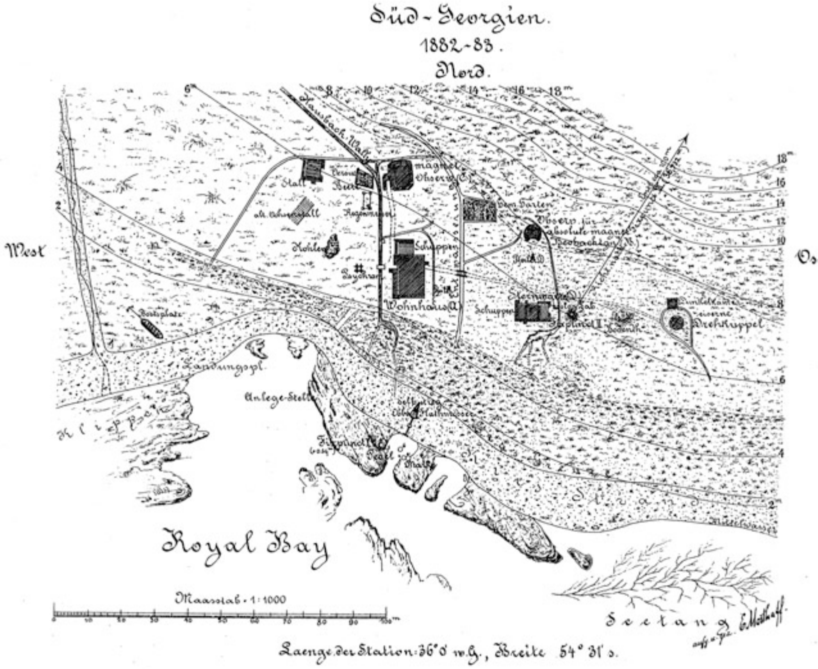


Fig. 3.10 Plan of the German station at South Georgia (Neumayer and Börgen 1886 vol.2)

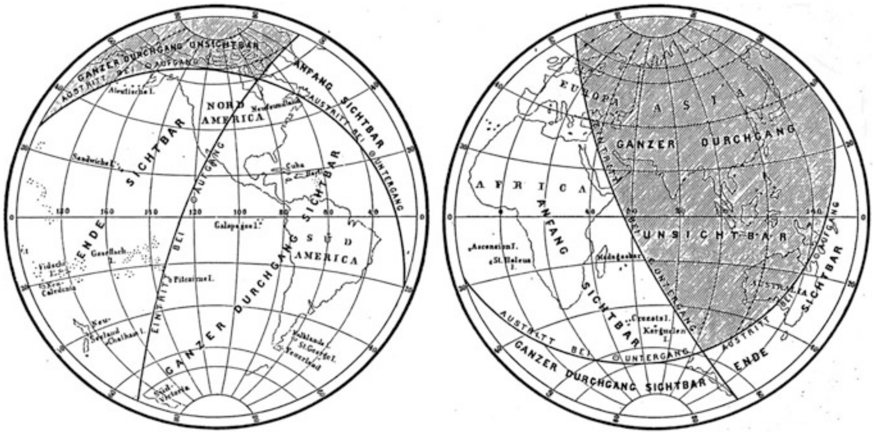


Fig. 3.11 Visibility of the transit of Venus on 6 December 1882 (Neucomb 1881:fig. 96)

salted. Christmas Day was white with snow. The men prepared a small Christmas tree and enjoyed a good wine sponsored by the famous wine cellar of the city hall of Bremen. To the surprise of the expedition members, Neumayer had organised personal presents to everyone from their family, which was very much appreciated.

In January they commenced construction of a tide gauge, which started to work the following month. Although there were the daily activities, the evenings became very boring. The men no longer grouped together, but separated after dinner and went to their cabins. One jovial evening is documented in the unpublished station diary: Schrader's birthday. On this occasion the other station members named a cape after him: Kap Schrader. Boredom is documented in the last diary entry on 4 March 1883.[42]

February was the warmest month, with a maximum of 17.8°C. With a sea temperature of 6.3°C two men went for a swim. The lowest temperature of the year occurred on 23 July (–12.3°C) while the lowest average for the year was –2.9°C. On 27/28 August puzzling variations were recorded on the barograph and the tide gauge. It was not until these could be compared with data from other areas that they were found to have been caused by the Krakatoa volcano eruption between Java and Sumatra on the previous day.

The corvette *Marie* arrived unexpectedly early on 1 September and with good help from seven of the crew the station was packed and ready for evacuation by the 5th. Much was left behind: all the buildings and their furniture including ovens, the Transit observatory, coal and some food, which could keep well. Some documents were deposited at the bottom of a pyramid of empty bottles and a note was left inviting any visitors to use the buildings for shelter. This also happened.[43] Montevideo was reached on 25 September. All but three of the scientists left by steamer for Hamburg on 11 October, the botanist Dr. Will stopping over at Rio on the way to collect flora. Dr. Vogel went first on a 2-week trip through Uruguay to Buenos Aires, while Drs. von den Steinen and Clauß went on a major expedition to Brazil and did not return to Germany before early 1885.

3.6.3 German Auxiliary Expedition to the Labrador Coast

Susan Barr

Georg von Neumayer and other members of the German Polar Commission saw relatively early in the IPY planning stage that there was an important gap in the proposed chain of IPY stations and existing weather stations. This was along the Labrador coast which was a crucial area for registering depressions moving into the Atlantic, and it was also believed to be in the zone of maximum auroral activity and thus important also in this respect for the IPY programme.[44] With two major expeditions to organise and fund already, the German Polar Commission could not manage a third. They could, however, meet the challenge in another way. The Herrnhuter Brüdergemeine (the Moravian Missionary) operated six stations along the Labrador coast and they were now enlisted to serve as meteorological observatories. Physicist

---

[42] With a break in entries 22–27 February and 19 February–3 March.

[43] See about later visitors in Headland 1984.

[44] Barr (2008:347).

Dr. Karl Richard Koch (1852–1924), Privatdozent in physics at the University of Freiburg, was sent to organise the scientific activities.[45]

Koch joined the Moravian supply ship *Harmony* at Stromness, Orkney and sailed with it to Hopedale mission. There he set up the instruments and instructed the missionaries in reading and recording methods. Remaining with the *Harmony*, he then visited the other five mission stations: Zoar, Nain, Rama, Hebron and Okak. He decided to winter at Nain and reached back there at the end of September. By 1 October he had set up his astronomical theodolite and auroral instruments and could start observations on this date as planned. A particular point of study that Koch himself chose to do was tracking the sequence of events as depressions moved across the coast. The results were remarkably detailed and accurate. Other studies he chose to do included solar radiation intensity and the plasticity of ice at low temperatures. In addition, he carried out alone the major aurora programme, also here producing excellent records. Finally, he produced an important and detailed anthropological study of the Labrador Inuit in the area, including the negative influence on their numbers from contact with Europeans as well as the rich music tradition they had acquired from the missionaries.

During the sledging season Koch made a trip to Zoar and Okak to check the instruments there and then on to the Hudson's Bay Company post at Davis Inlet (Ukkusiksallik). From there he was taken down to Hopedale where he spent a week. The trip back to Nain was too far into the melt season and presented great difficulties. Koch arrived back there on 6 June having been gone since 17 May.

When *Harmony* arrived again in mid-August, Koch sailed with her to make final visits to Rama, Hebron and Okak where he made arrangements for the meteorological observations to continue indefinitely. On 15 September *Harmony* set sail for London, where they arrived on 6 October.

3.7 Great Britain at Fort Rae, Canada

Susan Barr

After the huge commitment that Great Britain, and in particular the Royal Navy and the Admiralty, had shown already in the nineteenth century towards Arctic exploration, it was perhaps unexpected that they did not show much enthusiasm for participation in the IPY. However, the one fact most probably explains the other: such large resources and so many lives had been spent in the second-half of the century in the area of the Northwest Passage that a limit had been reached.

Another explanation for the British hesitation might lie in the strong influence of Sir Clements Markham (1830–1916), honorary secretary of the Royal Geographical Society and tireless propounder of polar exploration. In a letter of 7 December 1880

---

[45] Neumayer und Börgen (1886), Lüdecke (2005).

to arctic geographer Robert Brown,[46] Markham expresses the point of view of the traditional geographer fiercely opposed to Weyprecht's modern scientific approach:

> I look upon Weyprecht's scheme as upractical and of course most injurious to geographical research. He wants men to sit down for a couple of years to register observations at one spot, and not to explore. Such a scheme could only have been proposed by the most unpractical of specialists. But I must say that it is rather cool of some of the newspapers to ask the Geographical Society to advocate a scheme which is avowedly opposed to its main object, geographical discovery.[47]

Markham's biographer in Encyclopedia of the Arctic, Merrill Distad, claims on the other hand that "Although he often used appeals to patriotism to promote polar exploration, he declared that systematic, scientific research was a higher priority than reaching the Pole".[48] Whether this was stated before or after IPY-1 is not revealed.

The meteorological circles in Britain had, on the other hand, already indicated active interest as the secretary of the International Meteorological Commission (IMC) was Robert Scott, also secretary of the Meteorological Council of the Royal Society and head of the Meteorological Office.[49] Scott had co-signed on behalf of the IMC Professor Wild's letter of August 1879 to national meteorological offices inviting them to join the planned IPY (see Chap. 2). He was not, however, asked to join the International Polar Commission as representative for Great Britain before March 1882, and Britain did not make a definite commitment to join before 3 April.[50] So, in a break with British Arctic tradition, the Royal Navy was not involved in the IPY expedition; instead the Royal Society took the organising responsibility and the participants came from the Royal Artillery and the Royal Horse Artillery. In addition the participants were only four, and a relatively accessible and already established Hudson's Bay Company (HBC) post was chosen as base for the year.

The British trading post at Fort Rae (now known as Old Fort Rae) on the North Arm of the Great Slave Lake was built in 1852 by the HBC, and named for Chief Factor John Rae (1813–1893), an Orkney man who worked for many years for the HBC, amongst other responsibilities also as surgeon. He became exceptionally skilled in moving through and living off the land, and was a major factor in unravelling the fate of Sir John Franklin's Northwest Passage expedition 1845–1848. Several geographical features in north-eastern Arctic Canada as well as the

---

[46] Levere (1993:260) refers to Robert Brown as the arctic geographer Robert Brown of Campster, who accompanied Whymper to Greenland – ref. R. Brown, Journal, Greenland Expeditions 1867, SPRI MS 441/2/1. He adds that "This Robert Brown was the son of Thomas Brown; the names are common in Scotland and I have not found any connection between the Browns of Campster and the great botanist Robert Brown" (1773–1858). The younger Robert Brown is credited with geological, oceanographic and botanical work. Brown was by some interested parties put forward as a candidate for the British Arctic Expedition 1875–1876 but was not chosen by the Adminralty.

[47] Quoted in Levere (1993:315) with reference SPRI MS 441/9/20. I am grateful to Aant Elzinga for bringing this to my notice.

[48] Encyclopedia of the Arctic, Volume 2:1257.

[49] Barr (2008:255).

[50] ibid.

HBC station were named after Rae. Fort Rae was an important provisioning post for other fur trading forts in the Mackenzie-Great Slave Lake-Athabasca district. Early neighbours to the trading post were the Métis (of French-Cree heritage) and Métis families at Fort Rae are thought to have greatly outnumbered the native Chipewyan, Slavey and Dogrib traditional cultures in the area.[51] Fort Rae was not only the northernmost of the HBC stations, it was also nearest to the Magnetic Pole and thus advantageous for the IPY programme.

Canada contributed to the expedition with a grant of $4,000 for support for the men to travel to Fort Rae. This was announced by the federal government on 3 April 1882 and prompted a question to the responsible minister about the purpose of the grant. His reply was that: "The object is to obtain a better knowledge of the atmospheric laws and magnetic forces which are supposed to affect the state of the weather. It is supposed that this will enable observers at Toronto and elsewhere to better prognosticate the weather and we shall gain largely in that respect." [52]

The following four men were chosen by the Royal Society to participate in the expedition: Captain Henry P. Dawson as leader, with Sergeants J. English and F. Cooksley as observers and Gunner C. Wedenley for practical assistance. The group was well-supplied with provisions and equipment and also had the great advantage of receiving large quantities of meat, fish and game at Fort Rae. Indeed the HBC support was invaluable in many ways and additional support came from the British and Canadian steamship and railway companies that transported the men free of charge from Liverpool to Winnipeg.[53] The trip onwards was by steamer, ox-cart, boat and canoe with portages around rapids and between river systems, with arrival at Fort Rae on 30 August. The meteorological observations were started up the following day and the magnetic observations about a week later.

The station already consisted of a handful of log huts and a large store for trading goods. In addition there was an unfinished log storeroom, which the four men completed with doors, windows, floor and fireplace. This became the magnetic observatory. The winter cold, when it set in, and the attentions of wolverines and wolves were obstacles to the observers and their instruments that had to be overcome, amongst other measures, with a fence to keep the wolves from disturbing the men while noting the observations (Fig. 3.12).

Henry P. Dawson's own description of the winter cold runs thus

"Winter Life at Fort Rae: It was not until the beginning of December that our winter really set in, but when it did so there was no mistake about it, as the 1st of the month began with the thermometer at –34F°, and except for some mild weather at Christmas, the cold continued through that month. January was colder still, the thermometer once or twice approaching –50F°, but in the early part of February a violent storm was accompanied by a remarkable rise of temperature (to +20F°), and followed by some mild weather, since which the thermometer has again fallen,

---

[51] (http://www.greatcanadianlakes.com/northwest/slave/cul_page3.htm)

[52] (http://www.innovationcanada.ca/en/articles/securing-an-ipy-legacy).

[53] Further details about the expedition are mostly from Barr (2008).

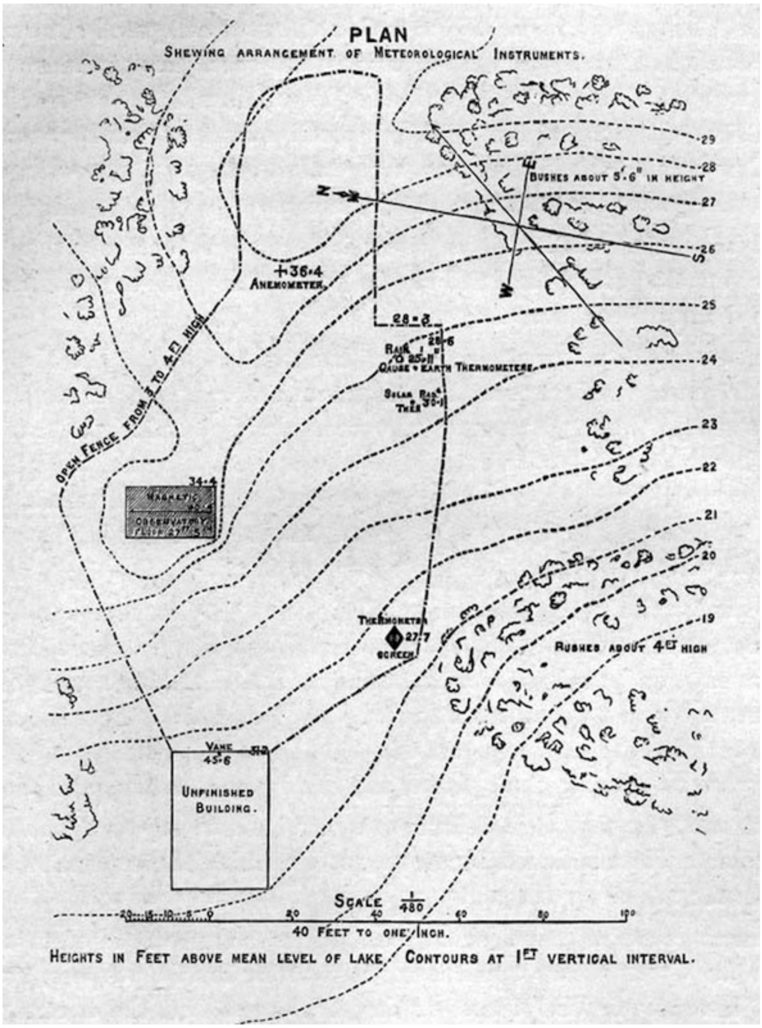


Fig. 3.12 Plan of the siting of the meteorological instruments (Dawson 1886)

reaching –39F° a couple of days ago."[54] On the other hand, the HBC personnel reported that it was an unusually mild winter with a very late start, much lighter snowfall than usual and unusually few severe storms.[55]

The aurora was observed every clear night throughout the winter, making the auroral report one of the largest. J.M. Stagg, who led the IPY-2 British expedition at Fort Rae 50 years later, remarked that: "The site of Fort Rae is of

---

[54] nature 28.

[55] Barr (2008:262).

exceptional interest, as it lies near the zone of maximum frequency of aurora, and auroral photography was one of the most important objects of the expedition. Extensive studies were also made in meteorology, including upper air investigation, atmospheric electricity and terrestrial magnetism."[56]

The stay at Fort Rae was over at the beginning of September and the men were back in England on 20 November 1883. William Barr remarks on the lack of details concerning the everyday life in the expedition's report, in addition to the fact that the HBC journal for Fort Rae 1882–1883 no longer exists.[57] There is no doubt, however, that the British IPY expedition was not one of the most hazardous or difficult.

3.8 The Netherlands – Beset in the Ice of the Kara Sea

Louwrens Hacquebord

3.8.1 The Beginning

The most important man behind the Dutch Polar Expedition 1882–1883 was Prof. Dr. C.H.D. Buys Ballot (1817–1890), director of the Royal Netherlands Meteorological Institute in Utrecht.[58] He participated in several international meteorological meetings and wanted to set up a global system of weather stations. In 1872 in Leipzig Buys Ballot presented a detailed plan to establish a permanent global network of meteorological observation stations. In Wenen at the first International Meteorological Congress Buys Ballot presented his plan again. The congress supported his plan and established a Permanent Committee to investigate the possibilities of the realisation of such a network. Later this committee developed into the World Meteorological Organisation (WMO).[59]

In accordance with his plan for the establishment of a network of observation stations around the Arctic (see Chap. 2 for details), Weyprecht and his advisor and friend Graf Wilczek sent letters in 1877 to the national Academies of Sciences and the national Geographical Societies to explain their plan and to ask these organisations to participate in the organisation of an International Polar Year. Two years later a committee of investigation and implementation was appointed at the meeting of the International Committee for Meteorology in Rome. The Royal Dutch Academy of Sciences and the Dutch Geographical Society received such a letter of

---

L. Hacquebord (✉)
Willem Barents Polar Institute, Univerisity of Groningen, Netherlands
e-mail: L.Hacquebord@rug.nl

[56] nature 133.

[57] Barr (2008:263).

[58] Hacquebord (1995:9).

[59] Snellen (1886:12).

explanation with the text of Weyprecht's speech in Graz.[60] In the Netherlands Buys Ballot was very interested in this plan because he saw possibilities of realising his own plan to set up a global network of observation stations.[61]

At the first International Polar Year conference in Hamburg in October 1879 the Netherlands was represented by Buys Ballot. The participants of this conference decided to organise a year with observations in the Polar Regions in 1881–1882 and made an implementation plan for this activity.

Back in the Netherlands Buys Ballot wrote a letter to the Minister of Public Works, Commerce and Industry to apply for financial support to realise the establishment of a Dutch observation station somewhere north of the polar circle. He also tried to sell the idea to organise a scientific expedition to the Arctic in the International Polar Year to the general public, but it turned out to be difficult to raise money for a Dutch scientific observation station.[62] This was, however, not a specifically Dutch problem. At the following meeting of the International Polar Year committee in Bern only four states had committed themselves to the IPY and the eight delegates decided therefore to postpone the Year to 1882–1883. In August 1881, at the third meeting of the IPY committee in St Petersburg things were far from positive. The most important advocate of the IPY was dead (Karl Weyprecht – see Chap. 2), Germany and England were absent and France and the Netherlands were still uncertain of their participation. It was, however, decided to proceed with the IPY and the delegates present, agreed on a beginning as soon as possible after the first of August 1882 and to the end of August 1883.

3.8.2 Financial Support

On 4 July 1881, just before the meeting of the IPY committee in St Petersburg, the Minister promised Buys Ballot to support the expedition with 30,000 Dutch guilders when the rest of the money needed came in from private organisations and individual persons. This promise stimulated Buys Ballot in his campaign to raise money. He wrote articles in newspapers to raise awareness of the IPY and made a brochure in which he explained the Austrian plan and asked for donations. He sent these brochures to all mayors in the Netherlands with the request that they encourage the inhabitants of their community to donate money to the project. However, despite all his efforts the IPY did not become really popular in the Netherlands. First, it was considered to be a purely scientific activity and the government had to finance scientific activities in the eyes of the public. Second, Buys Ballot's fund raising was competing with the Willem Barents Society, the organisation behind the Dutch schooner *Willem Barents*. Buys Ballot preferred cooperation to competition with the Society but the board of the Society was not interested. There were two reasons for this adverse attitude by the board; one is personal tension between Buys Ballot and

---

[60] Rijksarchief Noord-Holland 64/394.

[61] Snellen (1886:1).

[62] Langerveld (1983:14–18).

M.H. Jansen, one of the board members of the Society and the other is the opinion of one of the board members that a scientific expedition should be supported by the government. To avoid competition Buys Ballot started his campaign to raise money after the schooner had left for the Arctic in 1881.[63]

Little by little the money came in. Members of the Royal Family of the Netherlands such as Alexander, Crown Prince of the Netherlands, Prins Frederik, Prinsess Marianne, Prins Hendrik and the Duchess van Saksen-Weimar showed their interest in the expedition by their donations and the Duchess van Saksen-Weimar also wanted to be informed about the progress and the fate of the expedition.[64]

Some very important Dutch societies such as the Aardrijkskundig Genootschap in Amsterdam, the Bataafse Genootschap der Proefondervindelijke Wijsbegeerte in Rotterdam, the Hollandsche Maatschappij van Wetenschappen in Haarlem, the Teylers genootschap in Haarlem and the Provinciaal Utrechtsch genootschap van Kunsten en Wetenschappen contributed to the expedition.[65] Because the board of the Willem Barents Society did not allow Buys Ballot to make use of their organisation structure, he had to set up his own structure to raise money. In cities like Amsterdam, Rotterdam, Utrecht and Schiedam committees were established to collect money. Beside these local committees the collection of the donations of individual persons was centralised and led by B.J.G. Volck, assistant director of the department *Waarnemingen ter zee* (Observations at sea) of the Royal Dutch Meteorological Institute in Utrecht.[66] In this way Buys Ballot was able to collect most of the money he needed for the expedition and the Dutch Arctic observation station. The last action to raise money was set up in the spring of 1882, only a few months before the start of the IPY, and thanks to this action all money needed for the expedition was collected in time.

Beside money the expedition also needed meteorological and magnetic instruments which were partly in use by the Willem Barents Society. Buys Ballot had to force the board of the Society with intervention by the Minister of the Navy to return the instruments. This illustrates the disturbed relation between the two organisations.[67]

3.8.3 The Dutch Polar Expedition

Dr. Maurits Snellen (1840–1907) of the Royal Netherlands Meteorological Institute in Utrecht, became the leader of the Dutch Polar Expedition (1882–1883). He also did the meteorological and earth magnetic observations of the expedition. The care of the ship and the equipment was in the hands of the navy officer L.A.H. Lamie, who knew what kind of ship the expedition needed. Lamie had sailed into the polar

---

[63] Morzer Bruyns (1985:79).

[64] Snellen (1886:32).

[65] Snellen (1886:32).

[66] Snellen (1886:33).

[67] Morzer Bruyns (1985:80).

regions before on the Dutch schooner *Willem Barents* in 1880 and 1881. So, he was an experienced man in these areas. He was appointed to do the hydrographical observations and was responsible for the crew. The astronomical and the optical observation in the atmosphere (halos, parhelion, aurora borealis, etc.) were the fields of research of Dr. H. Ekama. Dr J.M. Ruys was asked to perform the natural-historical research and to build up and take care of the collections. Dr H.J. Kremer was the medical doctor.

The destination of the expedition was Dickson Harbour on an island at the mouth of the Yenisey River in northern Siberia. This good natural harbour had been discovered by the Finnish-Swede Adolf Erik Nordenskiöld in 1875 and named after his sponsor Oscar Dickson. The island became the main target of the Dutch expedition because all the other more obvious locations were occupied already by other countries that were much faster in their decision-making process. The Swedes planned to go to Spitsbergen, the Russians went to Novaya Zemlya and Austria–Hungary wanted to go to Jan Mayen. In this way the Dutch had to choose a location without any historical relation with the Netherlands. But they had the possibility of finding a location that was appropriate for establishing a trading post. The search for trade possibilities was encouraged by the main sponsor of the expedition, the Dutch Ministry of Public Works, Commerce and Industry. To stimulate trade between the Netherlands and the North Siberian region Frank Rust was accompanying the expedition. Had the expedition been successful at reaching the goal for the station, the trading possibilities might have been an interesting spin-off from the expedition.

The expedition needed a ship to sail to Dickson Harbour, but that turned out to be very difficult to realise. First, Buys Ballot tried to hire the schooner *Willem Barents* from the Willem Barents Society. But the board of this society was not willing to lend out the ship. The board wanted to continue the sailings with their schooner that they started in 1878 in the Arctic. This meant that the ship was not available for the IPY expedition. The Dutch navy was not able to help Buys Ballot either because they had to cut down their costs. Besides that there were no other ships available in the Netherlands appropriate for polar seas. This caused the organisation to look for a ship somewhere outside the Netherlands. The Bremen merchant Johan Ludwig von Knoop maintained a shipping route between Bremen and the mouth of the Yenisey River with the steamship *Louise*. He was willing to transport the Dutch expedition and their equipment to Dickson Harbour, but unfortunately the *Louise* was too small to take everything on board. Finally, Buys Ballot found a ship in Norway. This ship belonging to the Norwegian ship owner Smith was called the *Varna* and had A. Knudsen as captain. It was available for £2000, which was more than calculated, but Buys Ballot had no choice.[68] The *Varna* was a wooden steamship very appropriate to sail into the ice of the Arctic seas and, what is more, it was big enough to transport the whole expedition team and all the equipment. Beside the already described staff members the expedition team consisted of: Svend Petersen (carpenter and blacksmith), A.A. van Dolder (engineer), C.M. Beutler (3rd

---

[68] Snellen (1886:39).

mate), J.W. Stapper (fireman 2nd class) and J. de Bruin (cook, baker and in charge of provisions). Because De Bruin had been cook on the first voyage of the Dutch schooner *Willem Barents*, he was an experienced Arctic sailor.[69]

The expedition was very well-equipped. They took notice of the reports of foreign expeditions and used the information from those reports very meticulously for their food and clothing. For hikes over the ice they brought sledges and a small boat and for trips over the river a steam long boat. Because there was no room for them on the *Varna* the long boat was transported by the *Louise* as that ship had to go to the Yenisey anyhow.

3.8.4 Into the Ice

The first Dutch polar expedition left the Netherlands on 5 July 1882. Buys Ballot said goodbye to the men in Ijmuiden and wished the members a safe journey and a safe return.

Thanks to the detailed report of Maurits Snellen, which was published in 1886 we know much about the arctic adventures of the expedition. On 22 July the *Varna* sailed into the harbour at Hammerfest. Here the expedition members had to buy their fur clothes. Together with the *Louise* the *Varna* left Hammerfest on the 28 July. Both ships sailed to the Jugor Strait to enter the Kara Sea. But when the Jugor Strait appeared to be blocked with ice the captains decided to sail to the north to the Matochkin Shar to try to enter the Kara Sea there. When they arrived at the entrance of the Matochkin Shar on 3 August they saw two ships, the *Willem Barents* and the *Hope*, anchored there. The meeting with the crew of the *Willem Barents* was most hearty according to Snellen.[70] The crew of the *Willem Barents* had all reason to be excited because they had found that very morning the members of Englishman Bernard Leigh Smith's expedition that had disappeared near Zemlya Frantsa Iosifa. After the meeting and the unavoidable group photo on board the *Willem Barents* the ships continued their voyage. The *Varna* and the *Louise* tried to enter the Kara Sea through the Matochkin Shar, but were not successful. Both ships sailed to the south again and tried the Kara Port. This strait was still blocked with ice upon their arrival on 22 August. The ships were lying there for days waiting for an opening in the ice. In the meantime the leaders were discussing an alternative destination. In case Dickson Harbour was unreachable and the Russians did not show up in their station in Karmakuli, the current situation in the Möller Bay on the west coast of the southern part of Novaya Zemlya, and otherwise Cape Rosmyslow in the Matochkin Shar, were considered to be alternatives.[71]

On 30 August both ships could enter the Kara Sea thanks to a strong current, but soon they were surrounded by ice again. They tried to make some progress in the

---

[69] Snellen (1886:37).

[70] Snellen (1886:59).

[71] Snellen (1886:64).

ice but this was very difficult. On 17 September the crew of the *Varna* suddenly saw a steamship in the ice. It turned out to be the Danish *Dymphna* on her way to Cape Chelyuskin. The *Varna* succeeded in getting closer to the Danish ship, but soon both ships were totally beset in the ice. The *Louise* could not follow the *Varna* in the direction of the *Dymphna* but came in open water again. This made the captain of the *Louise* decide to turn and leave the Kara Sea. The member of the Dutch expedition responsible for the stimulation of the trade with northern Siberia, Frank Rust, returned with the *Louise* because there was nothing more for him to do. The *Varna* and the *Dymphna* stayed the whole winter in the ice of the Kara Sea. Both ships experienced strong ice pressure several times and the *Varna* was squeezed so much that the crew decided to abandon ship on 24 December at 5:15 in the morning.[72] Most of them went to the *Dymphna* while the others stayed in the five tents they had erected on the ice. All together they were there with 42 men and six dogs. Most of the equipment including four boats and eight sledges was stored on the ice around the two ships (Fig. 3.13).[73]

The crews of both ships were not easily daunted. Already in October the Danes and the Dutch built a thermometer screen on the ice and on 9 October both crews

Fig. 3.13 The *Varna* and the *Dymphna* caught in the ice of the Kara Sea[74]

---

[72] Snellen (1886:100).

[73] Snellen (1886:100).

[74] Photo from Snellen M. and Ekama H. 1910: Rapport sur l'Expédition Néerlandaise qui a hiverné dans la Mer de Kara en (1882/1883). Utrecht: J. Van Boekhoven.

started with the regular observations. Because of their position on the sea ice they could not perform all the tasks agreed on, but they measured temperature, humidity, air pressure and precipitation. They also observed the direction of the cloud movement and the ice and measured the direction and the power of the wind.[75] Most of the instruments were read every hour, day and night on moving ice and sometimes with a temperature varying between –30° and –40°C.[76]

Despite the danger there was time for celebrations. As their famous predecessor Willem Barentsz and his companions did on Novaya Zemlya during their wintering in 1596–1597, the icebound men used all opportunities for celebrations: birthdays, St Nicolas' Eve, New Year's Eve, etc. were moments of merriment.

The ice pressure on 24 December had made it clear that the expedition had to expect the loss of both ships and the men therefore decided to erect on the ice the prefabricated house that had been meant for Dickson Harbour. On 28 December the house was completed and the place was named Nieuw Holland (Fig. 3.14). At that moment the *Varna* began to leak at the stern and took in water. The men tried to pump the water out with the help of windmills, but unfortunately this did not work. In July, when the surrounding sea ice began to melt, the *Varna* was sinking more and more and on 24 July the ship disappeared completely into the Kara Sea.

Fig. 3.14 The cabin on the ice[77]

---

[75] Snellen (1886:73).

[76] Snellen (1886:97).

[77] Photo from Snellen M. and Ekama H. 1910: Rapport sur l'Expédition Néerlandaise qui a hiverné dans la Mer de Kara en (1882/1883).

Because the *Dymphna* was still beset in the ice the Dutch expedition members and the Norwegian crew of the *Varna* decided to try to escape to the mainland over the ice. They said goodbye to the Danes and walked with the sledges and the boats to the coast of northern Russia. On 19 August they landed on a small island, which they named Buys Ballot Island. Six days later they arrived on the shore of the Jugor Strait where they saw three steamships. One of the ships was the *Louise*. The reception on the ships was fantastic and everybody was happy that the expedition ended so well.

3.8.5 On the Home Front

After a hesitant start the public in the Netherlands became really interested in the first International Polar Year and the Dutch polar expedition at the moment the expedition left the Netherlands. On July 1882, at the departure of the expedition from Amsterdam there were many people to say goodbye to the expedition and it received much attention in the national press. The press followed the expedition into the ice of the Kara Sea and it was known by the information from the *Louise* from Hammerfest that the expedition did not reach its destination. The absence of positive news about the expedition in the autumn of 1882 made the press and the people in the Netherlands worried about the fate of the expedition. The press began to blame Buys Ballot for the present situation and demand that he send out an expedition to rescue the men. At first there was no money available to organise such an expedition, but when the public became aware that Buys Ballot was setting up such an expedition on his own account they understood the urgency of the matter and money began to come in. Soon the *Ellida* could be hired to sail to the north.[78]

On 1 September when the members of the expedition on board of the *Louise* sailed into the harbour of Hammerfest, they saw the *Ellida* ready to sail into the Kara Sea. Coming ashore they heard that the *Georgy* from Archangelsk also sailed north to search for them. This together with the information that the *Willem Barents* was also searching for them, gave them a grateful feeling. The reception of the Dutch consul in Hammerfest, Mr. Robertson, was great and the expedition team received congratulations from all over Europe.

After two weeks the expedition team was received with much applause at the central station in Utrecht. Buys Ballot welcomed and congratulated them with their safe return. He told the expedition members that although they did not achieve their final destination he was happy to see them all back, healthy and in good shape. Everybody returned to their own home after these words. According to Maurits Snellen the houses were flagged and decorated and a triumphal arch was erected by the neighbours of their institute in Utrecht. The mayor of Utrecht and the Commissioner of the King in the province of Utrecht welcomed them in Tivoli with speeches, music,

---

[78] Snellen (1886:149).

food and drinks. In Snellen's words, "They were great days we experienced after our return".[79] The members of the expedition travelled around the whole country to lecture at the invitation of all kinds of organisations. After a hesitating start these celebrations and invitations showed how broadly the expedition was finally supported by the public. The same broad support was showed by the subscription list to Snellen's published report of the expedition. The publication of this report was not only supported by scientific organisations such as scientific associations and societies, but also by local governments, schools, libraries and individuals. The spread of the subscribers over the Netherlands shows a heavy representation in the western part of the country. Almost two-thirds of the total subscribers lived in the central part and only one-third in the periphery.

3.8.6 The Results

According to Snellen the international cooperation went very well. All individual expeditions had fulfilled their task except the Dutch. The Swedish expedition did not reach the proposed location on Spitsbergen, but they built their station at another location and did their observations there according to the agreed standard. The Russian expedition in the Lena delta was delayed because of a shipwreck on the river, but they did reach their final destination and stayed there another year to complete their programme. In this way only one of the proposed 14 stations (Dickson Harbour) was not occupied and two were not used in the way agreed.[80]

Concerning the Dutch share of the International Polar Year it is clear that the Dutch researchers could not fulfill their part of the research programme as they wanted, but they did collect much information about the meteorology of the Kara Sea, sea-ice movement in the Kara Sea, melting of sea ice and melting of sea ice under buildings. They also studied the aurora borealis, the refraction of light and the geographical distribution of marine animals.

Although Buys Ballot was an advocate of a network of permanent observation stations in the Arctic, he did not live long enough to see the realisation of this plan and it was not until the end of the twentieth century that the Dutch government financed a scientific research plan and established an observation station in the Arctic south of Dickson Harbour.[81]

After the Second World War Dickson Harbour played an important role as supply harbour on the northern sea route, but its role has recently decreased enormously.

---

[79] Snellen (1886:152–153).

[80] Snellen (1886:155).

[81] Willem Barentsz Station on the tundra south of Dickson.

3.9 The Norwegian Stations

Susan Barr

3.9.1 Bossekop

In 1873 the 1st International Meteorological Congress, which was held in Vienna, established a Permanent Meteorological Committee which developed into the International Meteorological Organisation (IMO), from 1950 the World Meteorological Organisation (WMO). Norway was one of the nine European founding nations of the IMO, and the Norwegian delegate was Henrik Mohn (1835–1916), who is counted as the founder of meteorology and physical oceanography in Norway. In 1866 he became the first professor of the new Meteorological Institute at the University of Christiania (Oslo). The University was only 55 years old at the time. He was director of the Meteorological Institute for 47 years and organised the systematic meteorological and climate research in Norway and started up the storm warnings and daily weather forecasts.

It was the Permanent Meteorological Committee which organised the 2nd International Meteorological Congress which was to meet in Rome in 1879, by preparing recommendations and later following up the resolutions. In this connection the president, C.H.D. Buys-Ballot (1817–1890), sent Weyprecht's proposal for a Polar Year to professor Mohn in order to receive his comments on the project.[82] Mohn was thereby involved in the recommendation which was to be put before the Congress and Norway was one of the first four countries to agree to establish a Polar Year station. Norway would not, however, agree to the Polar Year going ahead with less than eight participating countries and Mohn opposed the resolution by professor Heinrich Wild, president of the IMC in 1881, to arrange the IPY with only five countries. Mohn delayed Norway's final decision until the beginning of May 1881 and by the 14th Wild could announce that at least eight stations would carry out the simultaneous observations that were required for the Polar Year.[83]

It was Professor Mohn who chose Bossekop (Alta) in north Norway as the site for Norway's Polar Year station. He originally thought of three possible sites for the station within the zone of maximum intensity of the aurora: in Hammerfest, Tromsø and Bossekop. The latter was chosen since the Alta area had less cloud cover than the two others and "a wider Horizon".[84] An additional advantage was that the French *Recherche* expedition in 1838–1839 had established a winter base in Bossekop and studied the aurora and magnetism there. There were therefore grounds for comparison. As an extra advantage, Bossekop also had both postal and telegraph connections (the station chronometers could be checked daily at the telegraph station), and its situation at the head of the Altafjord allowed a regular

---

[82] Bones (2007a).

[83] ibid:196.

[84] Bones (2007b).

steamer service (once a week in winter and twice in summer), so there was no hardship of establishing the entire station in the Arctic wilderness as other countries had to. The station leader, Dr. Steen, also had his family with him, and they lived on the first floor of the farmhouse that became the main station building. The other members of the group lived in other existing buildings nearby (Fig. 3.15).

Mohn contributed further by acquiring most of the scientific equipment for the station, some of the instruments in addition being constructed according to his own designs.[85] Dr. Aksel S. Steen (1849–1915), 1st assistant (deputy leader) at the Norwegian Meteorological Institute, later director, was chosen to lead the work at Bossekop, with his qualifications from study trips to meteorological and magnetism institutions in Europe making him ideal for the task. Because of the delay in starting the IPY, from 1881 to 1882, Steen had time to make himself acquainted with the Bossekop area, to rent an empty farmhouse, and to decide where the various buildings should be placed in the open fields around this. These were mainly the magnetic and the astronomical observatories.

During a stopover in Tromsø on the way to Bossekop to open the station in 1882 Steen and Krafft met the Austro-Hungarian expeditioners, who were about to leave for the second time to try to get through the sea ice to Jan Mayen (see account above). In addition to Steen (leader and magnetism studies), the Norwegian station was manned from July 1882 by the above-mentioned Carl Krafft (aurora, humidity and photography), Jens Schroeter (astronomical observations together with Steen), Ivar Hesselberg (oceanographic studies of the fjord, magnetism and meteorology) and Olaf Hagen (practical assistant). The clerk of the local council, P. Guldahl, was happy to assist when extra-observing resources were needed.[86] Sophus Tromholt

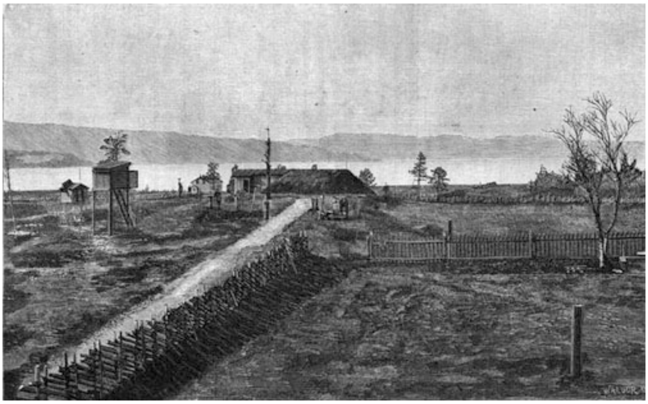


Fig. 3.15 The Norwegian IPY station at Bossekop (Steen 1887)

---

[85] ibid.

[86] Barr (2008:270).

Fig. 3.16 Schrøder asleep after dinner 1883. Carl Krafft © Directorate for Cultural Heritage, Norway

(see under) called in on the station in August on his way to Kautokeino in order to discuss his planned comparative aurora observations with Steen.

The Polar Year passed relatively easily for the Norwegian expedition, and as with Tromholt in Kautokeino, the local population was interested in the work and hospitable towards the scientists. Professor Mohn visited them in July 1883 on his inspection tour of meteorological stations in the northern Norwegian region of Finnmark, and summer tourists also dropped by to be shown around the station.[87] The expedition left for home by steamer on 6th September 1883, meeting members of the long-suffering Dutch expedition (see account above) who were also on their way home.

3.9.2 *Sophus Tromholt*

Sophus Tromholt (1851–1896) was Danish and is counted as one of the pioneers of aurora research.[88] In 1875 he took a job in Bergen as a teacher of nature studies and mathematics. In the winter of 1878–1879 he made an extensive study of aurora observations in Scandinavia. When the Norwegian Meteorological Institute established its Polar Year station in Bossekop, Tromholt went to Kautokeino on a 5-year stipend from the Norwegian state and with economic support from brewer J.C. Jacobsen in Copenhagen, staying from autumn 1882 to spring 1883. His mission was to run a one-man aurora observatory, which was to make synchronic observations with the IPY stations at Bossekop and Sodankylä in Finland. The aim was to calculate the height of the aurora by measuring the angle height over the horizon of the same aurora bow seen from two different stations. Kautokeino lies about 100 km south of Bossekop, and Tromholt visited the Bossekop station on his way in August 1882 in order to coordinate the aurora work.

---

[87] ibid:271.

[88] Tromholt (1885) is the main source for this account.

At the same time Tromholt made a huge contribution to the documentation through photographs and writing of the society and people in Kautokeino at that time. His enthusiasm for this went far beyond the research mandate and tasks he had. He is apparently still known there as *Násteolmmái* (the Star Man). Throughout his stay in Kautokeino, Tromholt sent travel letters to the newspaper *Morgenbladet*, first writing about the place and people he met there in the north, and later filling in with details of his aurora and ethnographical research. These writings were published in two volumes in London with the title "Under the Rays of the Aurora Borealis" (1885), which gained international interest. The volumes contained more than 150 illustrations of which more than 110 were photographic reproductions. A Norwegian one-volume edition was published the same year.[89] Many of his original negatives are to be found in the Bergen University Library's photo archives. The original idea had been to use his camera to photograph the aurora, but the dry-plate negatives could not catch enough light to produce an image. Instead the photographing was concentrated on the landscape, buildings and people.

During his time in Kautokeino, Tromholt lived in the house of the local police authority, so there was no question of him "suffering for science" as many other IPY participants did. He was an exotic foreigner in the Sámi community and described his attraction to the local inhabitants thus: "When I during the evenings go out to take observations they flock around me and stare with wonder at the strange things I occupy myself with. They can stand for hours and look in silent amazement. The instrument they have most feeling for is my photography apparatus. Almost daily they come to me for me to take a *govva* (picture) of them."[90] In fact Tromholt used both his observatory and camera as a means of establishing contact with local people. During the local district assembly in April 1883 he set up a temporary studio: "Beside the store hut at the vicarage and with the help of some ropes and sails [. . .] I made for myself a photographic studio of the proper sort, and the queues during midday were so big that I hardly could satisfy the wishes of the crowd".[91]

After his time in Kautokeino, Tromholt continued his aurora studies, making observations in Iceland the following winter and then being attached to the Norwegian Meteorological Institute in Kristiania (Oslo) to systemise his data. He never managed to publish his observations from the IPY and from Iceland, but a larger collection of data from historical sources was published post-mortem by the Scientific Society in Kristiania and the Fridtjof Nansen Fund in 1902. When his 5-year stipend ran out, Tromholt moved to Germany and supported himself with non-fiction writing and with lectures. He was somewhat bitter at not receiving economic support for more scientific research and he died aged only 45 in a lung sanatorium in Thüringen. He is most remembered today for his documentary photography of Kautokeino's population (Fig. 3.17).

---

[89] Tromholt (1885).

[90] Quoted from Tromholt (2007:IX).

[91] Tromholt (1885:426).

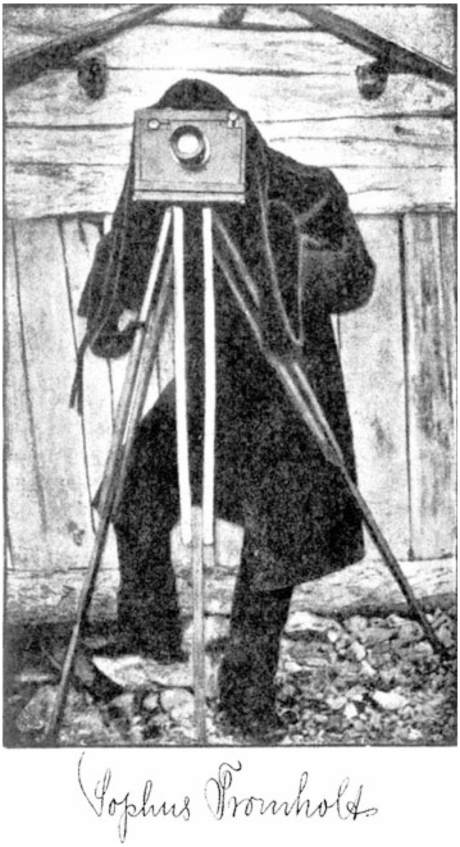


Fig. 3.17 Sophus Tromholt behind his camera (Tromholt 1885)

3.10 The Russian Polar Stations

Erki Tammiksaar and Natal'ya Georgievna Sukhova

In the summer of 1875, when Karl Weyprecht (1838–1881) began to pursue his idea of setting up an international network of observation stations in the Arctic, he also tried to earn the support of Russian polar explorers and naturalists. He sent his plan for the establishment of polar stations in the Arctic areas to Russia, namely

---

E. Tammiksaar (✉)
Institute of Ecology and Earth Sciences, University of Tartu, Tartu, Estonia; Centre for Science Studies, Estonian University of Life Sciences, Tartu, Estonia
e-mail: Erki.Tammiksaar@zbi.ee

N.G. Sukhova (✉)
St. Petersburg Branch of the Institute for the History of Science and Technology named after S.I. Vavilov of The Russian Academy of Sciences, Russia
e-mail: ngsukhova@mail.ru

to Karl Ernst von Baer (1792–1876), Alexander Theodor von Middendorff (1815–1894), Graf Friedrich Benjamin Lütke (1797–1882), Heinrich Wild (1833–1902) and Friedrich Reinhold von der Osten-Sacken (1832–1916). The answers and opinions that the researchers sent to Weyprecht have been preserved in the Austrian State Archives in Vienna. The plan was considered very important from the scientific point of view, but it was admitted that the realisation of it would be very complicated. The contents of the letters, sometimes exceeding the scope of the problem in question, provided a much broader view of the approaches to different problems.

The president of the St Petersburg Academy of Sciences and polar researcher Graf Lütke wrote at the beginning of August 1875 that Weyprecht's "principles" concerning the organisation of the investigations were evidently correct – "/. . ./ observations carried out simultaneously in different points of high latitudes, using the same method, provide a general picture of the physical phenomena and material for the explanation of them /. . ./".[92] But, in his opinion, observations obtained in different stations during a year only would be too scanty for learning all the factors having an effect on the nature of the polar areas.

In July 1875, Middendorff, zoologist and honorary member of the St Petersburg Academy of Sciences, in his verbose letter noted that, to his sorrow, the exploration of new lands or the adventures during an expedition appeared to be more intriguing for a wide public than serious projects promoting science. He also admitted that time was favourable for the popularisation of the plan for polar investigations, as joint activities in different regions – for example in the fields of meteorology, statistics, cattle plague – had become topical on an international scale. Middendorff also wrote that he, having contacts with members of the imperial family, wanted to be of help in the realisation of Weyprecht's plan.[93]

Osten-Sacken, the head of the Department of Physical Geography of the Russian Geographical Society, in his letter of 20 November 1875[94] emphasised the importance of scientific investigations in the Russian Empire, which included large polar areas in its territory. According to him the "scientific evenings and celebrations" devoted to the expedition of Adolf Erik Nordenskiöld (1832–1901), which had reached the mouth of the river Yenissey in 1875, lasted a whole week in St Petersburg. Osten-Sacken understood that the circumstance had to be taken advantage of to raise money for setting up an observation station in Novaya Zemlya.[95]

Wild, member of the Academy of Sciences and director of the St Petersburg Chief Physical Observatory, in his letter of 25 October 1875 confirmed that he completely agreed to the views of Weyprecht and would do everything necessary to help realise his plan.[96] Wild also discussed the plan with Lütke and Konstantin Stepanovich

---

[92] Österreichisches Staatsarchiv, Nachlass Weyprecht, B/205:1–3, Bl. 173–174v.

[93] Österreichisches Staatsarchiv, Nachlass Weyprecht, B/205:1–3, Bl. 185–186v.

[94] Because of the difference of 12 days in the Russian and European calendars in the nineteenth century, for the sake of clarity, only the new calendar has been used in the text.

[95] Österreichisches Staatsarchiv, Nachlass Weyprecht, B/205:1–3, Bl. 233–233v.

[96] Österreichisches Staatsarchiv, Nachlass Weyprecht, B/205:1–3, Bl. 309v–310.

Veselovsky (1819–1901), permanent secretary of the Academy of Sciences, who both promised to support the plan. Lütke had to present the plan to the Grand Duke Konstantin Nikolaevich (1827–1892), president of the Russian Geographical Society, and Veselovsky to Petr Petrovich Semenov (1827–1914), vice-president of the Geographical Society. "As chairman of the meteorological commission of the Geographical Society, I am doing everything possible" Wild wrote. "This undertaking will be the quickest and most reliable if the Imperial Russian Geographical Society will put its shoulder to the wheel."[97] Wild suggested that Weyprecht apply to Semenov and ask whether Russia could set up two stations as a minimum on the northern coast of the Empire, and to tell him that at first only the principal agreement of the society was expected.

In the first days of 1876, Weyprecht and Graf Hans Wilczek (1837–1922) sent their preliminary plan through the Austro-Hungarian Embassy and the Russian Ministry for Foreign Affairs to the Geographical Society.[98] The plan fixed the general tasks of the investigations and indicated the sites where observatories should be set up. As the idea of joint international investigations in polar regions did not yet meet the unanimous approval of the researchers, Weyprecht and Wilczek intended to establish in 1877 a polar station in the northern part of Novaya Zemlya (c. 76º N lat.) in order to carry out meteorological and magnetic observations there during a year. They also described the observation methods and expected results of different scientific questions. In addition, they wanted to know whether the Geographical Society wished to organise a main and a branch station in Arctic Siberia (at the mouth of the Lena River and in the New Siberian Islands) following the principles put forward in the programme.[99]

In 1876, the proposal of Weyprecht and Wilczek was sent to different Russian scholars in order to learn their positions. The plan was also discussed in the meteorological commission of the Russian Geographical Society. In February of the same year, the chairman of the meteorological commission, Wild, sent an approving letter to the council of the Society, having made only a few minor remarks on the plan. According to Wild, the Russian main station should be organised at the mouth of the Lena River and a branch in the New Siberian Islands (as it was difficult to reach there) as proposed in the letter from Weyprecht and Wilczek. Wild even compiled a budget of necessary finances.[100] On 2 April 1876, at the meeting of the Russian Geographical Society, the propositions of the mathematical, physical geographical and meteorological commissions concerning Weyprecht's plan were discussed. The

---

[97] Österreichisches Staatsarchiv, Nachlass Weyprecht, B/205:1–3, Bl. 309–309v.

[98] Semenov (1896: 692).

[99] Weyprecht K, Wilczek H von. An die hohe kaiserlich Russische Geografische Gesellschaft zu St Petersburg (Universitätsbibliothek Giessen, Handschriftenabteilung, Nachlass von Baer. Bd. 38, Bl. 60–64v; St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 71, l. 9–14).

[100] St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 71, l. 1–4.

programme of observations compiled by the commissions was approved and the mouth of the Lena was established as the place for the main Russian station.[101]

In 1878, the auditing commission of the Russian Geographical Society wanted to know at what stage the question of establishing the polar stations now was. The council of the Russian Geographical Society explained that the problem had not been solved yet as they were waiting for the approval of the observation programme and methods by all the geographical societies taking part in the international undertaking. Owing to the war in the Balkans they had as yet received no resolutions. The council also informed the auditing committee that the society would render assistance to two undertakings connected with polar investigations: the expedition of Nordenskiöld, which was to sail through the Northern Sea Route/Northeast Passage, and that of hydrographer Evstaphii Tyagin (1844–1898) who was going to Novaya Zemlya to set up a station for life saving at sea (southeast of Malye Karmakuly).

The places where observations would officially be recommended to be carried out (amongst them the Lena delta and Novaya Zemlya) were named in Hamburg in 1879 during the first meeting of the International Polar Commission (see Chap. 2 Table 2.2). In April 1880 Robert Lenz (1833–1903) (see Fig. 3.18), the Russian member of the International Polar Commission, informed Georg Neumayer (1826–1909), the chairman of the International Polar Commission, that the Russian government had provided funds for the establishment of the main station at the mouth of the Lena River and "the second branch in the New Sibirian Islands".[102] As the Russian Geographical Society had learned about Nordenskiöld's intention (who had returned from his famous trip along the coast of Eurasia on the *Vega* 1878–1880) to go on an expedition to investigate this archipelago, at the suggestion of Lenz, member of the Society, the Society decided that the branch station would be set up in the delta of the Kolyma River. As the Society did not have money to establish the station, it was decided to apply to the Siberian merchants for donations.[103] In spring 1881, Weyprecht and Wilczek agreed to Wild's proposal that the Russian station be established in Novaya Zemlya. After that, the Russian Geographical Society decided to give up the idea of setting up its main station at Kolyma and, in place of that, to establish it in Novaya Zemlya.

A special commission for the treatment of the problems associated with the establishment of Russian polar stations was founded at the Department of Physical Geography of the Russian Geographical Society on 14 May 1880. Lenz was elected the chairman of the commission.[104] Means for setting up a station in the Lena delta

---

[101] Archive of the Russian Geographical Society, f. 1–1876, op. 1, No 7, l. 23.

[102] St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 66, l. 50.

[103] St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 68, l. 39; Archive the Russian Geographial Society, f. 1–1876, op. 1, No 7, l. 194– 194 ob.

[104] Members of the commission were Osten-Sacken, Wild, Leopold von Schrenck (1826–1894), geologist Friedrich Schmidt (1832–1908), topographer Otto Stubendorff (1837–1918), astronomer August Wagner (1828–1886), meteorologist Mikhail Aleksandrovich Rykachev (1840–1919), hydrographer Ferdinand von Wrangell jun (1844–1919), meteorologist Aleksandr Ivanovich

Fig. 3.18 Robert Lenz (1833–1903)

were approved early in 1880, but for the main station in Novaya Zemlya – not before the beginning of 1882.

3.10.1 The Polar Station in the Lena Delta

In Russia it was very difficult to find people who could leave their jobs for a long period to join expeditions. The Russian Geographical Society applied to the Naval Ministry for help. In December 1880, at the recommendation of Ferdinand von Wrangell (1844–1919), Nikolai Danilovich Yurgens (1847–1898), first lieutenant of the corps of naval steersmen, was appointed for a term of 3 years "to take up the post of the head of the main polar station of Russia at the mouth of the Lena river".[105] Besides Yurgens, the leavers of the University of Dorpat, Alexander von Bunge (1851–1930), medical doctor, and Adolph Eigner (1854–?), astronomer of the same university, took part in the expedition, having been appointed on 24 May 1881. They were trained for the observations in the Chief Physical Observatory (under Wild) and the Pulkovo Observatory (under senior astronomer Wilhelm Doellen (1820–1897)).

Voeikov (1842–1916), Oberst Konstantin Vasil'evich Scharnhorst, mathematician Ferdinand Müller (1837–1900) and Nikolaj Vasil'evich Latkin (St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 66, l. 52).

[105] Archive the Russian Geographial Society, f. 1–1876, op. 1, No 7, l. 194.

The members of the expedition to the Lena delta departed from St Petersburg on 16 December 1881. To Nizhni, Novgorod Yurgens and his companions travelled by train. From there the party continued on sledge via Kazan to Perm. From Perm the journey continued by train to Yekaterinburg, from Yekaterinburg by sledge via Tyumen, Omsk, Tomsk and Krasnoyarsk to Irkutsk to complete purchases of supplies for the station.

In Irkutsk, in accordance with the resolution of the polar commission of the Russian Geographical Society Yurgens, together with the East-Siberian Department of the Society, began to look for possibilities for opening intermediate stations that synchronously with the main station in the Lena delta could perform meteorological observations in order to present a more proper picture of the temperature situations in East and South Siberia in 1882–1883. The polar commission of the Society suggested that the intermediate stations be set up at Zhigansk and Yakutsk and one between Irkutsk and Yakutsk. The Society decided to finance the observations to be performed there from the donations made by Siberian merchants for the Kolyma station. The sum had appeared to be too small (1,575 roubles) for the foundation of a station at the Kolyma. As a result of the efforts by Yurgens, who left Irkutsk for Yakutsk earlier than Eigner and Bunge, persons to perform observations in Vitimsk (Mikhail Ossipovich Olennikov) and Olekminsk (Mikhail Gerassimovich Serebryakov) – both in the Lena station – were recruited. Later, the East Siberian Department of the Russian Geographical Society succeeded in setting up observation stations in Verkholensk (with Kozhukharov, teacher of an orthodox school, later Gamkeridze, as observers), in Orlinsk[106] and Preobrazhensk. The geologist Jan Czerski (1845–1892), who had taken part in the Polish revolt in 1863–1864 and for that was exiled to Siberia, agreed to set up the last station at Nizhnaya Tungusk.[107]

Yurgens headed from Irkutsk for Yakutsk by sleigh at the end of March 1882, to make preparations for the building of the main house and observation pavilions of the station. Bunge and Eigner left Irkutsk by cart in the middle of May and made for the Lena River to sail to Yakutsk where they met up with Yurgens on 16 June. On 1 July, they continued the trip on barges towards the mouth of the Lena.[108] It was a risky undertaking. The local inhabitants never sailed on barges from Yakutsk down the river and warned that problems could emerge. The premonition proved true. On 8–10 July, the travellers were caught up in a violent storm as a result of which some of the instruments and other equipment were destroyed. Although, according to Yurgens, the trip to the mouth of the Lena passed without failures and the conditions in the observation stations were good, Lieutenant Giles B. Harber (1849–1925) and Master William H. Schuetze (?–1902), members of the Georges de Long (1844–1881) rescue expedition, who took the first reports by Yurgens to Yakutsk, told that Bunge had fallen from the roof of the barge when being on guard, and broken two ribs. To provide a better idea of what the station looked like, Schuetze drew a picture of the station for the officials in Yakutsk

---

[106] Protokoly (1882b:61—62).

[107] Protokoly (1882:117, 119–122), Deistviya (1882a:22).

[108] Bunge (1895:1–2), Barr (1985: 85).

Fig. 3.19 Sketch of the main Russian polar station at the mouth of the Lena river

(see Fig 3.19). It, together with above-information, was published in the publication of the East Siberian Department of the Russian Geographical Society.[109] All other reports on the activities of the station by Yurgens sent to the governor of the Yakutsk district[110] and the plan of the station he had compiled (see Fig. 3.20)[111] were also published in it.

The search for a suitable site for the station proved very difficult, although Georges Melville (1841–1912), a member of the de Long expedition, had given Yurgens in Yakutsk a precise map of the Lena delta he had drawn and recommended Barkin stan and the settlement of Tumatskoe as the best places to set up the station.[112] After long searches, Bunge found a suitable place at the southern tip of the island of Sagastyr' (in Russian: *sduvaet* (blow off)). On 22 August 1882, it was decided that a living house and a "pavilion" for instruments would be built there.[113] Life was quite hard at the station as the temperature in the living rooms was +4°C near the floor, while water froze on the floor. In the station there was a library and, in accordance with the order of the Governor General of East Siberia, newspapers and journals (amongst them *Dörptsche Zeitung*) were sent to the station.

Nine persons worked at the Sagastyr' station: three researchers and five assistants (Cossacks, sailors and a servant). Meteorological and magnetic observations were carried out in accordance with the revised programme confirmed during the third conference of the International Polar Commission in St Petersburg in 1881. Meteorological observations started on 31 August 1882, while magnetic observations only began on 31 October 1882, as the necessary observation instruments had been damaged by the storm breaking out during the journey. Bunge wrote

---

[109] Svedeniya (1882b:47–48).

[110] Svedeniya... (1883a, b).

[111] Svedeniya... (1883a).

[112] Svedeniya... (1882a:127).

[113] Bunge (1895:23), Barr (1985: 90).

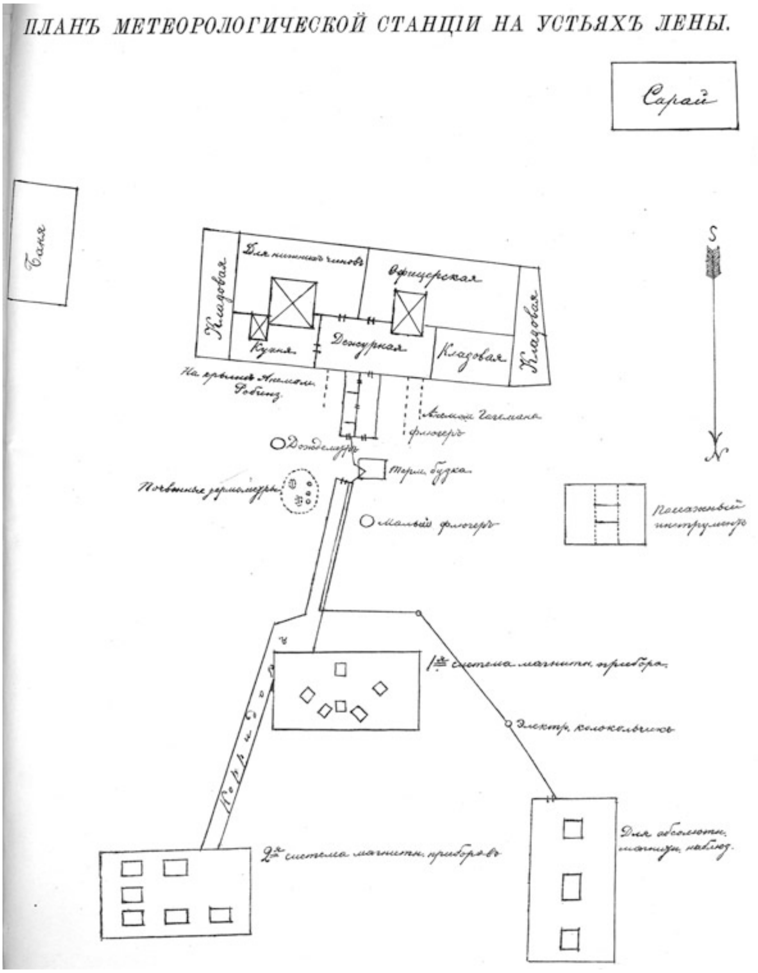


Fig. 3.20 Detailed plan of the Russian station at the mouth of the Lena river

thoroughly about the life at the Sagastyr' station: "The fact that we had to start magnetic observations a little later caused a lot of trouble to the head of the station [Yurgens]. Conscious of his responsibility, any delay distressed him deeply although, working day and night on the installation of the instruments, he could not blame himself for anything."[114] Magnetic and meteorological observations were carried out by Yurgens, Eigner and Bunge. They were assisted by two sailors sent to join the expedition. Yurgens and Eigner also went on excursions to the islands in the Lena delta and its surroundings, performed mapping and carried out astronomical observations as well as hydrological observations in the Lena River (measuring the

---

[114] Bunge (1895:23).

thickness of the ice, water temperature on the bottom and the surface of the river, water level). Different forms of aurora were observed.[115]

Bunge collected plants and compiled a paleontological collection, recorded data on the diseases of the local inhabitants and carried out ornitological observations. According to instructions from the Academy of Sciences, Bunge had to examine Cape Bykovski, where the adjunct of the Academy, Michael Adams (1780–1833), had found an almost complete mammoth skeleton in 1806. Bunge, however, discovered that the part of the bank where the mammoth had been found, did not exist any more. When the observations at the station were finished in 1884, Bunge continued the search for the remains of the mammoth. On the island of Mostakh in the mouth of the Lena, he found bones and part of the abdomen of a mammoth.[116] All the materials collected, Bunge used later in his articles published in the journals of the Academy of Sciences. The material was also used by other scientists.

At the beginning of 1883 Wild, in his consecutive circular, had asked the members of the International Polar Commission whether they could apply to their governments for permission to continue observations at the polar stations. He reminded them that not all the stations had started observations at the established time and, at the stations organised by the United States, the work was planned to be continued for three years. According to Wild, the continuation of the observations would cost less than the organisation of new expeditions. In Russia, Wild's proposal was supported both by the polar as well as by the meteorological commission of the Geographical Society. As observations were decided to be continued at both stations, the council of the Society applied to the Minister of Finance for means for urgent expenses.

However, already in March 1883 the Geographical Society knew that all the countries had refused to continue observations, and the council of the Society decided that it was no use continuing observations at the Russian stations and no need to apply for subsidy. Meanwhile, on 17 February 1883, Lenz had sent Yurgens a telegram asking whether the members of the expedition to the Lena delta agreed to continue observations for one more year. The note reached Sagastyr' on 14 April. In the letters of 28 and 29 April to the governor of the Yakutsk district Yurgens confirmed that he and his assistants, Bunge and Eigner, would gladly stay on at the island of Sagastyr', but he asked for replacements for the assistants of lower degrees because, despite all the attempts to make their work more varied, they were weary of continuing at the station. Those who wanted to leave were lower lance corporal Pushchin, lance corporal Gonyayev and Cossack Andrei Bol'shev. Sailors Dmitrii Burgkov and Vasilii Popov decided to stay. Yurgens also informed in the letter which provisions they needed in order to continue observations for another year.[117]

While Yurgens was writing a letter to St Petersburg, Lenz in St Petersburg was wondering how to inform the Sagastyr' station that the council of the Russian

---

[115] Svedeniya. . . (1884b), Bunge (1895:16–23).

[116] Svedeniya. . . (1884b), Bunge (1895:34).

[117] Svedeniya (1883b:19–20).

Geographical Society had decided to stop observations at the station. On 30 April he posted this message to Yurgens. On 22 August 1883 the deputy governor of Yakutsk visited the station and brought provisions for the coming winter. With him were the three persons to exchange for those who wanted to leave. From Lenz' letter Yurgens learned that at other polar stations official observations would not to be carried out during the whole year. However, it was impossible to leave Sagastyr' as the deputy governor's boat sank the day after his arrival. In addition, the flood made sailing along the Lena River impossible. They had to wait until the Lena would be covered with ice. The deputy governor left Sagastyr' only at the end of October, accompanied by Bunge, who now had a new appointment and was to travel to the New Siberian Islands, and the men who wished to depart from the station. In this way, Yurgens partly obeyed the Society's order to liquidate the station. In his letter of 28 October 1883 to the governor of Yakutsk, Yurgens announced that observations in the Lena delta would be continued as he had not got money for closing down the station and, as a matter of fact, they could not abandon the station because of the scanty number of dog-sledges, and thus the last expedition group (the expedition was divided into groups) would not be able to leave before April 1884.[118] In addition to three new Cossacks (Shakurdin, Popov, Kuryakin), Yurgens, Eigner and the servant Sysygin stayed at the station.

Bunge received the mail at Bulun. As he had been entitled by Yurgens to read his mail, he opened the letter from the Russian Geographical Society that delegated the decision of whether to continue or finish the work at the station to Yurgens. Bunge, being convinced that Yurgens would continue observations, decided to return to the station. He informed the Geographical Society of his decision. As a matter of fact, in November, it was almost impossible to leave the station. Besides, they had not enough money for travelling and they were short of warm clothes and dog-sledges.[119] So they stayed in Sagastyr' for another winter. At the end of 1883, the council of the Russian Geographical Society applied to Alexander III for additional means to maintain the station in 1884. In January 1884, the finances for covering the expenses were given to the Society. The observations on the island of Sagastyr' were finished at the end of March. In addition to meteorological observations, they had continued astronomical observations (the first of their kind in the whole of East Siberia) and the delta area of the Lena up to the river Olenek was mapped. As transport for carrying large loads was missing, the members of the expedition abandoned Sagastyr' in several groups: Eigner left in May, Yurgens at the beginning of July and Bunge as late as autumn as the St Petersburg Academy of Sciences had asked him to study the places where the remains of mammoths had been found in the Lena delta.

The expedition members arrived at Yakutsk on 30 August 1884 and in the East Siberian department of the Russian Geographical Society, Yurgens was welcomed on 22 October. He reached St Petersburg in May 1885 and presented in the Russian Geographical Society a longer report on the results of the expedition that aroused

---

[118] Svedeniya... (1884a:34)

[119] Svedeniya... (1884:33–35)

great interest.[120] All in all, 14,493 roubles and 3 kopecks were given to the expedition to Sagastyr' during the two years. The expedition cost 6,525 roubles and 81 kopecks. Of the remaining 7,967 roubles and 22 kopecks, the East Siberian department of the Russian Geographical Society decided to give to Yurgens 5,000 roubles and 1,500 roubles to Bunge when he would reach Irkutsk. With regard to the remaining money, instructions were waited from St Petersburg.[121]

For the contribution to the organisation of the polar station on the island of Sagastyr', the Russian Geographical Society awarded Yurgens the highest prize of the Society: the Konstantin gold medal, already in 1885. The report on the results of his activities was written by Lenz. On the initiative of the Geographical Society and in accordance with the application of the Naval Ministry, Yurgens was awarded the order of St Vladimir of the 4th rank the next year and was granted a pension for life to the amount of 400 roubles per year. Eigner's contribution was acknowledged by giving him a life pension of 300 roubles per year and by awarding him a small gold medal of the Geographical Society.[122]

3.10.2 The Polar Station in Novaya Zemlya

In spring 1881, it became evident that the Austrian station would be founded on the island of Jan Mayen. After that, the Russian Geographical Society decided to set up a station in Novaya Zemlya if the necessary finances would be given.[123] The funds, 20,000 rubles, from Alexander III were given only on 15 March 1882.[124] In accordance with the application of the polar commission of the Russian Geographical Society, the Naval Ministry appointed on 6 March Lieutenant Konstantin Petrovich Andreev (1853–1919), hydrographer, as head of the station in Novaya Zemlya. Owing to his enthusiastic activities, the whole team of the station in Novaya Zemlya was recruited in 2 months. Also at his initiative, as assistants there were appointed midshipman Dmitrii Aleksandrovich Volodkovskiy, military surgeon Leonid Francevich Grinevetskii and a former student of the St Petersburg University, Nikolai Vasil'evich Krivosheya, in April 1882.[125] The Naval Ministry also included four seamen, Anatoli Larionov, Nikolai Demidov, Yakov Trofimov and Fedor Tiskov in the expedition team.[126] The Society for Life Saving at Sea offered a house for the station and a building at Malye Karmakuly on the south-western coast of the southern island of Novaya Zemlya.[127]

---

[120] Yürgens (1885)

[121] Protokoly (1885:76)

[122] Archive the Russian geographical society, f. 1–1876, op. 1, No 7, l. 146 ob.

[123] St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 68, l. 43.

[124] Deistviya... (1882:35, 45).

[125] Archive the Russian geographical society, f. 1-1876, op. 1, No 7, l. 152.

[126] Deistviya (1882:45–46), Andreev, 1891: III; Barr 1985:111

[127] Deistviya (1882a:31–32)

Owing to the eager activities of Andreev, all the necessary preparations for the expedition were managed during the four months that had remained until the departure. Wild was busy teaching the expedition leader and the first assistant to be able to carry out magnetic observations. For astronomical observations, they trained at the Pulkovo Observatory in St Petersburg.[128]

The members of the Novaya Zemlya expedition gathered in Arkhangelsk in June 1882. Grinevetskii and Krivosheya, laden with meteorological instruments and other necessary supplies, travelled from St Petersburg on 19 May 1882 to Arkhangelsk on board the *Chizhov* sailing around Scandinavia. Andreev and Volodkovskiy, having with them magnetic instruments and chronographs, went from St Petersburg on 6 June 1882 to Vologda by train, from there sailing on along the river Severnaya Dvina.[129] In Arkhangelsk all necessary supplies such as warm clothes, flour, petrol and timber for building the instrument pavilions were provided and cattle were bought under the guidance of the governor. From Arkhangelsk the expedition continued by sea on the *Chizhov* and reached the Bay of Malye-Karmakuly on 16 August 1882 (see Fig. 3.21).[130]

Meteorological observations performed according to the international programme started in Malye Karmakuly on 12 September and magnetic observations on 12 October 1882. Besides these, astronomical observations were carried out, the

Fig. 3.21 The Bay of Malye-Karmakuly

---

[128] Andreev (1891:II).

[129] Smirnov (2007:134).

[130] [Andreev] (1891:VI; Barr 1985:113).

altitudes of some points were determined, changes in the sea level were measured and plant, animal and mineral collections were compiled. It was mainly Krivosheya who compiled the collections that later were put at the disposal of the Russian Geographical Society and aroused great interest. Grineveckii and the Samoyed Prokopi Vylke were the first to cross Novaya Zemlya on foot from the west to the east in April 1883.[131] Victor von Fuss (1839–?), astronomer of the marine observatory of Kronshtadt, who the marine administration had specially sent for a short-time mission to Novaya Zemlya, determined the exact coordinates of Malye Karmakuly.[132] For these achievements the three above-mentioned were awarded the silver medal of the Russian Geographical Society on 30 November 1883; Vylke was given the bronze medal.[133]

The expedition had at their disposal two houses. One became the residence of the head of the station and his assistants (each person had a single room); in the other house, the sailors of the lower service degree lived. The wintering in Novaya Zemlya turned out to be fatiguing. Because of the severe frost and winds, it was sometimes difficult to reach the observatory. Due to this, very soon the members of the expedition began to fall ill, one of the seamen accidentally committed suicide (he deliberately tried to have his leg frostbitten to get permission to go home, but he died from the cold), midshipman Volodkovskiy left for home shortly before the end of the expedition because of "poor health condition".[134]

Activities in the station on Novaya Zemlya were finished on 12 September 1883 and the members of the expedition returned to Arkhangelsk and from there to St Petersburg. Observations could be continued neither at the station of Malye Karmakuly nor on the island of Sagastyr' because of the absence of necessary means. After the end of the expedition, the missions of Andreev and Volodkovskiy were prolonged for half a year by the Naval Ministry at the request of the Geographical Society so that they could finish the analysis of the results obtained in the Novaya Zemlya station.[135]

At the beginning of his publication on the history of the expedition, the leader Andreev wrote as follows: "The decision [to set up the station in Novaya Zemlya] was made rather late; too little time remained for providing everything necessary for the expedition, for the preparations and training of the members of the expedition for research work that several of them knew very little about. Such haste and other circumstances were not favourable for the results of the expedition which, undoubtedly, would have had a considerably higher scientific value if the preparations should have been carried out as thoroughly as the preparations of the expedition to the mouth of the Lena River." [136] The total amount of money spent on the expedition to Novaya

---

[131] Grineveckii (1883).

[132] [Andreev] (1891), V; Deistviya... (1885:95–96).

[133] Deistviya... (1885:95–96).

[134] [Andreev] (1891:XIV).

[135] Deistviya... (1884:68).

[136] [Andreev] (1891:I).

Zemlya was 23,484 roubles and 89 kopecks: 3,469 roubles and 89 kopecks more than had been delivered from the state treasury for the expedition.[137]

On the initiative of the Geographical Society, Andreev was awarded the order of St Anna of the 4th class for his services for the expedition. Volodkovskiy and Grineveckii were awarded the order of St Anna of the 3rd class. In 1883 observations were finished in most of the polar stations (except the stations on the island of Sagastyr', in Sodankylä (Finland) and Lady Franklin Bay). In Russia, at the initiative of Wild, in addition to the stations mentioned, observations were also carried out in the geophysical observatories at Pavlovsk, Tiflis, Yekaterinburg, Nerchinsk, Tashkent and in the observatory of the Mezhevo Institute in Moscow.[138] Also, temporary meteorological stations were set up in Siberia: in the village of Preobrazhensk at Nizhni Tungusk, at Obdorsk (not far from the river Ob), at Mezen, Vitimsk, Verkholensk, Olekminsk, Kirensk, Nokthuisk, Verkhoiansk and Yakutsk.[139] Meteorological observations were also carried out in several smaller stations in Finland.

In Russia, the results of the magnetic observations in Novaya Zemlya were published in 1886[140] and meteorological observations in 1891.[141] In 1886, the first edition of the results of the meteorological observations in the mouth of the Lena in 1882–1883 was published, while the second edition, including the results of the observations in 1883–1884, was published in 1887.[142]

For several reasons, the processing of the results of magnetic and astronomical observations was delayed. That is why the volumes of the publications including the data on magnetic observations in these stations were published only in the 1990s of the nineteenth century.[143]

Acknowledgment This section on the Russian Polar Stations was written with the support of grant No. 7381 of the Estonian Science Foundation and grant No. SF0180049s09 of the Ministry of Education and Science in Estonia.

3.11 The Swedish Expedition to Svalbard

Susan Barr

It was not until 1755 that Sweden entered into Arctic activities when the *Greenland Company*, the Swedish whaling society in Göteborg, sent a ship north for the first time.[144] On a voyage to Svalbard in 1758 a naturalist, Anton Rolandson Martin

---

[137] Deistviya. . . (1884:68).

[138] Paseckii (1978:200).

[139] St Petersburg: Department of the Archives of the Academy of Sciences of Russia, f. 210, op. 2, No 71, l. 130–136.

[140] Lenz (1886a).

[141] Lenz (1891).

[142] Lenz (1886b, 1887).

[143] Lenz (1891), Tillo (1895).

[144] Information in the first section is from Liljequist (1993).

(1729–1786), was invited by the Company to take part and he thus became “the first Swedish polar scientist”.[145] However, 79 years were to pass before the next Swedish scientist visited the Arctic. This was zoologist Sven Lovén (1809–1895) in 1837 who only visited Svalbard once, but whose continued interest in the Arctic was a decisive factor in the start, in 1858, of a long and impressive Swedish Arctic expedition period. Otto Martin Torell (1828–1900) has, however, been called “the father of Swedish polar exploration” with his orientation towards systematic scientific studies of the Arctic[146] which he initiated in the late 1850s. For his first reconnaissance expedition to Svalbard, Torell was accompanied by amongst others the Finnish-Swedish scientist Adolf Erik Nordenskiöld (1832–1901), who was to become perhaps the most famous of the Swedish scientists of this period. Amongst his accomplishments was the first navigation of the Northeast Passage in 1878–1879, but Nordenskiõld also carried out considerable scientific work in both Svalbard and Greenland. In 1872–1873 he led a wintering expedition to Mosselbukta on the north coast of Spitsbergen. A strong and relatively large house was erected there and geophysical observations were carried out throughout the stay. Also, in 1872 Nordenskiöld was amongst the shareholders of a company, which was to establish a settlement at Kapp Thordsen on Spitsbergen to extract the local phosphorite for use as fertiliser. A two-storey house was erected 700 m inland from Isfjorden with a trolley rail to the shore. Nothing came of the planned wintering, however, as it became obvious that the enterprise was not economically viable. A considerable amount of equipment and provisions were left in the house and these should have saved the lives of 17 Norwegians whose ships were trapped in the ice later that summer, forcing them to winter in Svalbard. All 17 died in the course of the winter, however, with lead poisoning from the food tins seeming to have been the main cause. The house, which later became known as Svenskhuset (The Swedish House) was to serve the Swedish IPY expedition well a decade later.

When Karl Weyprecht launched his conviction at the Meeting of German Natural Scientists at Graz in 1875 that it was more important during a scientific expedition to pursue the science rather than the discovery of new bays and islands, he received an irritated answer from Adolf Erik Nordenskiöld. The latter wrote in a footnote to his expedition report the same year that:

> During the first general assembly of the 48th meeting of German Natural Scientists and Physicians, the famous German Polar Explorer Lieutenant Weyprecht has declared his conviction that the scientific results, which have been yielded by all the polar expeditions that have been dispatched until now, have not corresponded to the costs which have been spent upon them – because specialists have not taken part in these expeditions – and Herr Weyprecht’s statement seems to have gained great approval from many learned geographers with claims to literary and expert knowledge. One might, though, have expected that these Gentlemen should have been familiar enough with the arctic literature to know that the expeditions which have been dispatched from Sweden have always brought with them a

---

[145] Liljequist (1993:13).

[146] Liljequist (1993:22).

> scientific staff of specialists, by whom the physical features of Spitsbergen have been investigated in a manner which makes this distant ice-covered land one of the best known on Earth . . ..[147]

Being an Arctic research nation at this time, Sweden was naturally included amongst the representatives of eight nations who met at the special international congress in Hamburg in October 1879 to discuss the planned Polar Year. The Swedish representative in the International Polar Year Commission was Professor August Wijkander (1849–1913), astronomer and physicist who had participated in Nordenskiöld's wintering expedition 1872–1873 in the north of Svalbard. Despite backing for Swedish participation in the Polar Year from the scientific community, the Royal Swedish Academy of Science applied in vain to the government for funding for the Polar Year. The money actually came from a Stockholm industrialist who presented the required sum the following year, while a large number of other doners gave everything from soap and books to iron stoves and, not least, 1500 large bottles of beer and 14 cases of pressed yeast preserved in ice. The official Sweden contributed, however, with naval transport of the expedition to and from Svalbard, with a number of guns and scientific instruments and with some of the non-scientific staff. The Royal Academy established an organising committee which included Nordenskiöld, the expedition sponsor, Professor Erik Edlund (1819–1888): physicist who organised in 1858 the Swedish network of meteorological stations, Professor Robert Rubensson (1829–1902): head of the Central Meteorological Office in Sweden and Professor Daniel Georg Lindhagen (1819–1906) who was secretary to the Royal Academy.

It was natural for Sweden to establish their IPY base in Svalbard, given their extensive scientific involvement in the archipelago already. Head of the Nautical Meteorological Bureau in Stockholm, Captain F. Malmberg was to lead the expedition, but he fell ill in 1881 and was replaced by Nils Gustaf Ekholm (1848–1923) who had already been chosen to participate. He was in charge of the meteorological and astronomical observations. The other scientists were as follows[148]:

- Vilhelm Carlheim-Gyllenskiöld (1859–1934): expedition photographer and in charge of the aurora observations and other optical observations,
- Richard Henrik Albert Gyllencreutz (1850–1914): doctor,
- Emil Otto Solander (1858–1933): in charge of the geomagnetic observations,
- Henrik Allan Stjernspetz (1850–1920): Swedish army lieutenant in charge of the topographical research,
- Salomon August Andrée (1854–1897): civil engineer in charge of technical matters and the atmospheric electricity observations. Andrée was to become notorious for his fatal attempt to reach the North Pole by balloon from Svalbard in 1897.

---

[147] Quoted in Liljequist (1993:174).

[148] Information in the following section from Barr (1983).

Six assistants were also included in the group and were:

- Ole Ingebregtsen Kulseth: Norwegian hunter, carpenter and mason in charge of the other assistants,
- Carl Jonsson Ljungström (1845–193?): boatswain in the Swedish navy, in charge of the kitchen and provisions,
- Peder Ulrik Johnsen: Norwegian hunter, sail maker,
- Otto Julius Sundberg (1875–?): weapon smith from the Swedish navy,
- Nils Conrad Andersson: carpenter and glazier,
- Oluf Leonard Olsen: Norwegian sailor, cook.

The division into the two groups "scientists" and "workers" was very clear and is obvious throughout the final report of the expedition.[149]

The plan was for the expedition to have its base in Mosselbukta on the north coast of Spitsbergen, in the house that Nordenskiöld had erected in 1872. However, ice conditions along the north coast prevented the naval ships *Urd* and *Verdande* from reaching the spot and they turned south again to Isfjorden and the house erected there the same year – Svenskhuset.

The expedition was to stay at Kapp Thordsen from 21 July 1882 to 25 August 1883. Their only neighbours were the graves of the 17 Norwegians who had died in the house during the winter 10 years previously: one double grave and one large common grave.

Fig. 3.22 The Swedish scientists in their "garden" at Kapp Thordsen (Ekholm 1887)

---

[149] Ekholm (1887).

The materials left from the phosphorite attempt in 1872 were of good use to the IPY expedition as Salomon Andrée planned and supervised several modifications to the site. The cable lift and trolley rail, which had been erected to lift materials up the c. 30 m high bank from the shore and over the tundra to the site, was extended towards the house. During the autumn the loft room was converted into a sleeping room for the assistants and connected to the kitchen by an interior staircase instead of only the exterior stairs. A larger room with porch was added on the south side of the house and several outbuildings were erected including a gunpowder store shed, thermometer screen, a hut for the geomagnetic observations, a small astronomic observatory, a pigsty and a "chicken house" for the pigeons.

The expedition had expected to place their scientific instruments on special pillars left behind by Nordenskiöld's expedition in Mosselbukta, where the ground in addition was firm and hard and ideal for the geomagnetic observatory. At Kapp Thordsen the ground was c. 2 m of moss-covered clay mixed with frozen water. This mass thawed in the foundation holes for the pillars as they were gradually dug. This irritating fact was solved by knocking together boxes of tarred planks, which were sunk in the holes to support the thawing earth and then erecting the brick pillars on the boxes. It was engineer Andrée's idea to place the wind vane and recorder on the hilltop behind the site with an electric cable connecting it to the house for easy reading at the fixed times. Others of the instruments were not finally positioned until the beginning of January.

The rhythm of the days was to a great extent decided by the fixed times for observations, with the day for the scientists divided into 6 hours watches. Otherwise both scientists and assistants were kept busy for the first 3 months with the various building tasks both in- and outside the house. At the end of November the combined smithy and sauna building was finished and from then on all the men took a weekly sauna and also attended to regular washing of clothes, bedclothes and the rooms in the house. The expedition report shows that there was little chance to lapse into any long-lasting periods of boredom; in addition to the observations and other work, a large library had been brought along and otherwise hunting, walking, cards, billiards and drawing could pass the time. In addition, all kinds of occasions were celebrated with parties and banquets were frequent. The doctor, Gyllencreutz, was proud of the health of the men throughout the year, which he ascribed to the quality of the provisions in addition to the hygiene routines and the constant occupation with both work and leisure activities. Even during the winter darkness only two assistants, including one from the north of Norway (!), had any negative effects.

The food was varied and plentiful. The expedition had brought large amounts of preserved and dried food with them, but also pigs and three reindeer with calves, which were all slaughtered during the course of the year. Hunting brought them geese and ptarmigan, and more than 600 eggs were collected in the spring. The men saw only one polar bear during the year and did not manage to shoot it. Bread was baked once a week and alcohol was served regularly. To protect them from scurvy, even though the cause was not yet known, they had potash salt (similar to baking soda), juice, marmalade, jam, lime juice, cloudberries, bilberries and preserved fruit. No signs of scurvy appeared at all.

The expedition also brought with them from Sweden various seeds and earth samples to see what they could grow. Cress and radishes were sown indoors during the winter in the earth they had brought. The cress was a success, but the radishes did not grow until the light came back in the spring. Potatoes were planted in a barrel of Swedish earth, and although the plants flowered, new potatoes never developed. A garden was made in the sunniest corner outside the house and various seeds such as dill, cress, clover and radishes were sown without great success, but the garden functioned as a cosy outdoor place to sit when the weather permitted. Altogether the Swedish expedition was one of the most comfortable and successful of the various IPY expeditions.

During IPY-3, the IGY, the Swedish expedition to Svalbard carried out some comparative measurements at Kapp Thordsen in order to tie the 1882–1883 results to the 1957–1958 ones.

3.12 USA – The American Expeditions

Susan Barr

Two American expeditions were organised and run for the IPY-1: one at Barrow, Alaska near the northernmost point of the United States, and one at Lady Franklin Bay in the northeast of Ellesmere Island, now Canadian territory. The latter is decidedly the IPY expedition that has gained most publicity owing to the terrible fate of its members. Both expeditions ran for two complete years (September 1881–August 1883), and both produced excellent scientific records. While the Barrow station was situated at an Eskimo settlement and the stay there was fairly mundane for the scientists, Lady Franklin Bay was a remote high-Arctic situation that was deadly dependent on reasonable ice conditions for transport in and out.

3.12.1 Lady Franklin Bay, Canada

In the mid-1870s Captain Henry W. Howgate (1834–1901) of the US Army had conceived a plan to establish a scientific and commercial station at Lady Franklin Bay. In 1877 he sent a ship to Cumberland Sound to recruit Inuit families to move to the site.[150] So far the plans were successful, but when the shipload of "colonists" arrived at Disko in spring 1878, the skipper learned that the scheme had collapsed back home. Howgate continued working on his idea, however, and was able on 1 May 1880 to have an Act of Congress passed which designated Lady Franklin Bay as the site for a temporary scientific station which would be operated by the US Signal Service. Howgate's steamer *Gulnare* was to be the expedition ship and Lieutenant Adolphus Greely (1844–1935) was chosen as leader with Dr. Octave

---

[150] Information mainly from Barr (2008).

Pavy (1844–1884) as surgeon. Greely declined to take command of the expedition when the Navy Department refused to accept *Gulnare* as a suitable ship, but in spring 1880 Pavy and the other expedition members proceeded with the *Gulnare* to Disko, where it was damaged and the expedition was disbanded. Dr. Pavy, however, remained in Greenland to carry out various studies.

In September 1880 Dr. Wild, the president of the International Polar Commission, wrote to the US chief signal officer, General W.B. Hazen, to ask whether the United States would fill in the gaps in the planned IPY circle of Arctic stations at Point Barrow and “some point in the Archipelago of North America”.[151] Hazen agreed to the two stations, and it was natural that the “some point” became Lady Franklin Bay since this was already authorised by Congress. William Barr mentions an additional important point for the siting of the station, which was that a previous expedition had wintered close by and collected meteorological and magnetic data, giving an excellent basis for a new series. This was Captain George Nares’ expedition in 1875–1876 when Captain Henry Stephenson and the *Discovery* with crew wintered in Discovery Harbour, 200 m from the site-to-be of the IPY station, while Nares and the *Alert* with crew wintered at Floeberg Beach further north. During the winterings the area had been thoroughly explored and documented.

Greely was again assigned to lead the expedition, but bureaucratic delays left him with only 72 hours in which to submit a detailed requisition for food, clothing and other supplies for two years. Making up the expedition crew were two other officers, 21 enlisted men, a doctor (Dr. Pavy again) and two Inuit hunters. Two of the enlisted men had specifically joined the Army in order to take part in the expedition: Sergeant Edward Israel was an astronomer and Sergeant George Rice a photographer. The steamer *Proteus* was chosen to transport the expedition, manned by Captain Richard Pike and a crew of Newfoundland sealers. The final instructions that Greely received from the Signal Office were extremely detailed with regard to, amongst other matters, transport to and from the Lady Franklin Bay area and how and where caches with depots and messages were to be established. This was to prove fatal for the ultimate fate of Greely’s men. A supply ship was planned to visit the station in the summer of 1882. In case of ice hindrance, the places where the supplies would be cached were named. If the relief vessel could not reach the station in 1883, then Greely’s party was to start to make its own way south by boat in order to meet up with the vessel or, alternatively, to get to the depot on Littleton Island. As William Barr points out, Greely’s hands were tied in particular by the instructions that the station should be evacuated no later than 1 September 1883 and that his route south was specified in that he was to follow the Ellesmere Island coast and not the Greenland side. On the latter coast he most probably would have been able to meet up with local Inuit who could have helped the group.

In addition to transport details, the instructions also specified that the expedition was to attend to a much broader programme than only the geophysical observations and measurements of the IPY programme. The men were to explore and chart the

---

[151] Greely (1886a) quoted in Barr (2008:12).

coastlines in the area and to make accurate measurements of the positions of geographical features such as cliffs and islands. They were also charged with collecting specimens of fauna, flora and minerals on behalf of the US Government. Greely's own detailed account of the expedition[152] – although obviously he would wish to exonerate himself as much as possible – tells a credible tale of military bungling, lack of adequate funds and late decisions by superiors that gave an unnecessarily trying start for an expedition going to perhaps the most extreme of the IPY station sites.

The *Proteus* left Newfoundland on 7 July 1881 and arrived at Godhavn (Qeqertarsuaq), Greenland on the 16th, where 12 dogs, dog food and sealskins were bought. Leftovers from Howgate's 1880 expedition were taken aboard, consisting of 11/2 tonnes of pemmican and a house, and the surgeon Pavy, who had spent the winter at nearby Ritenbenk (Agpat), arrived to join the ship. On the 21st the *Proteus* continued on to Ritenbenk to pick up more dogs and supplies that Pavy had collected there, and where they were also joined by Henry Clay who had been a member of the Howgate expedition and had wintered with Pavy. Skin clothing was purchased at Prøven, where the two Greenlanders Jens Edward and Thorlip Frederik Christiansen were also hired with all their hunting equipment. In Upernavik more dogs and dog equipment were purchased, but some of these last 10 dogs were diseased, ultimately leading to the death of two-thirds of the expedition's total number of dogs.

The *Proteus* crossed Melville Bay in record time and proceeded northwards, stopping to investigate for cairns and depots left in connection with the Nares expedition. No Greenlanders were seen along the coast, not even in the Etah area, and this was to have a negative bearing on the retreat south in 1883. The ship reached all the way to the southern entrance to Lady Franklin Bay on 4 August, before being stopped by the ice (Fig. 3.23).

Unfortunately these favourable ice conditions were not to be repeated the following two years. The final site for the station was decided on 12 August and the house, Fort Conger – named after Senator and expedition supporter Omar D. Conger (1818–1898) – was erected. This prefabricated board hut measured 18.5 m × 5.2 m, was double-walled and insulated with tarred paper. It was divided into three rooms, with the traditional military division into one room for officers and one for the men. Various additions and refinements were made during the stay and the area around seemed to be flush with game. The *Proteus* finally left on 26 August, after some trouble with the ice at the same spot as before. Greely sent a detailed note with the ship stating what they needed to be sent with a relief vessel the following summer and where the supplies were to be left in the event that ice prevented the vessel from reaching Fort Conger. Three of the expedition members, including Clay, were sent back with the *Proteus*.

The relief vessel was in fact unable to reach Fort Conger the following year. The men had spent a successful year both with their scientific programme and with extensive exploration sledging trips across a wide area both in northeast Ellesmere

---

[152] Greely (1886a).

Fig. 3.23 View towards Lady Franklin Bay. Photo Susan Barr

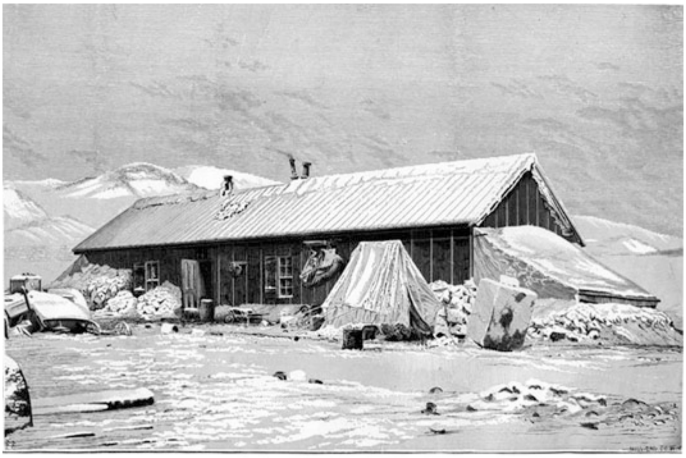
Island and across to the Greenland coast. Lake Hazen (named after the chief signal officer) was one of the expedition's geographical discoveries – "one of the most impressive features of the Canadian High Arctic".[153] A large amount of musk ox meat helped to prevent scurvy and health was generally good, despite a few accidents and some winter depression. The lowest temperature recorded that winter was –52.3°C. In May 1882, Ltn Lockwood led a small party which explored the northwestern coast of Greenland, reaching Lockwood Island on the 13th at 83°23.8′ N and thus passing the record of 83°20′26" N set by A.H. Markham during Nares' expedition. Lockwood's sledge trip covered an impressive 1,700 km.

By the time the IPY scientific programme actually started on 1 July 1882, the expedition was well into its routines, both around the station and far afield. The fact that the relief ship did not appear in August was a great disappointment and a puzzle, since there was more than enough open water visible in the station vicinity and as far south as Kennedy Channel. However, just south of here the ice was thick in the Kane Basin and the relief ship *Neptune* was unable to push through. Some supplies were left in depots, but the majority was taken back home in line with rather inexplicable instructions that the captain had been given. The men at Fort Conger were in no danger thus far – they still had adequate supplies, although some foodstuffs were rationed. The second winter was in some ways better, as experience from the first winter led to improvements to the hut (Fig. 3.24).

In spring 1883, preparations were started for a retreat south in case the relief ship did not reach them this summer either. At the same time Greely and Pavy fell out over the botanical collection the doctor had been ordered to compile as expedition naturalist. Greely found it to be exceedingly poor and ordered Lockwood to take over as naturalist. On 20 July Pavy's contract with the expedition expired

---

[153] Barr (2008:31).



Our House at Conger (West Side), March, 1882.
(From a photograph.)

Fig. 3.24 The expedition hut Fort Conger in March 1882 (Greely 1886b)

and he refused to renew it or turn over his diary for the expedition final report. He was placed “under arrest”, although he continued to give medical advice whenever called for.[154] Greely’s instructions stated that the station must be abandoned by 1 September. The 25 men started south on 9 August with their launch towing four smaller boats. They had with them provisions for 40 days and would pick up enough for 20 days more from two depots.

Meanwhile at the end of June two ships, the *Proteus* and the *Yantic*, had been despatched north to relieve Greely’s expedition. Again the instructions were so detailed that personal initiatives that might arise out of on-the-spot appraisal of the conditions were rendered more or less impossible. *Proteus* reached a position north of Pim Island, but got nipped by the ice there and sank. A depot of clothing and provisions was left on the north coast of Pim Island before the crew of the *Proteus* retreated across to the Greenland coast in the whaleboats they had saved. A mixture of confusion, inadequate instructions and unfortunate circumstances resulted in the *Yantic* and the men from the *Proteus* working their way back and forth for some time without accomplishing depot-laying of provisions or messages which would be of any particular use to Greely’s party as they made their way south and during their stay on Pim Island. The relief expeditions returned home, where it was decided after some discussion that nothing more could be done that year.

Greely’s boats struggled for 6 weeks through ice, fog and bad weather. At Cape Hawks the expected depot from the relief ships was not to be found and soon afterwards the boats were iced in and drifted slowly southwards with the pack. On 10 September the men made a strike for the shore, hauling a boat and supplies on

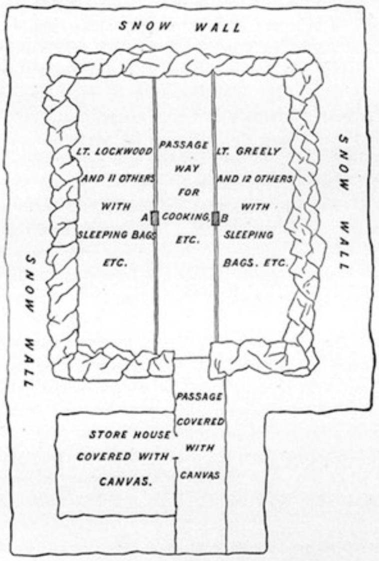
---

[154] A relatively personal article exhonerating Pavy is to be found in Pavy (1886).

sledges. It was 19 days later before they finally made the coast of Ellesmere Island having been forced by gales and ice drift backwards and forwards between the Ellesmere and Greenland coasts. They landed at Eskimo Point, a little south of Pim Island, but moved north to the vicinity of Cape Sabine on Pim Island where they knew a depot should be and where they found the disappointingly small depot left by the crew of the doomed *Proteus*. Greely and his men were still in good health and still had some hope that a ship would reach them before the winter set in. They constructed a rock hut roofed with the whaleboat and canvas and called it Camp Clay after Senator Clay. Later it became known as Camp Starvation. Rations were seriously limited, and the hope was to get through the winter until March when they would try to cross to Littleton Island, where there should have been a wintering relief expedition or a larger depot waiting (Fig. 3.25).

The winter turned out to be horrific and deadly. Scurvy appeared and the first man died on 18 January 1884. An attempt was made to send two men to Littleton Island, but they could not get across an open lead. Others were sent out to try to find depots, and returned exhausted and frozen. A young polar bear shot on 11 April and tiny crustaceans caught in a net in a tide crack were the only fresh additions to the rations. One man was shot for stealing food. Towards the end of May the few

APPENDIX No. 107.—*Plan of winter quarters at Camp Clay.*



Stone hut about 25′ × 17′. Wall 3½ feet high. Boat extended from one end of wall to the other, and allowed one to stand up between thwarts, in passage way. Oars inserted in holes cut in gunwale and ends resting on side walls allowed house to be covered with canvas, which was also partly supported by interwoven ropes. A and B, upright supports to boat: on A, lamp for light and melting ice; on B, barometer. Cooking done in center of passage. Twelve men had space 6′ × 2′ 1″ for sleeping and living quarters; thirteen, owing to Elison's condition, had only 1′ 10″ × 6′ for sleeping and living quarters.

Fig. 3.25 Plan of the Camp Clay/Camp Starvation hut on Pim Island (Greely 1886b) men left alive moved to a tent on slightly higher ground as the floor of their hut was sodden from melting snow. On 22 June only Greely, Brainard, Long, Elison (who had solidly frozen both hands and feet on a depot trip in early November), and three others were still more or less alive. This date happened to be Pavy's birthday, but he had died 16 days previously.[155]

A large apparatus had finally been set in motion to rescue Greely's group, including Nares' ship *Alert*, sent by the British Admiralty, Scottish whalers, the *Bear* – sister ship to the *Proteus* – and several other ships. Searches were made at all places along the Greenland coast where it had originally been agreed that depots would be left and that Greely's expedition should attempt to reach. Cape Sabine was not considered to be relevant since it was known that the depot there was far too small for a wintering party. It was therefore more or less by chance that Greely heard a ship's whistle and sent Brainard and Long to check. Long was spotted on the shore and soon the pitiful tent with the other six survivors was found. They and 12 bodies that were buried or lying nearby were taken to the ship and it was discovered that flesh had been cut from six of the bodies. The suspicions of cannibalism were horrifying. Elison, who had survived with frozen hands and feet through the entire winter, died on the ship home when the surgeons had no choice but to amputate his feet. Greely thus returned with only five of the original 24 who had spent the two years with him at Lady Franklin Bay (Fig. 3.26).

Fig. 3.26 Memorial to the expedition at Pim Island. Photo Susan Barr

---

[155] Pavy (1886).

No other IPY expedition can match Greely's for its sufferings and deaths. At the same time the expedition saved all its records from the two years in northeast Ellesmere Island. In addition they gained a furthest-north record, discovered the largest lake in the High Arctic and mapped a considerable area of both Ellesmere Island and the northwest coast of Greenland. William Barr points to the existence of a large polynya – North Water Polynya – that lies between Pim Island to the west and Littleton Island to the east which prevented Greely's group from crossing. He maintains that if Greely had taken two Greenlanders from the Etah area with him instead of from Prøven, they would have known of this and known to cross further north.[156] Greely at least went on to become one of the Grand Old Men of the American polar scene, and indeed he was the one who described Norwegian Fridtjof Nansen's plan to drift over the Arctic Ocean with the *Fram* in 1893 as an "illogical scheme of self-destruction".[157]

3.12.2 Point Barrow, Alaska

In contrast to the expedition to Ellesmere Island, the American expedition to Barrow, Alaska was fairly mundane.[158] Again it was the chief signal officer, US Army who sent out the expedition, and again it functioned for two full years: 1881–1883. Ltn P. Henry Ray (1842–1911) was appointed leader and with him were six others from the Army and Signal Corps and three helpers: a carpenter, a cook and a workman. The station was to be sited as close to Point Barrow as practicable – the Point being the northernmost point of the United States – and was to be kept open until 1884. Flora, fauna, mineral and ethnographical collections were to be made, in addition to the scientific programme. Supply vessels were to be sent to Barrow each summer.

The expedition left San Francisco on 18 July 1881 and reached Point Barrow on 8 September, the voyage having included a stopover of a few days in Chukotka on the west side of the Bering Strait. The station could not be erected on Point Barrow itself, since an Eskimo village already occupied the available area. This part of the coastline is extremely flat and susceptible to erosion at the coast and with wet and boggy areas further inland (Fig. 3.27), so there were not many suitable sites to choose. Ray ended up with a site near to another Eskimo village of 23 huts and c.150 people, Uglaamie, which is today's settlement of Barrow. The locals helped to unload the ship and soon the hut was erected, divided into six sleeping cubicles and a larger room for Ray. A two-storey tower at one end of the one-storey hut was for firing musketry and a Gatling gun in case the natives turned aggressive! The men moved into the hut on 22 September and the first meteorological observations could begin on 15 October (Fig. 3.28).

---

[156] Barr (2008:62).

[157] Quoted in (Barr 1996:27).

[158] The main source for this account is Barr (2008).

Fig. 3.27 Landscape at Barrow. Photo Susan Barr

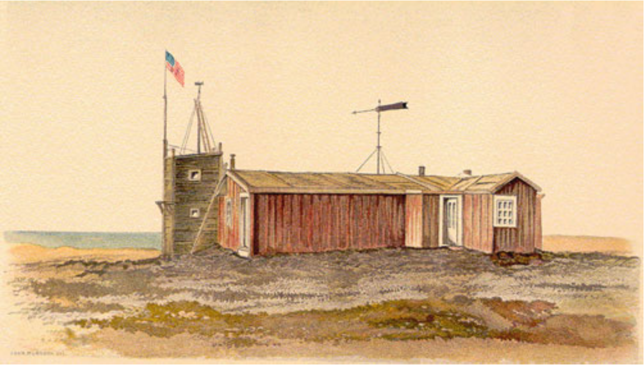


Fig. 3.28 The IPY station at Point Barrow (Ray 1885)

Unlike others of the IPY-1 expeditions, the Barrow group did not move much around. The coast is not very suitable for boating and they had no dogs with them for sledging. The winter was thus fairly monotonous, with the daily chores and the scientific observations comprising the routine. Daily exercise outside was statutory. Ray did, however, manage a short sledging trip southeast across the tundra in March 1882. At the end of June a whaler arrived with post for the group. A week later the ice gripped the ship and stove her in and the crew had to escape with very little over the ice to the station. For a week or so the shipwrecked crew lived in tents beside the station before they were picked up by other whalers. The relief ship for the station then arrived with three new observers and new provisions and instruments. One of the winterers was sent back with the ship.

The IPY routine now began in earnest, while the station was continually improved with new observatories connected by snow passages. Again the winter was rather monotonous and Ray made a new exploring trip with a team of eight dogs and an Eskimo guide and his wife. He got far enough south to spot the foothills of the Brooks Range, and in addition fetched some caribou carcasses that an Eskimo had agreed to provide for the station. Ray was not impressed by the land he travelled through, but – as William Barr remarks – he had no idea of the wealth of oil that would later be found in the area.[159] With refreshing insight he remarked of the Eskimo method of travel that "the nearer one conforms to the habits of the natives the less liable he is to meet with disaster, and the less he will be burdened with unnecessary camp equipment and blankets".[160] More caribou from local hunters and 500 eiders shot by the men from the station provided ample fresh meat in the spring, and in June the men could join in the traditional local whale feast as the Eskimos caught the first whale of the season.

In 1883, the ice along the coast stayed right until late August, where it had been open in mid-June the previous year. Plans for a boat trip east to the Canadian border were thus frustrated. On 1 August the first ships of the season were spotted out in the ice and Ray was able to cross the ice to receive some post. Amongst other news he learned that the station was to be evacuated that season instead of continuing until 1884, as originally planned. Soon there were a number of whale ships near to the station and more news informed Ray that he was to sell as much of the station stores as possible. All possible stores were then sold to the whalers and the station was made ready for the evacuation without the observations being stopped.

On learning that the relief ship, the *Leo*, was lying clear of the ice some distance away, Ray and two others of the group were taken by launch from the whaling ship *Rainbow* to meet the *Leo*. A sudden storm caused great difficulties as they reached the *Leo*, but after some troubles the *Leo* was able to anchor off the station on 22 August. Gales continued to thwart the evacuation and the *Leo* was damaged in the ice, but the station equipment and the men were finally onloaded on the 28th, the final observations having been taken at midnight on the 27th. The station house with furniture and stoves, 12 tonnes of coal, a grindstone and some worn-out equipment that could be of use to the Eskimos were left behind, with promises from the Elders that the house would be left as a refuge for any future shipwreck victims. The departure from Barrow came on the 29th, but the voyage south was disturbed and delayed by gales. San Francisco was finally reached in the early morning of 7 October.

Ray's expedition had lasted 27 months, had travelled 120,000 km and had stayed comfortably and healthily at the northernmost point of Alaska. The two US IPY expeditions ended on completely different notes, but both completed the IPY programme satisfactorily and produced useful observations and studies in addition.

---

[159] Barr (2008:78).

[160] Ray (1885) quoted in Barr (2008:78).

3.12.3 Lucien Turner at Fort Chimo, Ungava Bay, Canada

William Barr describes a further American expedition, which belongs under the IPY flag.[161] This was mounted by naturalist Lucien Turner (1848–1909), member of the Army Signal Corps, and it went to Fort Chimo (now Kuujjuaq) in Ungava Bay off the Hudson Strait. Turner's expedition was supported by the Smithsonian Institution, but W. Barr shows that correspondence proves that Chief Signal Officer W.B. Hazen of the US Army, who was responsible for the American expeditions described above, also involved himself in Turner's and more or less turned it into an auxiliary IPY expedition. From 1874 to 1877 Turner had been a meteorological observer for the Signal Service at St. Michael, Alaska and he had also trained voluntary observers for the Service in the Aleutians from 1878 to 1881.[162] In addition he had carried out important naturalist and ethnographical studies and collections. He spoke various native dialects as well as Russian.[163]

Turner travelled overland from Washington to Quebec and transferred to Hudson's Bay Company ships on 4 June 1882 towards Fort Chimo. Various ice hindrances and other occurrences delayed the arrival at Fort Chimo until 6 August, but once there Turner stayed for 2 years. From this base and in addition to his meteorological observations, he made some extensive hunting and collecting trips and established good relationships with the local Inuit and Naskapi Indians. He was thus able to produce an excellent ethnographical report on both. In addition, he made a large natural history collection, particularly of bird skins and eggs. Turner's relationship with the employees at the Company post was not so good and they had little understanding of his work.

Turner did not leave a published account of his IPY period, but further information about his scientific contribution can be found in his personal papers in the Smithsonian Institution Archives (see this reference) which include notes, drawings and photographs.

References

Andreev, K.P. 1891: Vvedenie. In: Lenz R (ed) Trudy Russkoi polyarnoi stancii na ust'e Leny. Meteorologicheskie nablyudeniya za 1882–1883 god. Imperatorskaya Akademiya nauk, S-Peterburg 2: I–XVII.

Baker, F.W.G. 1982: The First International Polar Year, 1882–1883. *Polar Record* 21(132): 275–285.

Baker, F.W.G. 2009: The First International Polar Year (1882–1883): French Measurements of Carbon dioxide Concentrations in the Atmosphere at Bahia Orange, Hoste Island, Tierra del Fuego. *Polar Record* 45(234): 265–268, July 2009.

Barr, S. 1983: Rapport fra et år i Svenskhuset (1882–83) [Report from a year in Svenskhuset 1882–83]. In: Svalbardboka 1983–84: 102–109.

---

[161] Barr (2008:365–366).

[162] Smithsonian Institution Archives.

[163] Barr (2008:365–366).

Barr, S. 1996: Fram mot Nordpolen [Fram Towards the North Pole]. Schibsteds forlag, Oslo.

Barr, S. 2003: Det første internasjonale polarår 1882–83 [The First International Polar Year 1882–83]. In: Jan Mayen – Øyas historie gjennom 1500 år [The Island's History Through 1500 Years]. Oslo 2003: 45–57.

Barr, W. 1985: The Expeditions of the First International Polar Year, 1882–83. The Arctic Institute of North America Technical Paper No. 29, University of Calgary, Canada, 222 pp.

Barr, W. 2008: *The Expeditions of the First International Polar Year 1882–1883*. Calgary, Canada: The Arctic Institute of North America.

Bones, S. 2007a: Norway and Past International Polar Years – A Historical Account. *Polar Research* 26: 195–203.

Bones, S. 2007b: Norsk polarhistorie på nett [Norwegian Polar History on the Internet], http://www.polarhistorie.no/artikler/2007/ipy_1881–82. Accessed August 2009.

von Bunge, A. 1895: Anhang. Die Lena-Expedition, 1881–1884. In: von Tillo, A. (ed) Beobachtungen der russischen Polarstation an der Lenamündung. Astronomische und magnetische Beobachtungen 1882–1884. Imperatorskaya Akademiya nauk, S-Peterburg 1.

Dawson, H.P. 1886: *Observations of the International Polar Expedition, Fort Rae*. London: Eyre and Spottiswood for Trübner and Co.

Deistviya 1882a: Deistviya obshchestva. Zhurnaly obshchago sobraniya Imperatorskogo Russkogo geograficheskogo obshchestva [fevral']. Izvestiya Imperatorskogo Russkogo geograficheskogo obshchestva 18(2): 17–32.

Deistviya 1882b: Deistviya obshchestva. Zhurnaly obshchago sobraniya Imperatorskogo Russkogo geograficheskogo obshchestva. Izvestiya Imperatorskogo Russkogo geograficheskogo obshchestva, 18(3): 35–74.

Deistviya 1884: Deistviya obshchestva. Zhurnaly obshchago sobraniya Imperatorskogo Russkogo geograficheskogo obshchestva [za 1883 g.]. Izvestiya Imperatorskogo Russkogo geograficheskogo obshchestva, 19(2): 49–73.

Deistviya 1885: Deistviya obshchestva. Zhurnaly obshchago sobraniya Imperatorskogo Russkogo geograficheskogo obshchestva [za 1884 g.]. Izvestiya Imperatorskogo Russkogo geograficheskogo obshchestva, 1884, 20(1): 87–108.

Ekholm, N. 1887: Observations faites au Cap Thordsen, Spitzberg, par l'expédition suédoise". Stockholm.

Greely, A.W. 1886a: *Three Years of Arctic Service: An Account of the Lady Franklin Bay Expedition of 1881–1884,* 2 Vols. New York, NY: C. Scribner's Sons.

Greely, A.W. 1886b: *Report on the Proceedings of the United States expedition to Lady Franklin Bay, Grinnell Land*. Washington, DC: Government Printing Office.

Grineveckii, L.F. 1883: Poperek Novoi Zemli. Izvestiya Imperatorskogo Russkogo geograficheskogo obshchestva 19(4): 265–291.

Hacquebord, L. 1995: Nederlandse Poolkringen. Honderdvijfentwintig jaar Nederlands onderzoek in poolgebieden. Inaugurele rede Rijksuniversiteit Groningen. Groningen: Arctisch Centrum.

Headland, R. 1984: *The Island of South Georgia*. Cambridge: Cambridge University Press.

Højlund Nielsen, Kristine 2008: 125th Anniversary of the Danish Artic [sic] Station in Nuuk. Greenland Collector September 2008: 5. http://www.stamps.gl/NR/rdonlyres/CF979115-A986-411A-AD77-DC2FC484B1E9/0/Collector_UK_web.pdf (accessed December 2009).

Howat, J. 2009: Seemann, JHMC. In: D. Tatham (ed) *The Dictionary of Falklands Biography (including South Georgia). From Discovery up to 1981,* p 481. England: ABC Print.

Kretzer, H-J (year not given): Station der Deutschen Polar-Kommission in Süd-Georgien, Royal Bay. 1882–83. POLLICHIA-Sonderveröffentlichung Nr.11. Gefördert von der Georg von Neumayer-Stiftung.

L'Institut Météorologique de Danemark.1889–1893. Exploration Internationale des Régions Arctiques, 1882–1883. Expédition danoise. Observations faits à Godthaab. København: Chez G.E.C. Gad, Librarie de L'Université.

Langerveld, T. 1983: De Nederlandse poolexpeditie van 1882. Zenit 10 nr. 1: 14–18.

Lemström, S., and Biese, E. (eds) 1886–1898: Observations faites aux stations de Sodankylä et de Kultala. Helsingfors: L'Imprimerie des Hértiers de Simelius.

Lenz, R. (ed) 1886a: Trudy Russkoi polyarnoi stancii na Novoi Zemle. Meteorologicheskie nablyudeniya, obrabotannye K.P. Andreevym. Imperatorskaya Akademiya nauk, S-Peterburg 2

Lenz, R. (ed) 1886b: Trudy Russkoi polyarnoi stancii na ust'e Leny. Meteorologicheskie nablyudeniya za 1882–1883 gg., obrabotannye A.G. Eignerom. Imperatorskaya Akademiya nauk, S-Peterburg 2(1).

Lenz, R. (ed) 1887: Trudy Russkoi polyarnoi stancii na ust'e Leny. Meteorologicheskie nablyudeniya za 1882–1883 gg., obrabotannye A.G. Eignerom. Imperatorskaya Akademiya nauk, S-Peterburg 2(2).

Lenz, R. (ed) 1891: Trudy Russkoi polyarnoi stancii na Novoi Zemle. Magnitnye nablyudeniya, obrabotannye K.P. Andreevym. Imperatorskaya Akademiya nauk, S-Peterburg 1

Levere, T.H. 1993: Science and the Canadian Arctic. A Century of Exploration 1818–1918. Cambridge: Cambridge University Press.

Liljequist, G.H. 1993: High Latitudes. Swedish Polar Research Secretariat, Stockholm.

Lüdecke, C. 2005: East Meets West: Meteorological Observations of the Moravians in Greenland and Labrador in the eighteenth century. Proceedings of the 22nd International Congress of History of Science, Beijing, 24–30 July 2005. *History of Meteorology* 2, 123–132. http://www.meteohistory.org/2005historyofmeteorology2/09luedecke.pdf

Lüdecke, C. 2008: Schrader, Karl Wilhelm Otto. In: D. Tatham (ed) *The Dictionary of Falklands Biography (Including South Georgia). From Discovery up to 1981,* pp 478–479. England: ABC Print .

Morzer Bruyns, W.F.J. (ed) 1985: De eerste tocht van de Willem Barents naar de Noordelijke IJzee 1878, deel 1 en 2. De Walburg Pers Zutphen.

nature 133, 412–412 (17 March 1934).

nature 28, 371–371 (16 August 1883).

Neumayer, G., und C. Börgen (Hrsg) 1886: Die internationale Polarforschung 1882–1883. Die Beobachtungs-Ergebnisse der deutschen Stationen. Berlin, A. Asher & Co., vol. 1: Kingua-Fjord und die meteorologischen Stationen II. Ordnung in Labrador: Hebron, Okak, Nain, Hoffenthal, Rama, sowie die magnetischen Observatorien in Breslau und Göttingen, 737 pp.

Nevanlinna, H. 1999: Geomagnetic Observations at Sodankylä During the First International Polar Year (1882–1883). In: Geophysics (1999), 35(1–2):15–22. Helsinki: Geophysical Society of Finland.

Nuttall, M. (ed.) 2005: Encyclopaedia of the Arctic. New York and London: Routledge.

Paseckii, V.M. 1978: *Meteorologicheskii centr Rossii. Istoriya osnovaniya i stanovleniya*. Leningrad: Gidrometeoizdat

Paulsen, 1884: Résumé des travaux de l′expédition polaire danoise internationale faits a Godthaab (Groënland Occidental) 1 Aout 1882–31 Aout 1883 Par Adam F.W. Paulsen, Chef de l'Expédition. Digitalised version on: http://www.archive.org/stream/rsumdestravauxd00hovggoog#page/n12/mode/1up

Pavy, L. May 1886: Dr. Pavy and the Polar Expedition. *The North American Review* 142(352), University of Northern Iowa, March 1886, pp 258–270, http://freepages.genealogy.rootsweb.ancestry.com/˜shannonfamilies/droctavepavy.htm Accessed December 2009.

Popular Science Monthly Volume 24.djvu/498–99. Ref. http://en.wikisource.org/wiki/Page:Popular_Science_Monthly_Volume_24.djvu/498. Accessed September 2009.

Protokoly 1882: Protokoly rasporyaditel'nogo Komiteta Vostochnogo Sibirskogo Otdela Imparatorskogo Russkogo geograficheskogo obshchestva za 1882 g. Izvestiya Vostochno-Sibirskogo otdeleniya Imperatorskogo Russkogo geograficheskogo obshchestva 13(1–2): 115–125)

Protokoly 1885: Protokoly rasporyaditel'nogo Komiteta Vostochnogo Sibirskogo Otdela Imparatorskogo Russkogo geograficheskogo obshchestva za 1884 g. Izvestiya Vostochno-Sibirskogo otdeleniya Imperatorskogo Russkogo geograficheskogo obshchestva 15(5–6): 73–80.

Ray, P.H. 1885: *Report of the International Polar Expedition to Point Barrow, Alaska*. Washington, DC: Government Printing Office.

Rijksarchief Noord-Holland (RANH) in Haarlem, Archive of the Royal Dutch Academy of Sciences (KNAW) 64/394.

Scientific American Supplement 1884–1885 – Also available from Amazon: Scientific American Reference Book. (http://chestofbooks.com/crafts/scientific-american/sup3/The-French-Scientific-Station-At-Cape-Horn.html). Accessed November 2009.

Semenov, P.P. 1896: Istoriia poluvekovoi deiatel'nosti Imperatorskogo Russkogo geograficheskogo obshchestva 1845–1895. Bezobrazov: S.-Peterburg 2(4).

Smirnov, V.G. 2007: Issledovaniya Morogogo okeana voennymi moryakami i uchenymi Rossii 1826–1895 gg. Glavnoe upravlenie navigacii i okeanografii Ministerstva oborony Rossiiskoi Federacii.

Smithsonian Institution Archives, http://siarchives.si.edu/findingaids/FARU7192.HTM. Accessed December 2009.

Snellen, M. 1886: De Nederlandsche Pool-Expeditie 1882–1883. Utrecht: Firma L.E.Bosch en Zoon.

Stauning, P. 2002: Ørsted – to – Ørsted, Geomagnetic and Auroral Research in Denmark. www.control.auc.dk/˜danji/pr/oersted/posters/H3-Geoaures.ppt (Accessed November 2009). Danish Meteorological Institute, September 2002.

Stauning, P. 2004: Samuel Petrus Kleinschmidt (1814–1886): Auroral observations from Nuuk (Godthaab) 1865–1880. In: http://www.dpc.dk/Res&Log/IPY/Presentations/PeterStauning.ppt#1 (accessed November 2009). Danish Meteorological Institute.

Steen, A.S. 1887. Die internationale Polarforschung, 1882–1883. Beobachtungs-Ergebnisse der Norwegischen Polarstation Bossekop in Alten. Christiania: Grödahl & Sons.

Svedeniya 1882a: Svedeniya o Lenskoi ekspedicii. (Pis'mo nachal'nika eya N. D. Yurgensa [Urochishche Muchukhu-Kharieta. Pravyi bereg Leny] poluchennoe 29 iylya [1882 g.]. Izvestiya Vostochno-Sibirskogo otdeleniya Imperatorskogo Russkogo geograficheskogo obshchestva 13(1–2): 127–128.

Svedeniya 1882b: Svedeniya o meteorologicheskoi stancii na ust'yakh r. Leny. Izvestiya Vostochno-Sibirskogo otdeleniya Imperatorskogo Russkogo geograficheskogo obshchestva. 13(3): 46–48

Svedeniya 1883a: Svedeniya o russkoi polyarnoi magnitno-meteorologicheskoi stancii na ust'yakh Leny. Izvestiya Vostochno-Sibirskogo otdeleniya Imperatorskogo Russkogo geograficheskogo obshchestva 14(1–2): 61–65.

Svedeniya 1883b: Svedeniya o polyarnoi meteorologicheskoi stancii na ust'e reki Leny. Izvestiya Vostochno-Sibirskogo otdeleniya Imperatorskogo Russkogo geograficheskogo obshchestva 14(3): 18–21.

Svedeniya 1884a: Svedeniya o polyarnoi meteorologicheskoi stancii na ust'e reki Leny. Izvestiya Vostochno-Sibirskogo otdeleniya Imperatorskogo Russkogo geograficheskogo obshchestva 14(4–5): 33–36.

Svedeniya 1884b: [Svedeniya o polyarnoi meteorologicheskoi stancii na ust'e reki Leny]. Izvestiya Vostochno-Sibirskogo otdeleniya Imperatorskogo Russkogo geograficheskogo obshchestva 15(1): 97–99.

von Tillo, A. 1895: Trudy Russkoi polyarnoi stancii na ust'e Leny. Astronomicheskie i magnitnye nablyudeniya za 1882–1884 gg., obrabotannye V.V. Fusom, F.F. Millerom i N.D. Yurgensom.

Tromholt, S. 1885: Under Nordlysets straaler. Gyldendals Kjøbenhavn. Reprinted in facsimile 2007 by Samisk høgskole/Nordisk Samisk Institutt.

Wilczek H. 1934: *Happy Retrospect: Reminiscences of Count Wilczek 1837–1922*. London G. Bell and Sons Ltd.

Wohlgemuth, Emil Edlen von, 1886: Vorbericht zur wissenschaftlichen Publication der Österreichischen Polarstation Jan Mayen. 1 Band. Wien, Die Kaiserlich-Königliche Hof-und Staatsdruckerei.

Yurgens, N.D. 1885: Ekspediciya k ust'yu reki Leny s 1881 goda po 1885 god. Predvaritel'nyi ochet nachal'niki ekspedicii N.D. Yurgensa. Izvestiya Imperatorskogo Russkogo geograficheskogo obshchestva 21(4): 249–284.

Chapter 4
An Evaluation of the Achievements of the First International Polar Year

Aant Elzinga

4.1 Introduction

First of all it should be noted that the first polar year did not start from scratch. During the 50 years prior to it a lot of polar expeditions with significant research components had already taken place. Differentiation in science together with societal needs of agriculture, commerce and navigation had contributed to the existence of meteorology and magnetic studies as important disciplines. Reporting and plotting weather observations had become systematised and benefited from the development of telegraph services. Systematic observation in the upper part of the northern hemisphere was however lacking, while at the same time it was intimated that weather events in that region might have a bearing on weather variability in Europe and North America. What was new and pioneering with the first international polar year was its dedication to obtaining the first series ever of coordinated synoptic observations at multiple locations in the Arctic. Moreover, it was the first international meteorological experiment in a defined region over a specific period of observation. In addition there were two regular stations set in the far south (see below), plus a meteorological station in Port Stanley,[1] while 35 temperate and tropical observatories were also engaged. Magnetic observatories all over the world were involved.

Altogether about 700 men participated. They manned meteorological, magnetic and auroral observation posts. Although a great deal of data was gathered, the follow-up in terms of research was relatively small. In some cases damage to instruments had also affected the quality of data sets. Nevertheless, the magnetic variation data gathered did prove to be valuable for the early understanding of aurora,

---

A. Elzinga (✉)
Department of Philosophy, Linguistics and Theory of Science, University of Gothenburg , Sweden
e-mail: aant.elzinga@theorysc.gu.se

[1] The Port Stanley meteorological station was set up for IPY-1 by the Deutsche Seewarte.

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_4,

magnetic storms and atmospheric currents.[2] The Finns carried out exciting pioneering aurora studies, a field that in many years that followed became a strong point in both Finland and Norway. The Norwegian meteorologist Henrik Mohn, credited with laying the groundwork for modern research in his field in Norway, is one who was strengthened in his belief that the polar region was the source of cyclones that affected weather in the inhabited regions in the North. Today, in retrospect, the records obtained provide a valuable historical source for comparison with twentieth century data regarding environmental and climate change. Thus, a reanalysis a few years ago of the air-surface temperature and sea-level pressures observed during 1882–1883 revealed a north Atlantic oscillation signal. Attentive perusal of neglected facets in the history of science and technology also reveal now that in 1924 meteorological data coming out of IPY-1 was used to construct circumpolar charts for planning the Aeroarctic international airship expedition to the Russian Arctic that took place in 1931.[3]

4.2 Presentism – or Reading the Present into the Past

Now, it may be asked, to what extent a retrospective finding of this kind-thanks to present day analysis and interpretation-can be considered an achievement of the First Polar Year? Similarly, what do we make of the oft-cited statement by Sydney Chapman who found geomagnetic data for 1882–1883, compiled some years after IPY-1, useful in his own work in the 1920s? At that time he was pondering the way earth magnetic and aurora events disturbed wireless communications in connection with his hypothesis on the flow of currents in the ionosphere, a concept that had only emerged in the early twentieth century. Swedish IPY-1 investigations have in retrospect been credited with revealing several new findings. Salomon Andrée, whose own reflections will be taken up at some length below, was in charge of measuring snowdrift and atmospheric electricity. With regard to the latter phenomenon he is credited with discovering how the aeroelectrical parameters varied with the passage of a weather front. “Of course the concept of the front was not yet created. Andrée spoke rather unclearly about the passage of a barometer-minimum, but the presentation bears witness to a careful correlation of different elements of the weather and variations in atmospheric electricity at a time when no-one yet had found any measurable atmospheric electricity in the polar region.”[4] The same author indicates how the polar year data contained signs of a close relationship between location of the magnetic pole and the direction defined by the top in the curve of the aurora bow

---

[2] The concept (later associated with magnetic solar storms) of electric currents flowing into and away from an auroral ionosphere was first proposed by Birkeland, hence the term “Birkeland current” (Birkeland 1908). This was adopted in later literature and is still used. The existence was confirmed by satellite observations in 1960.

[3] Lüdecke (2008).

[4] Nyberg (1982:21).

in the sky. "It was also with the help of these observations that one could determine how the maximum of northern lights activity everywhere occurred at the same absolute time. The material was used in the calculation of daily variations in the location of the aurora by among others Hannes Alfvén as late as 1940."[5] Further, again the same author in his evaluation says, "With the help of the eleven polar stations' results one was able for the first time to note that the intensity of earth magnetism increased powerfully in the neighborhood of the magnetic north pole and values from 1882-83 could be used later to study the secular variation" of the same.[6] Finally, he notes also that as a result of the polar year an idea prevalent in many places at the time was actually falsified, viz. the claim held with great conviction in the culture of popular beliefs that northern lights were accompanied by some acoustic phenomena (whistling, for example). The examples of how the present is read into the past may certainly be multiplied by looking at popular historical accounts from various different countries.

Recent writers moreover are now directing our attention once again to the fact that the data in the archive of IPY-1 contain a record of exceptional anomalous tides and unusually red skies at sunset that are linked to the violent eruption of the volcano Krakatoa in the East Indies 26–27 August 1883. Obviously the two southern stations operated by France and Germany were ideally situated to record some of the effects. Thus, with their self-regulating tide gauges, they contributed to the data that made possible the first accurate measurements of the rate of movement of the associated great waves (later called "seismic sea-waves" and nowadays called "tsunamis") and the movement of dust in the upper global atmosphere. These observations have been reworked and are still regarded as useful.[7] It should be noted however that the term "tsunami" did not exist in the scientific literature in the 1880s, so that its use as a scientific concept now, when utilising records of the past (and using computer-aided simulation models), carries with it a tendency to "read-in" more than what was there at the time. Similarly, a record of 39 measurements (between 31 October 1882 and 1 July 1883, and a shorter period between 20 September and 21 October 1883) of carbon dioxide concentrations in the atmosphere at Orange Bay near Cape Horn made by the French expedition members, published in 1886 and about which little was known until recently, has gained new actuality. It seems to be the first long series of measurements of carbon dioxide concentrations to be made in the southern hemisphere and as such are held to be an interesting base for comparing measurements today using the same technique as then.[8]

---

[5] ibid:22.

[6] ibid:21; Birkeland (1908:Preface, iii) reported having made use of evidence of "certain well-marked magnetic storms in 1882–1883, from the observations in the reports of the international expeditions".

[7] According to Latter 1981, "Krakatoa, 1883, is the only eruption sequence for which sufficient data exist for a detailed study of tsunamis. The times at which air and water waves generated by this sequence were recorded have been reread, and new origin times have been calculated and compared with observations made at the time." Nicolet 1984 gives the figure 150 m/s for the speed of the great tidal wave.

[8] Baker (2009).

4.3 Facilities and Instruments

Consider now what lay behind all the data generated as far as instruments and human effort are concerned.[9] The camps at the polar year stations were to be laid out according to a preconceived standard plan. This meant a small rectangular prefabricated residential house and several prefabricated auxiliary huts. In most cases the main house had a mast carrying an anemometer and wind direction vane to allow observations to be easily taken. In some cases the latter two instruments were mounted on a pole on an elevated location further away. The French had an electric recorder for the rotation anemometer. They also boasted a photographic laboratory. For the most part however the first polar year instruments were mechanical ones that needed to be read directly.

The main building of the various expeditions usually had a barometer[10] on the wall and a chronometer (with reserves if needed – the Dutch expedition carried six) that sounded at distinct times (e.g. 5 min before the hour) before a set of observations were to begin on the hour. The main chronometer was adjusted on the basis of astronomical observations as often as possible. The latter involved work at a special astronomical shed with a passage telescope, a pendulum clock and sextants used to determine time. Other auxiliary buildings were placed a short distance away from the main house, the magnetic hut usually at least 200 m away to prevent disturbances. Measuring of atmospheric electricity took place at a separate location. The magnetic observatory typically called for a small one-room cabin constructed with either copper nails or wooden pegs and containing instruments for magnetic observation every hour and more frequently during the term days, 1st and 15th of every month. There were often separate huts for measuring absolute and variable magnetic parameters. The absolute measurements would be made less frequently (e.g. twice a month, usually following the term days, as the Germans did at Royal Bay, South Georgia). Most observations were by direct reading of instruments. Despite the fact that a method had recently been developed for recording – photographically – variations in magnetic parameters, only the French at Cape Horn possessed such a magnetograph. Automatic recording in the French case involved a clockwork mechanism that moved a sensitised strip of bromide paper behind a horizontal window through which a light was cast, reflected by the mirrors of the magnetic instrument.

A louvred shed or thermometer screen was built to shield instruments against precipitation and direct heat radiation from outside sources. Heinrich Wild had designed one kind of setup for this purpose, but there were others too. Inside this were mounted the meteorological instruments to be read every hour, wet and dry bulb thermometers, maximum and minimum thermometers, a hair hygrometer, an

---

[9] Barr (2008) is used as a source here. A well-balanced critical historical assessment of the conditions of and results coming out of the three expeditions in the Canadian Arctic may be found in Levere (1993:315–334).

[10] Barometers were usually kept in the main building because pressure inside and outside the house is the same.

evapirometer (the Swedes had both a Hamburg evapirometer and a Wild evapirometer), and outside a rain gauge. Soil or (where relevant) rock temperatures were also taken at three or more different levels. If the station was located on a coast then tidal gauges were put in place and the specific gravity of the seawater and its temperature at different levels could be observed. The German station on South Georgia had a self-registering barograph, and also self-registering thermograph on land.

4.4 Process of Observation and Sources of Error

Since readings of instruments had to be made every hour the regime of observation was divided into watches, e.g. four watches of 6 hours, with more hands on deck on term days with their exhaustive requirements. The daily schedule was thus fairly rigid. Since William Barr's *The First Polar Year 1882–1883*, based on primary sources, gives a thorough account of activities and life at the 14 stations it will be used here to reconstruct important facets of the fieldwork. Despite many differences and variations between the sites one can discern a common denominator. Take, for example, the German station at Royal Bay on South Georgia. It had a rather sophisticated setup and a staff of seven observers who alternated with normally two on duty each 6 hour watch.

A signal clock in the living room of the station alerted the observer(s) 5 min before every hour. One went out to do the magnetic rounds, reading the instruments in a prescribed order, alerted by signals from the signal clock that were relayed to the variation hut by an electric cable. Thereafter came the meteorological observations, with the barometer being read exactly on the hour. This was done from inside the main house. A barometer and barograph were located in the living room. The wind vane and the cup-anemometer on the mast on the roof could also be read from inside the house since they were connected to dials on the wall. Thermometers, psychrometer, hygrometer and thermograph were read at the louvred screen outside. In addition, a daily reading was taken of the threefold soil temperatures nearby, and likewise with the maximum and minimum thermometers, specific gravity of the seawater and more.

Within each hour the routine normally took 5–10 min. On term days and when there were magnetic storms on normal watch days the activities became very intense, with two men needed in the magnetic observatory at the same time to cover both sets of instruments. Term days meant reading the magnetic variation instruments every 5 min for 23 hours and every 20 seconds for the final hour. "/T/he rapid succession of readings chained them /the observers/ to the observatory for the entire duration of the watch, which usually lasted two or three hours."[11] In the meantime one of the observers would still have to make the weather observations punctually on the hour and in addition prepare the meals.

---

[11] Barr (2008:286).

Still, monitoring dials and making tabulations at the South Georgia station was not as onerous as the same tasks carried out in snowstorms in severely cold Arctic nights.[12] Here is an account of the routine at the Russian station on Novaya Zemlya. Hourly the duty observer took the barometer reading in one of the rooms of the main house; thereafter he climbed up to the attic to read a dial connected by rods and gears to an anemometer on the roof. Next he went to the meteorological screen, taking note of the cloud cover in the sky while on the way. After the meteorological observations came the readings in the magnetic observatory. During blizzards however a safety line had to be strung from the main house to the weather screen and the other huts so the observer would not get lost or fall as he shuffled along on slippery reindeer-skin boots. Instruments in the auxiliary buildings had to be protected from fine drifting snow by bell jars. In the dark lanterns were needed, but these were useless when the flame blew out. At other times the observer clung to the screen against the force of a gale with a poor light in hand squinting at the thermometer scales which sometimes got covered by rime ice and snow that had to be removed by a warm hand that might cause further problems. In this way all sorts of errors crept in, but the expedition leader insisted that the show must go on; the monthly tabulations had to be filled with figures.

Proper calibration of instruments also presented difficulties since there was only limited communication between a few stations and their home countries, and between the stations themselves there was essentially no contact. Wireless telegraphy was still in its infancy and the radio did not exist. Coordination of activities between the different sites therefore had to follow a strictly pre-ordained plan requiring determination of local times and their translation in relationship to the norm of the agreed timetable with the help of astronomical instruments. This meant that in practice all kinds of deviations crept in, often stemming from inaccuracies in local scheduling, personal styles of observation, as well as interference caused by harsh natural conditions and other factors. Only the Bossekop station in Norway enjoyed regular telegraphic contact with a home country centre (Kristiania, now Oslo).

A lesson that lay in line with the reigning ideal of science, and therefore obvious afterwards, was that more sophisticated instruments and research techniques were needed. It also became clear that ordinary scientific instruments could not be used directly in polar regions. They have to be modified in order to function under severe conditions.

4.5 The Primacy of Inductivism as an Ideal of Science and Way of Life

The general idea behind IPY-1 was to obtain an overview of geophysical phenomena in poorly known parts of the world in the hope of gaining for the first time detailed meteorological and earth magnetic pictures of the world. Epistemologically IPY-1

---

[12] cf. Nicolet (1984).

rested on an inductivist ideal of science, giving primacy to systematic observation and hoping that some patterns transcending the local might emerge from the data. This would give clues to relationships and trends that might be found by generalising from discrete time series of observations obtained at many sites. Weyprecht himself expressed the ideal as "... proceeding through comparison to deduce from observations collected at different points, independent of the particularities that characterize the different years of observation, the general laws governing the phenomena under study ...".[13] The approach was affirmed by the second International Meteorological Congress in Rome 1879 which, however, rejected a proposal to establish an international meteorological institute and instead recommended a looser arrangement whereby dissemination of relevant results and publication "for the purpose of deducing general laws in meteorology" should be left to individual countries.[14] To be able to deliver high-quality data, observers had a rigorous regime with many working hours under sometimes extremely adverse conditions. The rhythms of daily life were dictated by the Göttingen clock and the repetitious needs of capricious instruments. The loss of sociality was often compensated for by exaggerated rituals of feasting and drinking organised around national holidays, birthdays of members of the royal family or that of fellow expedition members, a practice also evident during IPY-2.[15] Further insights into the practical implications of inductivism in the field may be gleaned from the diary of Salomon August Andrée (1854–1897), of the balloon *Örnen* fame, who participated in the Swedish IPY expedition to Kapp Thordsen, Spitsbergen.[16]

Pack ice prevented the Swedish expedition from reaching northern Spitsbergen, so instead the party of 12 stayed in a fairly comfortable large abandoned house, the "Swedish House", erected some years before by a company in the phosphate fertiliser business. Here Andrée and his companions spent 13 months from 1 August 1882 onward. The diary records ingredients of daily meals, numbers of hours on watch punctuated by short hours of sleep, hunting sorties, annoying habits of various researchers and flights of fantasy. It also reports the author's struggles with his instrument to measure atmospheric electricity as well as various bouts with astronomical observations and geomagnetic measurements when the temperature was below –30°C.

The term days he found most taxing: "November 1. Term day. Did in one stretch 31 hours watch. Thereof 7 ordinary watches, 22 minutes instrument readings, and 2 passes with on the one hand readings every 20 seconds and on the other hand every 10 seconds. Altogether during this time I made over 1300 observations."[17] On another occasion he notes how all 12 expedition members were kept busy an entire

---

[13] Wilczek and Weyprecht (1887:1, cited in Summerhayes 2008:323).

[14] Daniel (1973:11).

[15] Tollner and others (1934:11).

[16] Andrée (2008).

[17] ibid.:38.

term day. Irritation grew with continual interruptions of sleep to stand watch.[18] It was necessary to nurse the instruments to make measurements, sometimes over a 10 hour stretch with an observation every minute.[19]

Afterwards there was the endless task of recording the data neatly in tables. Sometimes a series of slight errors in “20-second curves” showing variations in atmospheric electricity meant 14 days of earlier work had to be written off with a necessity of recalculating and correcting a thousand arithmetic figures.[20] Andrée became obsessed with these curves. As the polar year progressed the diary entries for the term days become blank which indicates a lack of time. By 1 May the following year, Andrée was however optimistic, finding that he was able to confirm a pattern in his curves of variation in atmospheric electricity, showing two definite minima, at 9–10 a.m. and 9–10 p.m., respectively. Then he adds, “[i]t is not that much of a result after so much effort and moreover the next month maybe will turn the result topsy-turvy into disarray again”.[21]

The tacit epistemology behind all this presupposed the calibration of instruments would be standardised in different parts of the world. Still for the worker in the field, possible correlations would not be immediately recognisable. One had to await further compilations and comparisons of results from the different sites. Standardisation of units of measurement and symbols of representation as well as similarity in instrumentation were major concerns in nineteenth century science, and part of the task of the new scientific associations established around several different disciplines was to promote unification and standardisation of methodologies and techniques. Inductivist and positivist philosophies of science fit hand in glove with the empiricist mode of scientific knowledge production accented by IPY-1. The predominant ideal of science was in principle a democratic one since it did not make a distinction between potential observers as long as they were sufficiently trained. In practice however the hierarchy of the world of scientific academies and central meteorological institutes in the different countries made a difference when it came to whose voices counted for more than others. Hierarchy and prestige consciousness together with inductivism tended to mitigate the development of speculative hypotheses as well as the possibility of the kind of proactive style in science as later critics like Henryk Arctowsky demanded (see below). The inductivist ideal of arriving at general laws of nature on the basis of seeking correlations in vast amounts of data, moreover, would actually have required much longer observation series, which then – given the absence of present-day computer-aided techniques – would have made the task of digesting the material and arriving at syntheses *even more difficult*. Adding to this counterfactual line of reasoning one might further hazard the view that possibly the existence of clearly defined hypotheses and a number of

---

[18] ibid.:46.

[19] ibid.:38.

[20] ibid.:84.

[21] ibid.:79.

leading researchers who championed them might have led to better utilisation of the various results.

4.6 The Question of Leadership – Coordination Is Not the Same as Cooperation and Integrative Efforts in Research

Activities during IPY-1 were very much the work of single nations. Only in one case was there some cooperation, and that was mainly because the Dutch expedition vessel was beset by ice in the same area of the Arctic as a Danish steamer. A clear distinction should be made between scientific coordination and cooperation. IPY-1 was a matter of coordination of activities but not of cooperation, neither in the field nor in the actual analysis of the resulting data and follow-up in publication. This latter was left to the different countries themselves. Each was expected to carry the cost of its own processing and publication of records, for which one year was formally allotted, a timeframe that proved wholly unrealistic. Astronomers had some experience of international cooperation, but this was the first time such an exercise was launched in the study of geophysical phenomena on a very grand scale. Therefore, it is not surprising that the architects of the exercise were unaware of the managerial difficulties involved and the need of a longer-term timeframe with a strong proactive leadership. Tensions between meteorologists and geomagneticians – where the latter looked down on the former as poor non-mathematical cousins – also created difficulties and personal animosity that made strong central leadership impossible.[22]

As it turned out, although a couple of general expedition accounts came in 1884, the first papers with actual results did not appear until two years later. At the Munich meeting of the International Polar Commission (IPC), i.e. at its last meeting in 1891 (when it was dissolved), Neumayer initiated a discussion on how to generalise the results and two committees were set up, one for meteorology and one for magnetism, inviting researchers to work on the data. To what extent this helped is unclear. He himself had just finished editing a couple of substantial volumes that appeared in German. Also he had already incorporated magnetic material from the IPY together with previously collected measurements to plot magnetic maps for the epoch 1885. They were published as a separate small volume of a larger publication, the *Physical Atlas*, by Heinrich Berghaus.

Special mention must be made of the pivotal role of the Swiss meteorologist Heinrich Wild who was the President of the International Meteorological Committee and replaced Neumayer as head of the IPC. He had influence in high places and had considerable experience with modernising and expanding the Russian meteorological service, which required extensive recruitment and training. He provided

---

[22] See also Chap. 2 in this volume where the authors take up the friction between Neumayer and Wild and their differences regarding the mandates of the International Meteorological Committee and the International Polar Commission, with Neumayer wanting the latter to be independent while Wild insisted on subordination to the IMC.

assistance in training persons from several countries in the art of tending some of the instruments used at the IPY stations. Apart from his diplomatic success and managerial skills in bringing a sufficient number of countries on board the IPY-1 Wild, as a member of the St Petersburg Academy of Sciences and the Director of the Central Physical Observatory in St Petersburg, was instrumental in gaining the support of his Academy in making the Pavlovsk Observatory the site of the permanent depository of the archives and results of IPY-1. For a long time the importance of Wild's efforts has unfortunately been overshadowed by the names of Weyprecht, Wilczek and Neumayer that tend to feature centrally in traditional historical accounts. Wild's diplomatic style in coordinating activities deserves further attention.[23] So does the style of his approach to organising a regime of observation compared to that of Neumayer.

4.7 (Under-) Utilisation of the Results

In all 22 major volumes of material were compiled, much of it meticulous tabulations of geomagnetic observations, meteorological conditions, etc. In addition there appeared travelogues and a variety of scattered papers. For a long time the most complete and most easily accessible sets of these were in Vienna and in the Netherlands, but after the end of the Cold War, the St Petersburg repository is now also easier to visit. The official reports of the French expedition to Cape Horn were the most extensive. They amount to nine volumes, exceeding the length of that of any other station, and providing a remarkable compendium of scientific data about a little known area of the world. The most valuable part however falls outside the scope of the three official areas of the IPY.

The two substantial volumes edited by Neumayer contain contributions by several authors, covering different aspects and findings of both German expeditions. The British expedition to Fort Rae in Canada yielded a compact volume of 326 pages, comprising a brief introductory description of the purpose and events of the enterprise followed by page upon page of tabulations to which are appended a set of plates with graphs showing bimonthly and term day averages of the magnetic data. Sponsored by the Admiralty this volume was published in London in 1886.

In Denmark the Danish Meteorological Institute published two volumes on the expedition to Godthaab (now Nuuk), West Greenland (1888–1893) in Danish; in addition there appeared a report in *nature* 1884 and a couple of separate articles in Danish journals. Swedes published two volumes in French, the Norwegians a couple of volumes in German, the Dutch came with a first report in their language in 1886 and a further report in French in 1910. The Russians produced numerous publications, many of them in Russian. The Finns published their results in three volumes in French that also cover an extension of data for a second year (1883–1884) for the core programme.

---

[23] The case for this is well argued by Tammiksaar et al. (2009).

The Imperial Academy of Science in Vienna produced three volumes written by Emil Edlen von Wolgemuth, covering not only results from the core programmes, but also the topography of Jan Mayen Island, hydrology, the chemistry of seawater, zoology, botany and mineralogy.

Adolphus Washington Greely's fateful expedition to Lady Franklin Bay on Ellesmore Island generated four volumes, two of them that Greely produced with a commercial publisher (1886) and two volumes comprising official Proceedings released by the government printers in Washington DC. The Greely expedition with its tragic loss of 19 men, turbulent political context and blunders in rescue operations fired the popular imagination and is mentioned in almost all books on polar history. Therefore, its impact in the literature is probably greater than that of any of the other expeditions. As late as 1998 the "Greely starvation camp" was the subject of a scientific investigation to determine what lay behind the death and survival of Greely's men and to what extent current scientific knowledge might have provided a better chance for the survival of more men.[24]

Since the national academies of science in the various countries regularly exchanged publications, many of the volumes ended up in the libraries or archives of these institutions. Copies were also distributed by individuals through the network of their discipline.

As time went on it became clear that the lack of a central facility to take charge of coordinating the compilation of data and then distributing it hindered continuity in science. This was a point raised both in 1906 at an international polar conference in Brussels and again in 1913 at a meeting in Rome of the International Polar Commission (IPC)[25] that had been created, an organisation that fell victim to World War I. Henryk Arctowski, a veteran of the *Belgica* expedition to Antarctica (1898–1899) who had been very active in the IPC, took up the issue once more during discussions in the late 1920s in the course of planning IPY-2. He was very explicit in this evaluation, stating "it is possible that the principal reason for this lack of tangible results can be sought in the fact that the international organization in a certain way disbanded itself after the return of the national expeditions . . .. It may be said that if the publication, and above all the discussion of observations, had been left to a central office, possibly international, the scientific level of the work accomplished would have been better appreciated".[26] To some extent this criticism touches on the weakness of coordinative efforts as opposed to cooperative and integrative approaches. The question of a follow-up after a large-scale campaign like

---

[24] This investigation involving an on-site visit to the "starvation camp" was undertaken during the International Arctic Polynya Expedition 1998; see Weslawski and Legezynska (2002).

[25] At this meeting, at the Xth International Geographical Congress (IGC) a proposal put forward was that contact ought to be taken with the Carnegie Institution of Washington, USA, to see if someone there might be willing to tackle the task of synthesizing the data records (Commission Polaire Internationale, 1913:21–22). G. Lecointe said he would take the appropriate contact to explore the possibility, but what happened after that is unknown.

[26] Cited in Baker (1982:282).

the IPY was found to be vital, a lesson that should have been drawn by many more scientists, especially those in positions of authority.

The problem was that the various countries involved compiled national reports, but they made insufficient efforts to distribute them. Also, as already noted, it took much longer to assemble the results than had been anticipated. By the time of the last meeting of the IPC in 1891, where Neumayer urged that something be done about putting researchers onto analysing the vast stocks of data that had been generated, not all results were in hand yet. A number of publications on magnetic observations, for example, were still missing, namely the Danish reports from Godthaab, the Russian ones from Sagastyr' (Lena Delta – the Novaya Zemlya results were published in 1886, but the meteorological ones from there came only in 1891) and the Finnish data from Sodankylä. The Dutch expedition that got trapped in the Kara Sea was unable to carry out the magnetic programme. During the 1890s, further publications appeared in various places.[27]

Ten years ago a reanalysis of the magnetic data from Sodankylä (Finland) concluded that the quality of magnetic observations of the parameters D (declination) and H (horizontal intensity) was good, but that the data for Z (vertical intensity) was less reliable. The tables and diagrams have been available in electronic form since 1990. Here one can trace the signal of a magnetic storm in November 1882, one of the largest in the latter part of the nineteenth century.[28]

A systematic reanalysis and recalculation in 2006 of IPY-1 data has, in retrospect, provided insights into climatic processes and points of comparison with later Arctic climate patterns. However, "while the stations showed that sea-level pressures and surface air temperatures were indeed influenced by large scale hemispheric circulation patterns, the data lacked sufficient density and the time period was too short to allow for any fundamental discoveries in meteorology or earth magnetism".[29] The Finnish data alone referred to above include a total of 28,512 magnetic observations for the period 21 August 1882 to 31 August 1883.[30] A rough estimate of the volume of data generated by all 14 IPY-1 stations suggests that overall the number of magnetic data points, considering three parameters, might have been of the order of 35,000 data points/yr/station, or c. 500,000 data points. For meteorological observations, considering only five parameters, there might have been 50,000 data points/yr/station, or well over 700,000, plus qualitative categorisations of cloud patterns. In addition there was data from 33 routine magnetic and meteorological observatories and other observers from non-polar parts of the globe. Astronomical observations for purposes of keeping chronometers in check every day added further to the tabulations.

---

[27] See further Lüdecke (2004).

[28] Nivanlinna (1999).

[29] Fleming and Seitchek (2009); see also Wood and Overland (2006).

[30] For a return to observations taken in Canada see Newitt and Dawson (1984) and Nevanlinna (1999).

When it comes to aurora, the observations were fewer in number and more qualitative in character. The Finns even tried to produce aurora artificially using an electrical "discharge apparatus", an experiment that failed. Yet, masses of data and sketches were collected and catalogued. The number of aurora observations varied greatly per station. At one end of the scale we have the American expedition to Fort Conger reporting two observations a week over maybe 25–30 weeks, making a total of say 55. At the other end of the scale we have the British expedition to Fort Rae in Canada whose members enjoyed 133 clear winter nights with northern lights and produced a voluminous aurora report to which relevant comments on magnetic disturbances were appended. The other eight Arctic stations perhaps lay somewhere in between these extremes. To this must be added Sophus Tromholt's passionate quest (see below). In total this would give in the order of maybe 1,000 significant observations with details about form, color, position and intensity. This may of course still not be all that much to generalise from, and there seems to be no record of anyone having gone systematically through all the records. The fact that as time went on there were many new northern lights expeditions using more sophisticated methods of observation might have been a disincentive to do so.

Aurora photographs did not come onto the scene until 1885, and even then they gave images of blurred blobs. One of the early experimenters was the independent Danish investigator Sophus Tromholt who – at a site 100 km from Bossekop in Norway – had synchronised his observations of aurora (without a camera) with those taken by the Norwegian and Finnish stations, respectively, south and north of him. He estimated that the lower edge of the aurora lay at an altitude between 74 and 164 km above the horizon, with an average of 133 km, which was a fairly good guess. The Swedes at Kapp Thordsen in Svalbard at first gave a figure of less than 20 km and later adjusted the average to about 57 km, which was still far off the mark. The first useful photographs were by Martin Brendal during a later German expedition to Bossekop (1890–1892) and these were not published until 1900.[31] In the meantime Kristian Birkeland had begun a series of expeditions to northern Norway in passionate pursuit of the mysteries of northern lights, leading to pioneering experimental and theoretical work later on; among other things he simulated northern lights by impacting a little "terella" with a charged electro-magnetic field in a vacuous transparent box, thus opening up a parallel empirical source for dynamic conceptual models.[32] The problem of determining the height of the aurora above the Earth's horizon was solved by Norwegian investigators at Bossekop in 1910–1913. They made 40,000 photographs simultaneously, making triangulations from – in each case – two different locations.[33]

---

[31] Baschin (1900); also Størmer (1955).

[32] Jago (2001) and Kragh (2009).

[33] Bones (2007:109) and Størmer (1913).

4.8 Incidental Findings

In terms of value for money, two independent one-man auxiliary expeditions outside the official IPY programme were very productive, more so than some of the more expensive national expeditions. One was the work of Karl Richard Koch on the coast of Labrador who got German monks at six Moravian brotherhood missions stretched along the coast to produce hourly weather reports.[34] Barometer and temperature readings as well as rain and snow gauges provided interesting comparative material over a large area. Koch himself also analysed one detailed study tracking a depression across the coast, using hourly observations during the winter. He also made studies of solar radiation and outgoing radiation at night. In addition he made observations of Inuit and gave a useful picture of their lifestyle. Koch's findings were incorporated in one of Neumayer's two volumes on the German expeditions. The meteorological part contributed to advancing the understanding of weather patterns in an important Atlantic Gulf stream area.

The other single-man expedition has already been mentioned, the one undertaken by the Dane Sophus Tromholt at Kautokeino in northern Norway. Apart from the richly documented aurora studies he also recorded detailed ethnographic observations of Sami life, their modes of transport and travel, reindeer handling and other aspects, in pictorial detail. His very readable and well-illustrated thick book *Under the Rays of the Aurora Borealis: In the Land of Lapps and Kvaens*,[35] published already in 1885 both in English and Norwegian, had a broad popular impact, stirring the imagination of many people. A fascinating account of seasonal variation in the life of Inuit families on Baffin Island in northern Canada is included in the report of the German expedition to Clearwater (Kingua) Fjord in Neumayer's edition of German results. Here we meet descriptions of caribou-skin tents and sketches of the design and layout of snow houses, as well as drawings of Inuit snow-glasses, hunting-tools, ceremonial masks and other artefacts like carvings. This was by the accompanying physicist who served as an assistant, H. Abbes; his 60-page tract is entitled *The Eskimoes of Cumberland Sound* (1890). A one-man expedition by Lucien Turner to the Hudson's Bay post at Fort Chimo (Ungava Bay, Hudson Strait) supported by the American Signal service also did ethnographical studies. Just as the German expedition was leaving Franz Boas, who later became a famous anthropologist, arrived on the scene to spend a year in the same region, starting a career, and leading to a smaller 20-page paper, "A year among the Eskimo" that is sometimes (wrongly) also associated with IPY-1. Even though Boas' ethnographic work is nowadays much better known, this does not detract from the fact that Abbes' study is still very interesting, useful and valuable. The American expedition to Point Barrow, Alaska, also left some interesting ethnographic records. It is clear that in North America the indigenous people used as helpers were instrumental in

---

[34] Barr (2008:347–348).

[35] Tromholt (1885).

providing important information; had it been today they would have received much greater credit.[36]

Ethnographic studies that may have carried further in their own right are those that came out of the French expedition to Cape Horn. These studies are focused on the life and conditions of the sea-oriented aborigines of the islands of southern Tierra del Fuego, the Yámana that Charles Darwin and Captain Fitzroy on the *Beagle* expedition had classed as the lowest standing human creatures on Earth, and wondered if they could ever be "civilized". By 1882 the Christian mission working out of Ushaia had been busy for some time and information was circulating widely through the journals of missionary societies, so there was an appetite of curiosity that benefited scientific investigations. The French expedition members had good contacts with the Mission that helped them in being able to make casts of Indian faces and putting together a voluminous richly illustrated ethnographic work. This was also picked up by later scientists such as the geographer of Antarctic fame, Otto Nordenskjöld (1869–1928), who visited the region several times, and wrote on the same subject himself already in 1898 upon his return from leading a two-year so-called Magellan Expedition. He praised the French for their scientific contribution, but at the same time complained that they were too critical of the civilising effort of the missionaries, its limited reach and even negative effects.[37]

Since the French expedition had the luxury of a ship, the *Romanche*, during their entire stay, they were also able to do an extensive survey of coastal areas and produced a detailed authoritative map of the eastern part of the Beagle Channel. In addition a large natural history collection was taken back to France. Some of the other expeditions are also remembered for excellent surveying sorties. The Germans on South Georgia made 33 trips on land and 13 by sea, with triangulation that led to an elegant map of the large vicinity of their station at a scale of 1:50,000. When they left the island their ship was loaded with 21 cases of scientific samples of various sorts to be studied back home in Germany, together with the various scientific records that filled two further cases. The German expedition to Baffin Island in northern Canada also did some surveying of Kingua Fjord, adding knowledge from an opposite end of the globe. The American expedition to Fort Conger at Lady Franklin Bay at 80°N latitude, in spite of severe hardships, tragic losses of many lives and internal conflicts, also added importantly to contemporary geographical knowledge. William Barr writes, when Greely and five other survivors finally were able to step ashore in Portsmouth, New Hampshire on 1 August 1884, that they brought south with them "a full set of scientific records spanning two years of the most northerly of the stations of the International Polar Year. In addition their contribution in terms of geographical exploration was the most impressive of any of the expeditions, with Lockwood's trip along the north coast of Greenland and the two

---

[36] For further references to early "Arctic anthropology" see Krupnik et al. (2005:89–90).

[37] Nordenskjöld (1897); it may be noted here that Nordenskjöld himself was an ecumenically minded Christian with a positive view of the white man's civilizing mission – cf. Elzinga and others (2004).

major trips into the interior of Ellesmere Island representing the highlights of these achievements".[38]

The Russian expeditioners to Ostrov Sagastyr' in the delta of the Lena River also did a fair amount of surveying. They were able to produce a nice map of some of the Lena delta area which described some striking geomorphological features and processes of formation of tundra, and discussed the thermal abrasion of the ice-rich sediments. Plants and fragments of fossilised mammoth bones were also collected for natural history museum displays. In addition, some amateur ethnological observations were made regarding the indigenous people with whom they came into contact as occasional helpers or through various encounters.

The members of the Austro-Hungarian expedition to Jan Mayen did, outside their regular duties, some surveying that became the basis of an elegant detailed map of the island at a scale of 1:100,000. This map was the best one available until 1958 when it was replaced by a Norwegian one.[39] The expeditioners also made boat trips during which they dredged for marine specimens. In addition some glaciological investigations were carried out, and there was a report of noctilucent clouds.

In the realm of oceanography the trapped Dutch expedition in the Kara Sea, because it drifted long distances with the ice, was able to make a contribution to the study of marine science that well matched the one of the French expedition to Cape Horn. A zoological laboratory for the study of specimens taken up out of the sea was rigged up in the makeshift hut on the ice. Upstairs in the same hut there was a darkroom for developing photographs. Water temperature and density profiles from sea surface to sea bottom were compiled during the drift. An interesting paper correlating the relationship between wind and ice drift in the Kara Sea, and discussing the influence of streams created by the flow of two major Russian rivers into that body of water, also appeared in a collection published in French in 1910. Oceanographic studies were also done by the Norwegians, but to a lesser extent. The Swedes and Russians also did some hydrographical work.

As already indicated, several of the expeditions delivered interesting collections of botanical and zoological, as well as geological material. In this respect the expedition to South Georgia was perhaps particularly important. Finally, the Swedes may be credited for their study of human physiology and medical aspects of daily diet to compensate negative effects of the lack of sunlight during their sojourn at Kapp Thordsen.

4.9 Conclusion

Overall IPY-1 was a remarkable feat. It became an example of large-scale mobilisation of science with the intention of making results available in a free scientific spirit. Although meteorological studies were limited to the surface of the earth, the idea of

---

[38] Barr (2008:62).

[39] Barr (2003:55).

the importance of atmospheric movements and changes grew. Even though the grid of sites of observation and the timeframe was too limited for making useful generalisations of the kind (natural laws) which the architects of the global exercise had envisioned on the basis of their epistemology, a baseline record of measurements was constructed, one that later investigators could go back to for purposes of comparison. The weakness in the quality of the data and instruments at the same time provided good lessons for improvements in techniques during the decades that followed. A major lesson lay at the managerial level concerning follow-up in order to secure what nowadays is called the "heritage" of a polar year. The weakness in this respect was responsible for passivity in dissemination of results and consequently under-utilisation of the massive stocks of meteorological and magnetic materials, as well as respectable aurora observations, natural history and ethnographic materials that had been assembled. This was a point that was emphasised by early critics and surfaced again during discussions in connection with the planning of IPY-2. While paying due respect to all that was achieved during IPY-1, and marvelling over the fact that this was possible despite conflicts at various stages of planning and implementation, as well as severe hardships suffered by the foot-soldiers out in the field doing the observations in many cases, we must at the same time avoid exaggerating the value of the scientific results by reading aspects of the present into the past.

Acknowledgement This is made of helpful comments provided by Rip Bulkeley and Cornelia Lüdecke on a draft of this chapter.

References

Andrée, S.A. 2008: *Svenska Fysikaliska-Meteorologiska Expeditionen Till Spetsbergen Juli 1882-September 1883*. S.A. Andrées dagbok från deltagande I det första internationella polaråret. Grenna: Stiftelsen Grenna (Museum skriftserien 7).

Baker, F.W.G. 1982: The First International Polar Year, 1882–1883. *Polar Record* 21(132): 275–285.

Baker, F.W.G. 2009: The First International Polar Year (1882–1883): French Measurements of Carbon Dioxide Concentrations in the Atmosphere at Bahia Orange, Hoste Island, Tierra del Fuego. *Polar Record* 45(234):265–268.

Barr, S. 2003: *Det Første Internasjonale Polarår 1882–1883* [The First International PolarYear 1882–83]. In: Jan Mayen – Øyas Historie Gjennom 1500 år, pp 45–57. [The Island's History Through 1500 Years.] Oslo, 2nd edition published by Barr.

Barr, W. 2008: *The Expeditions of the First International Polar Year 1882–1883,* 2nd edn. Calgary: The Arctic Institute of North America.

Baschin, O. 1900: Dier Ersten Nordlichtfotografien, Aufgenomen in Bossekop, *Meteoroligische Zeitschrift* 17(1900): 278.

Birkeland, Kr. 1908: *The Norwegian Aurora Polaris Expedition 1902–1903*. Vol. I, *On the Cause of Magnetic Storms and the Origin of Terrestrial Magnetism.* Christiania: H. Aschehoug & Co.

Bones, S. 2007: Norway and past International Polar Years – a historical account. *Polar Research* 26(2 – Sept.): 195–203.

Commission Internationale Polaire 1913: *Proces-verbal Des Séances De La Commission Internationale Polair tenue à Rome en 1913: Presenté* par G. Lecointe. Bruxelles: Hayez.

Daniel, H. 1973: *One Hundred Years of International Co-Operation in Meteorology*. Geneva: WMO (Report no. 345).

Elzinga, A., T. Nordin, D. Turner, and U. Wråkberg (eds) 2004: *Antarctic Challenges. Historical and Current Perspectives on Otto Nordenskjöld's Antarctic Expedition 1901–1903*. Göteborg: Royal Society of Arts and Sciences.

Fleming, J.R., and C. Seitchek 2009: Advancing polar research and communicating its wonders: Quests, questions, and capabilities of weather and climate studies in international polar years. In I. Krupnik, M.A. Lang, and S.E. Miller (eds) *Smithsonian at the Poles. Contributions to International Polar Year Science,* pp. 1–12. Washington, DC: Smithsonian Institute Scholarly Press.

Jago, L. 2001: *The Northern Light*s. New York, NY: Alfred Knopf.

Kragh, H. 2009: The Spectrum of the Aurora Borealis: From Enigma to Laboratory Science. *Historical Studies in the Natural Sciences* 39(4): 377–417.

Krupnik, I., M. Bravo, Y. Csonka, G. Hovelsrud-Broda, L. Müller-Wille, B. Poppel, P. Schweitzer, and S. Sörlin 2005: Social Sciences and Humanities In The International Polar Year 2007–2008: An Integrating Mission. *Arctic* 88(1): 88–99.

Latter, J.H. 1981: Tsunamis of volcanic origin: summary of causes, with particular reference to Krakatoa, 1883. *Bulletin of Volcanology* 44(3 – Sept): 467–490.

Levere, T.H. 1993: *Science and the Canadian Arctic. A Century of Exploration 1818–1918*. Cambridge: Cambridge University Press.

Lüdecke, C. 2004: The First International Polar Year. A Big Experiment With Small Science Equipment. *Proceedings of the International Commission of Meteorology* 1(1): 55–64.

Lüdecke, C. 2008: From the Bottom of the Stratosphere – Arctic Climate as Seen from the 1st International Polar Year (1882–1883) Until the End of World War II. In: S. Brönniman, J. Luterbacher, T. Ewen, H.F. Diaz, R.S. Stolarsky, and Q. Nue (eds) *Climate Variability and Extremes During the Past 100 Years,* pp 29–45. Berlin: Springer.

Nevanlinna, H. 1999: Geomagnetic Observations at Sodankylä During the First International Polar Year (1882–1883). *Geographica* 35(1–2): 15–22.

Newitt, L.R., and E. Dawson 1984: Magnetic Observations at the International Polar Year Stations in Vanada. *Arctic* 37(2): 255–262.

Nordenskjöld, O. 1897: *Från Eldslandet. Skildringar Från Den Svenska Expeditionen till Magellansländerna 1895–1897*. Stockholm: Norstedt & Söner Förlag.

Nicolet, M. 1984: The International Geophysical Year (1957–1958). Great Achievements and Minor Obstacles. *GeoJournal* 8(4): 303–320.

Nyberg, A. 1982: Den Svenska Polarexpeditionen 1882–1883. In: *Polarforkning förr, Nu Och I Framtiden,* pp 7–23. Stockholm: Kungliga Vetenskapsadkademiens Informationsavdelning.

Størmer, C. 1913: On an Auroral Expedition to Bossekop in the Spring of 1913. *The Astrophysical Journal* 38(4): 311–314.

Størmer, C. 1955: *Polar Aurora*. Oxford: Claridon Press.

Summerhayes, C.P. 2008: International Collaboration in Antarctica: The International Polar Years, the International Geophysical Year, and the Scientific Committee on Antarctic Research. *Polar Record* 44(231): 321–334.

Tammiksaar, E., N.G. Sukova, and I.R. Stone 2009: Russia and the International Polar Year, 1882–1883. *Polar Record* 45(234): 215–223.

Tollner, H., R. Kanitschreiber, and F. Kopf. 1934: *Vierzehn Monate in der Arktis*. Wien-Innsbruch-München: Verlagsanstalt Tirolia.

Weslawski J.M., and J. Legezynska 2002: Chances for Arctic Survival: Greely's Expedition Revisted. *Arctic* 55(4): 373–379.

Tromholt, S. 1885: *Under the Rays of the Aurora Borealis: In the Land of the Lapps and Kvaens.* London: S. Low, Marston, Searle and Rivington.

Wood, K.A., and J.E. Overland 2006: Climate Lessons from the First International Polar Year. *Bulletin of the American Meteorological Society* 87(12): 1685–1687.

Chapter 5
International Cooperation in Antarctica 1901–1904

Cornelia Lüdecke

It took some years after the first International Polar Year (1882–1883) until magnetic measurements were coordinated in the Commission for Terrestrial Magnetism and Atmospheric Electricity, within the International Meteorological Committee from 1891. The investigation of the magnetic field of the earth became one of the most important goals of the leading nations, which invested a lot of money in the establishment of magnetic observatories at home and in their colonies.

When the XIth German Geographer's Day took place in Bremen on 17–20 April 1895 under the presidency of the director of the German Maritime Observatory at Hamburg, Georg von Neumayer (1826–1909), the future exploration of the south polar region was discussed in one of the sessions.[1] Obviously, the time was ripe to establish a German Commission on South Polar Exploration with Neumayer as chairman, who had been promoting German south polar research since the mid-1860s.[2]

Clements Markham (1830–1916), president of the Royal Geographical Society, had a similar dream of sending an expedition toward the South Pole. There had been a British absence of about 60 years since James Clark Ross (1800–1862) had determined the magnetic pole of the southern hemisphere at 75° 5′S and 154° 25′E during his expedition form 1839 to 1843. It was Markham's turn to organize the VIth International Geographical Congress in London on 26 July–3 August 1895[3] and he invited Neumayer to give a talk on south polar research supporting his own ideas. The need for international collaboration was also addressed. At the end of the session, the General Assembly of the Congress recommended exploration of the last white spots on the globe, i.e., the south polar region:

C. Lüdecke (✉)
Institute of History of Science, Mathematics and Technology, University of Hamburg, Germany
e-mail: C.Luedecke@lrz.uni-muenchen.de

---

[1] Lüdecke (2003).

[2] Lüdecke (2007a, b).

[3] Markham (1986) (posthum).

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_5,

> Antarctic Exploration
> That the Congress record its opinion that the exploration of the Antarctic Regions is the greatest piece of geographical exploration still to be undertaken. That, in view of the additions to knowledge in almost every branch of science which would result from such a scientific exploration, the Congress recommends that the scientific societies throughout the world should urge, in whatever way seems to them most effective, that this work should be undertaken before the close of the century.[4]

When the VIIth International Geographical Congress took place in Berlin on 28 September–4 October 1899, an entire session was devoted to Antarctic research, during which the fields of work of the planned German and British expeditions were defined. Markham divided a map of Antarctica into four quadrants starting at the 0° Greenwich meridian.[5] The Weddell and Enderby quadrants (i.e., between 270° W and 90° E) were designated as the working area of the German expedition, while the Ross and Victoria quadrants (90° E to 270° W) were British according to the earlier work of the Ross expedition.

Additionally, the leader of the German expedition, Erich von Drygalski (1865–1949), proposed an international cooperation of meteorological and magnetic measurements similar to the IPY-1 according to Neumayer's ideas. Finally, a scientific collaboration was agreed upon within the international cooperation for the exploration of the south polar region, with the congress secretariat at Berlin functioning as the focal point.

The planned British and German expeditions were to carry out hourly simultaneous meteorological and magnetic measurements using the same instrumentation and the same time of observation.[6] Magnetic-term days with hourly observations were defined on the 1st and 15th of each month from 1 February 1902 until 15 February 1903. Magnetic-term hours with intensified measurements were to start on the same day from 0 to 1 a.m. and continued on the next term day starting an hour later lasting from 1 to 2 a.m., so as to cover each hour of a day during the year. Meteorological observations at 12.00 noon Greenwich Time should be made from 1 October 1901 until 31 March 1903 including all merchant and navy ships sailing on a route south of 30°S.

In the end a German, a British, and a Swedish expedition were sent to Antarctica in 1901, being followed by a Scottish expedition in 1902 (Fig. 5.1).

With regard to the international collaboration, people were convinced that "[r]ivalry there will be; but it will consist in the endeavour of each Expedition to obtain the best possible scientific results. There will be cooperation as well as division of labor; while Sweden will specialize on the geology of Terre Louis Philip [the Antarctic Peninsula], and Scotland on the deep sea investigation and meteorology [it was planned to investigate the Weddell Sea area], the German [this expedition wanted to investigate the unknown Antarctic coast south of Kerguelen at 90° E] and British [to Victoria Land at the Ross Sea] Expeditions will devote special attention

---

[4] Keltie and Mill (1896:780).

[5] Markham (1986) (posthum).

[6] Bidlingmaier (1901).

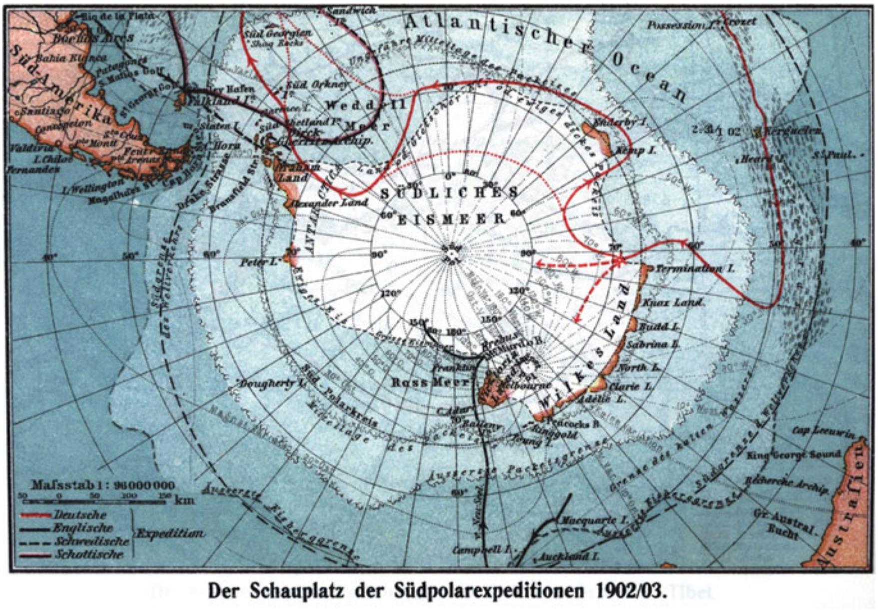


Fig. 5.1 Expeditions to Antarctica (1902–1904) (Kalender, 1903)

to magnetism. In all of them purely geographical work will necessarily form an important feature."[7]

These expeditions also established base stations which were not influenced by the Antarctic continent (Fig. 5.2 and Table 5.1). Additionally, the Göttingen Academy of Sciences established a geophysical observatory in Apia at the German colony in Samoa to fill the gap in the Southern Hemisphere. Independent of the Antarctic cooperation, Kristian Birkeland (1867–1919) led the *Norwegian Aurora Polaris Expedition* from 1902 to 1903. He established four Arctic stations on Iceland, Finland, Svalbard, and Novaya Zemlya for simultaneous measuring according to the instructions of the magnetic cooperation.[8] When Robert F. Scott wintered a second time in Antarctica and a French Antarctic expedition set sail in 1903, the international cooperation was expanded for a second year.

The main idea of the cooperation had been scientific collaboration and exchange of data, instead of political rivalry which existed especially between Great Britain and the German Reich. The latter was a strongly developing sea power and a future menace for Great Britain. Neumayer expressed it this way: "This working together of nations is qualified to consolidate peace between them and to stimulate the competition on a field ennobling the human race."[9]

---

[7] Bruce (1901:466).

[8] Birkeland (1908, 1913).

[9] Neumayer (1901:454).

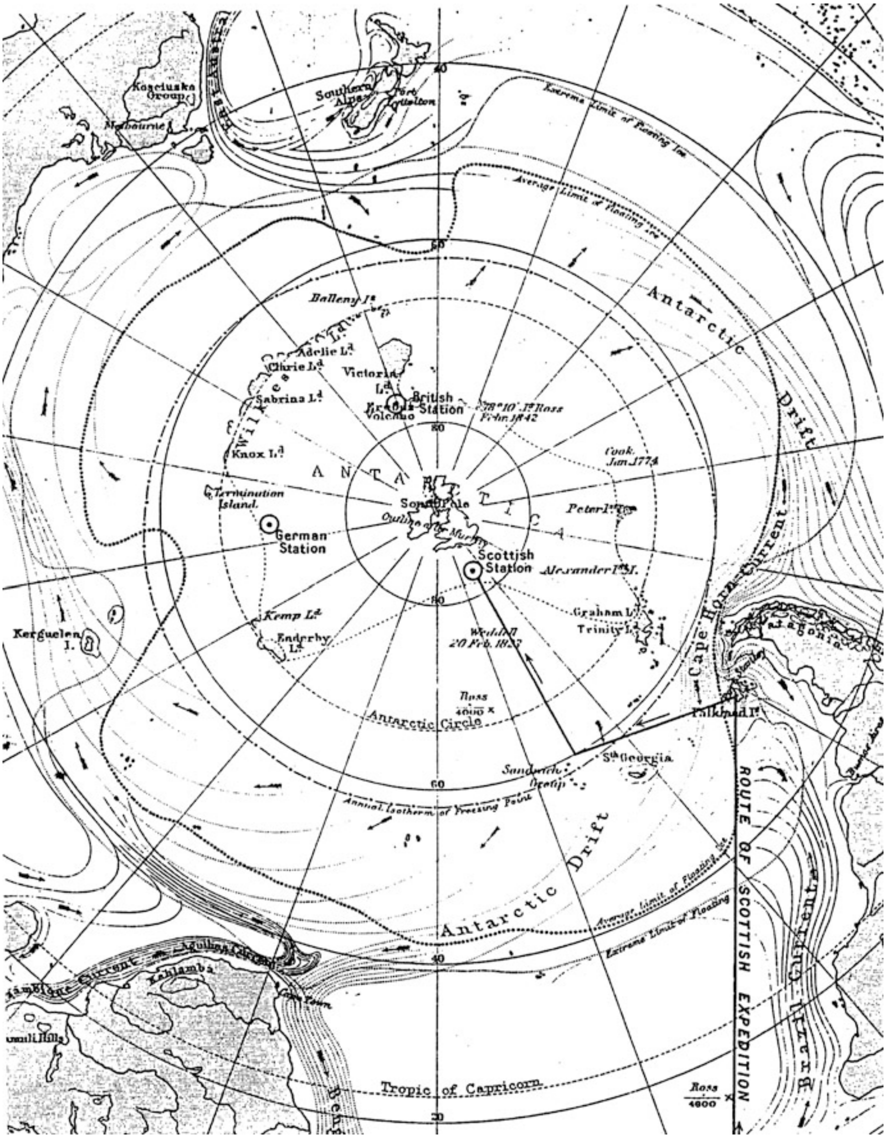


Fig. 5.2 Planned Antarctic stations of the international cooperation of meteorological and magnetic measurements (1902–1904) (Bruce, 1901)

New techniques were introduced in the polar regions, such as ascents of manned captive balloons. Robert Falcon Scott (1868–1912) had been the first to use such a balloon for reconnaissance up to 700 ft (213 m) on 4 February 1902.[10] Drygalski

---

[10] Scott (1905, vol. I:191).

Table 5.1 Expeditions, base stations, and additional cooperating stations of the international cooperation in Antarctica (1901–1904), after Lüdecke (2003)

Period	Country	Station	Remark	Measurements
1901–1903	Germany	Wilhelm II Land (south of Kerguelen)	German wintering station	Comprehensive measurements
1901–1903	Sweden	Snow Hill Island, Hope Bay, Paulet Island (Antarctic Peninsula)	Swedish wintering station	Comprehensive measurements
1901–1903	Great Britain	Victoria-Land (Western Ross Sea)	British wintering station	Comprehensive measurements
1901–1903	Germany	Kerguelen Island (southern Indian Ocean)	German base station	Magnetism and meteorology
1901	Great Britain	Christchurch (New Zealand)	British base station	Magnetism
From 1902 onward	Argentine	Staten Island	Swedish base station	Meteorology, magnetism and hydrography
From 1902	Germany	Apia (German Samoa)	Installed by the Göttingen Academy of Science	Magnetism, meteorology, air-electricity, hydrology and seismics
1902–1903	Norway	Iceland, Svalbard, Novaya Zemlya, Bossekop (Norway)	Aurora Borealis Expedition	Magnetism
1902–1904	Scotland	Laurie Island (South Orkneys)	Scottish wintering station	Comprehensive measurements including extensive oceanographic work
1903–1904	Scotland	Cape Pembroke (Falkland Islands)	Scottish base station	Meteorology
1903–1905	France	L’Île Wandel, today: Booth Island (Western Antarctic Peninsula)	French wintering station	Comprehensive measurements

followed on 29 March 1902 and reached a height of over 500 m (over 1,700 ft).[11] He took thermometer readings during his ascent and observed a significant inversion of the boundary layer above the snow-covered ice (Fig. 5.3).

---

[11] Drygalski (1989:157f).

Fig. 5.3 Balloon ascent at the German winter station of the *Gauss* at Kaiser Wilhelm II Land on 29 March 1902 (Private possession of Gazert, Partenkirchen)

Although the Antarctic network of stations was far from as dense as the Arctic network of the Polar Year, the analysis of the meteorological data indicated that *terra incognita* was a continent and not a Southern Ice Sea (*Südliches Eismeer*) as depicted in Fig. 5.1. Data on the magnetic field of the earth, measured by the British *Discovery* and the German *Gauss*, did not cover large areas, but improved the nautical charts of the southern seas.

A comparison of the Norwegian and British data collection proved for the first time that magnetic storms occurred simultaneously in the northern and the southern hemisphere. They only differ in day and night time effects as well as in seasonal effects.[12]

Fifty-three German ships participated in the meteorological cooperation and sent their data consisting of time, location, air pressure and temperature, wind direction and speed in Beaufort, clouds (class, cloudiness, direction of movement), and further remarks on special weather phenomena to Berlin after their return.[13] The Hydrographical Office in Washington D.C. provided additional observations from

---

[12] Chree (1909).

[13] Meinardus und Mecking (1911:11 pp.).

350 ships of different nationalities and also Argentine sent material from 31 land stations. Further data came from British ships and stations in the British colonies. The Antarctic expeditions and their base stations delivered the most interesting material. Unfortunately, the data of the French Antarctic expedition could not be included in the analysis. Finally, contributions from 1,000 German ship logs were added which still had to be reduced to Greenwich time.

Altogether about 600,000 single data were available in spring 1906, which were used to construct 913 daily synoptic weather charts. In a second step, 30 charts of monthly means and several other quarterly, seasonal, and yearly charts were processed.[14] These charts showed that data was only available between South America and the Antarctic Peninsula to construct isobars and isotherms, when ships sailed round Cape Horn. The meteorological network had not been by far dense enough to follow the tracks of storms and polar depressions, but they were useful in descriptive respects. Thus Neumayer's idea of drawing weather charts to improve sailing directions of the Cape Horn Route could not be realized. However, when the meteorological atlas was published during the World War I, it was considered to be a "remarkable monument of international work of peace."[15] Nevertheless, at that time these maps were no longer crucial for the Cape Horn Route, because the Panama Canal was opened on 3 August 1914.

In addition, German geographer Wilhelm Meinardus (1867–1952) used pressure and wind data to calculate the mean height of the Antarctic continent, which resulted in 2,000 ± 200 m.[16] Geographical investigations indicated that Antarctica was a big continent covered by ice. All in all the International Cooperation in Antarctica (1901–1904) was an important milestone in further expanding the idea of international scientific collaboration during IPY-1 to the investigation of the south polar region. This led to a first concrete vision of the sixth continent.

Acknowledgement My thanks go to Volker Gazert (Partenkirchen) for the use of the picture of the balloon ascent in Antarctica (Fig. 5.3).

References

Bidlingmaier, F. 1901: Die erdmagnetisch-meteorologischen Arbeiten und Ausrüstungsgegenstände der deutschen Südpolar-Expedition und die Vorschläge für die internationale Kooperation während der Zeit der Südpolar-Forschung 1901–1903. *Petermanns Geographische Mitteilungen* 47, pp. 152–153. Translation: *Scottish Geographical Magazine* (9): 467 ff.

Birkeland, K. 1908, 1913: *The Norwegian Aurora Polaris Expedition, 1902–1903. 2 Vols*. Christiania: Aschehoug.

Bruce, W.S. 1901: The German South Polar Expedition. *Scottish Geographical Magazine* 17(9): 461–467. Vol. 17.

---

[14] Meinardus and Mecking (1915).

[15] Meinardus (1916:329).

[16] Meinardus (1909).

Chree, C. 1909: *National Antarctic Expedition 1901–1904. Magnetic Observations*. London: Royal Society.

Drygalski, E. v. 1989: *The Southern Ice-Continent: The German South Polar Expedition Aboard the Gauss 1901–1903*. Bluntisham and Norfolk: Bluntisham Books and the Erskine Press.

Kalender, 1903: Geographen Kalender 1903/1904. Gotha, map 11.

Keltie, J.S., and H.R. Mill 1896: *Report of the Sixth International Geographical Congress, held in London, 1895*. London: John Murray.

Lüdecke, C. 2003: Scientific collaboration in Antarctica (1901–1903): A Challenge in Times of Political Rivalry. *Polar Record* 39(208): 25–48.

Lüdecke, C. 2007a: Georg Balthasar von Neumayer (1826–1909). In: B. Riffenburgh (ed) *Ensyclopedia of the Antarctic,* Vol. 1, pp. 668–669. New York: Routledge.

Lüdecke, C. 2007b: Auf zum Südpol! Georg von Neumayer und sein Einsatz für die deutsche Südpolarforschung. In: G. Wolfschmidt (Hrsg.) *Hamburgs Geschichte einmal anders – Entwicklung der Naturwissenschaft, Medizin und Technik – Teil 1,* pp. 200–215. Norderstedt: Books on Demand (Nuncius Hamburgensis – Beiträge zur Geschichte der Naturwissenschaften, Band 2).

Markham, C. 1986 (posthum): Antarctic Obsession. A Personal Narrative of the Origins of the British National Antarctic Expedition 1901–1904. C. Holland (ed), Norfolk: Bluntisham Books and the Erskine Press

Meinardus, W. 1909: Die mutmaßliche Höhe des antarktischen Kontinents. Petermanns *Geographische Mitteilungen*, Part I: (9): 304–309; Teil II: (12): 355–360.

Meinardus, W. 1916: Über die meteorologischen Arbeiten der Deutschen Südpolar-Expedition 1901 bis 1903. Vol. 43. *Annalen der Hydrographie und Maritimen Meteorologie* (6): 327–329.

Meinardus, W., und Mecking, L. 1911: Das Beobachtungsmaterial der internationalen meteorologischen Kooperation und seine Verwertung nebst Erläuterungen zum meteorologischen Atlas. In: E.v. Drygalski (ed) *Deutsche Südpolar-Expedition 1901–1903,* pp. 1–42. Georg Reimer, Berlin, Bd. III: Meteorologie I, 2. (1).

Meinardus, W., und Mecking, L. 1915: Atlas Meteorologie. In: E.v. Drygalski (Hrsg.) *Deutsche Südpolar-Expedition 1901–1903 im Auftrage des Reichsamtes des Innern*. Berlin I (2–4): Verlag Georg Reimer.

Neumayer, G.v. 1901: *Auf zum Südpol! 45 Jahre Wirkens zur Förderung der Erforschung der Südpolarregion 1855–1900*. Berlin: Vita Deutsches Verlagshaus.

Scott, R.F. 1905: *The Voyage of the Discovery,* 2 Vols. London: Thomas Nelson and sons.

Chapter 6
The Second International Polar Year 1932–1933

Cornelia Lüdecke and Julia Lajus

After the first International Polar Year, magnetism and polar research were institutionalised by the International Meteorological Committee (IMC) within the Commission for Terrestrial Magnetism and Atmospheric Electricity established in 1891.[1] The Commission for Aeronautics followed in 1896 under the presidency of the leading aerologist Hugo Hergesell (1859–1938) to co-ordinate aerological ascents to investigate the meteorological conditions of the upper air on an international basis.[2] At the end of the nineteenth century, aerological methods with registering instruments connected to kites and captured balloons to measure air pressure indicating the height, temperature and humidity had been well-established. By soundings of free-flying pilot balloons with two theodolites, wind speed and direction could be derived. The understanding of meteorological processes had made huge progress with the discovery of the stratosphere and the tropopause in 1902.[3] During a Danish expedition to the east coast of Greenland 1906–1908, Alfred Wegener (1880–1930) successfully introduced aerology to polar regions[4] (Fig. 6.1). Due to Hergesell's initiative a German Geophysical Observatory was established on the west coast of Spitsbergen in 1911 in context with Graf Ferdinand von Zeppelin's (1838–1917) plan to explore the High Arctic with his dirigibles.[5]

At the meeting of the then-called International Commission for Scientific Aeronautics in Vienna in 1912, Hergesell reported about a visit to his institute at

C. Lüdecke (✉)
Institute of History of Science, Mathematics and Technology, University of Hamburg, Germany
e-mail: C.Luedecke@lrz.uni-muenchen.de

J. Lajus (✉)
Center for Environmental and Technological History, European University at St Petersburg, Russia
e-mail: jlajus@eu.spb.ru

---

[1] Cannegieter (1963:22).

[2] Cannegieter (1963:164ff).

[3] Hoinka (1997).

[4] Wegener (1909).

[5] Dege (1962).

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_6,

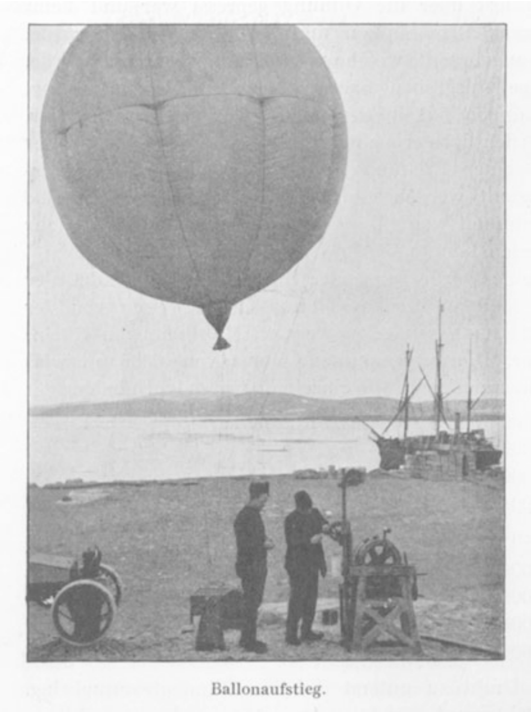


Fig. 6.1 Balloon ascent on the west coast of Greenland in 1906 (Wegener 1909:14)

Strassburg by the Norwegian polar explorer Roald Amundsen (1872–1928) who wished to discuss a new Arctic expedition after his successful conquest of the South Pole in December 1911. Hergesell saw a possibility that "Amundsen may be able to establish an aerological station in North-West America with the help of the Carnegie Institution."[6] Hergesell was very much interested in the realisation of Amundsen's plan and was looking for support from his colleagues. After his presentation, the aeronautic commission expressed the wish to maintain the important German station on Spitsbergen as long as possible[7] and that the "aerological work which will be carried out the next year in high polar latitudes by the expeditions of Captain Amundsen", who planned to cross the Arctic basin in 1913, "by the Swiss expedition, by the Danish expedition for the exploration of Greenland,[8] and by the aerological [German] station at Spitzbergen be completed by aerological observations on the shores of the Arctic Ocean and in the Island of Novaya Zemlya."[9]

---

[6] Hergesell (1913:42).

[7] Cannegieter (1963:44), Rykatcheff (1913).

[8] There seems to be a lack of correct information. The Swiss expedition referred to Alfred de Quervain (1879–1927), who crossed Greenland in 1912 and the Danish expedition referred to Johan Peter Koch (1870–1928) and Alfred Wegener (1880–1939), who crossed Greenland in 1913.

[9] Rykatcheff (1913:43–44).

Consequently the commission suggested selecting the stations of the Polar Year 1882–1883 in Russia on Novaya Zemlya and at the Lena delta and “to ensure that corresponding stations in Europe, Asia and America may be in operation”.[10] Additional aerological observations near the cold pole in Siberia with expeditions to Jakutsk and Werchojansk[11] were proposed by the St Petersburg Academy of Sciences.

At the 10th Meeting of the International Meteorological Committee in Rome in 1913 the president of the Commission for Terrestrial Magnetism and Atmospheric Electricity, the Russian General Mikhail A.Rykachev (1840–1919), presented his proposal “concerning the study of different layers of the atmosphere in polar regions”.[12] Ewoud van Everdingen (1873–1955), director of the Dutch Meteorological Service and one of the members of the International Meteorological Committee, was among the members of Rykachev’s commission and supported the idea. A special Polar Commission of five (Rykachev, Amundsen, Hergesell, Ryder, Stupart)[13] was nominated under the presidency of Rykachev to follow up the idea. They adopted the resolution that the Academy of Sciences in St Petersburg soon would effectuate “to initiate aerological observations in the region of the Siberian pole independently of the international undertaking”,[14] i.e. the polar expeditions planned for 1913 as mentioned before.

Additionally, the Aeronautic Committee regarded the “opportunity for the establishment of polar stations for the study of the atmospheric conditions of the different atmosphere strata” as exceptionally favourable in “consideration of the probable continuance of the aerological station in Spitzbergen and of the co-operation of the expedition projected by Amundsen and by the Canadian Government”.[15] The programme was adopted enthusiastically and the Commission was then renamed the Commission for Polar Meteorology.[16] The commission met in Copenhagen (28 February–1 March 1914) to discuss a network of aerological stations around the Arctic waters in combination with similar observations during Amundsen’s planned drift over the North Pole in 1915[17] (see Fig. 8.1). At this meeting experts like de Quervain and Wegener (acting as secretary) were among the four new members. Unfortunately the plans had to be modified, because Amundsen’s expedition was postponed in the meantime and it seemed that it quite possibly would never to take place due to insufficient funds. Finally, all efforts to install a new network of Arctic

---

[10] Rykatcheff (1913:44).

[11] Modern English spelling: Yakutsk and Verkhoyansk.

[12] Rykatcheff (1913:42).

[13] Capt. C. H. Ryder had conducted aurora observations in northeast Greenland 1891–1892 and became director of the Central Meteorological Institute in Copenhagen, Denmark, while Frederick Stupart came from the Meteorological Service in Toronto, Canada

[14] Meteorological Committee (1913:15).

[15] Meteorological Committee (1913:15).

[16] Cannegieter (1963:185).

[17] Talman (1914).

stations came to an end due to the outbreak of the First World War in the last days of July 1914.

After the First World War, civil aviation started with regular traffic between western European capitals.[18] In this context the investigation of the upper air by aircraft at single stations was an important improvement of observing methods providing crucial information for briefing the pilots. Even a Commission for the Application of Meteorology to Aerial Navigation was founded in 1919 within the now-called International Meteorological Organisation (IMO). When Amundsen planned a new expedition to leave Nome, Alaska, in 1922 with Arctic stations equipped by Canada, Great Britain, Finland and Norway (Jan Mayen), and the Dane Knud Rasmussen (1879–1933) planned his 5th Thule expedition to start from Thule on the northwest coast of Greenland and intended wintering north of the Hudson Bay in Canada during 1922–1924, the appointed independent Polar Commission of ten members under the presidency of Sir Napier Shaw recommended the continuation of observations in high latitudes already started and pronounced the hope: “that the Governments will provide funds for the continuation of their co-operation during the whole period of the Amundsen expedition 1921–1925 and if possible, permanently”.[19] Although Amundsen’s expedition was cancelled, the whole initiative led to the opening of the Geophysical Observatory on Matotchkin Shar on Novaya Zemlya in 1923.[20] Besides the Polar Commission then was united with the Commission for the Réseau Mondial in 1921 and became the Commission for the Réseau Mondial and Polar Meteorology.

A new milestone in aerology was the invention of the radiosonde at the end of the 1920s. This system carries a sounding instrument for meteorological parameters, the data of which were transmitted by radio waves to a ground based station, where also wind speed and direction could be calculated by the position of the balloon as it rose. A network of many stations allowed the 3-D investigation of the higher atmosphere up to 30 km height and especially a detailed investigation of the newly discovered region of high wind speeds later called the jet stream.[21] In addition, the polar front theory had been developed in the 1920s by the Bergen School of the Norwegian meteorologist Vilhelm Bjerknes (1862–1951), which provided the foundation of modern weather forecasting.[22]

In the middle of the 1920s, the discovery of an electrically conductive layer at a great height had directed attention to the ionosphere, which became most important for the new wireless communication techniques by radio waves.[23] This conductive layer was believed to be connected with sun radiation and the aurora, which seemed

---

[18] Cannegieter (1963:51).

[19] Cannegieter (1963:186).

[20] Breitfuß (1939:164).

[21] Georgi (1928a, b), Lewis (2003).

[22] Friedmann (1989).

[23] Secrétariat (1930b:57), Laursen (1982).

to be associated with so-called magnetic storms, which could not be investigated sufficiently by single expeditions to high latitudes. As a very valuable consequence of the new communication methods, precise time signals were available by radio all over the world for co-ordinated determination of the height of the aurora by photography from two distant places. In addition, high resolution registering magnetometers were already available at that time which allowed the investigation of magnetic disturbances and their relationship to auroral displays in greater detail.

A new aspect of global transport arose after the First World War with regard to the great development of airships during the war. As aircraft engines were still too small to cover great distances or to carry heavy loads, airships came into the focus of global planners. The economic recovery led to the idea of trans-Arctic air traffic. One of the promoters had been the retired German Capt. Walter Bruns (1889–1955), who suggested a trans-Arctic traffic route for airships from Europe to Tokyo or San Francisco in 1919 (Fig. 6.2), which became the basis for further discussions in Germany.[24]

However, before this could happen more meteorological information, especially about regions of fog development and the height of inversion layers of the interior of the Arctic, was needed, as it would be very dangerous for airships to accumulate a weight of ice from damp air at freezing temperatures. The Swedish Andrée balloon expedition to the North Pole of 1897 had still not been found (not until 6 August 1930) and it served as a warning example. It was necessary first to carry out an expedition in order to study the feasibility of the undertaking. This led in 1924 to the foundation of the International Society for the Exploration of the Arctic Regions by Means of Aircraft (Aeroarctic) under the presidency of Fridtjof Nansen (1861–1930).[25] Twenty-one nations joined, not least Germany and the Soviet Union, which were also mainly represented on the Executive Board and committees. Some members already had deep insight into the establishing of an international polar organisation, because Everdingen (now president of the International Meteorological Organisation and council member of the Aeroarctic) had been the Dutch deputy and Henryk Arctowski (1871–1958, Polish member of the *Belgica* expedition, which was the first to winter over in Antarctica – in 1898) had been the Polish deputy of the International Polar Commission 1908–1915.

During the planning of the first expedition with the airship LZ 127 *Graf Zeppelin* to the Russian Arctic, more meteorological data from high latitudes were needed. The issue of meteorological stations in the Arctic was tabled during a meeting of a special committee of the Aeroarctic in Berlin on 16 November 1926, right after the first General Assembly. Among the nine members of the special committee were vice admiral Hugo Dominik (1872–1933) from the Executive Board and director of the German Maritime Observatory (Deutsche Seewarte) in Hamburg; Johannes Georgi (1888–1972), meteorologist at the same observatory; Leonid

---

[24] Bruns (1927).

[25] Lüdecke (1995:55–56, 138–140, 163–165).

Fig. 6.2 Map of the planned trans-Arctic air routes for world traffic with airships from Europe to North America to Japan (Kohlschütter 1927:13)

Breitfuß (1864–1950), a Russian zoologist, polar explorer and chronologist of polar research of German origin living in Berlin;[26] Pavel V. (Paul Ludwig von) Wittenburg (1884–1968), geologist, secretary of the Yakutsk Commission of the Academy of Science of the USSR and Rudolf L. Samoilowitsch[27] (1881–1939), director of the Institute for the Exploration of the North in Leningrad (today St Petersburg).[28] It is interesting to note that both Wittenburg and Samoilowitsch were graduates

---

[26] Lüdecke (2001).

[27] Modern English spelling for his name is Samoilovich, but here we keep the German spelling Samoilowitsch which he used himself. For a recent biography of Samoilovich, who was repressed by Soviet authorities in 1939, see Koriakin (2007).

[28] Berson and Breitfuß (1927:111–112).

from German universities and thus spoke fluent German (Wittenburg's father was a German who lived in Russia, while Samoilowitsch originated from a Jewish family) and had very good connections in German scientific circles.

Wittenburg gave a report about the recent actions of the Yakutsk Commission and the plan to establish three radio stations on the island Bolshoi Liakhovskoi (New Siberian Islands/Novosibirskiye Ostrova), on the northern tip of Novaya Zemlya and on Zemlya Frantsa Iosifa. He encouraged that the latter station should be built and maintained by the Soviet Union, Germany and Norway. Dominik offered to lobby for special funds for the Maritime Observatory to equip the planned Russian Arctic stations with instruments. He appreciated very much that a permanent station for meteorological and aerological measurements would be installed on Zemlya Frantsa Iosifa in collaboration with different countries. He also wanted to recommend that the great plan include yearly replacement of the personnel by the German government.

In this context Breitfuß (Fig. 6.3) encouraged a repeat of the IPY-1 with a broader framework and a longer observing period. Especially the investigation of the southern extent of the Arctic ice limit in the Greenland Sea, Barents Sea and Kara Sea should be included, which would allow the determination of the geographical extent

Fig. 6.3 Leonid Breitfuß (1864–1950), picture taken 1936 (Herrmann's estate, Bonn)

of the Arctic ice. This information was assumed to be crucial for weather forecasting and should be measured in February, May, August and November from ships and aircraft.

Subsequently Georgi presented the preliminary results of pilot balloon measurements up to 21,200 m in Iceland, where he detected a cold air outburst from the Arctic up to the stratosphere. It seemed to be necessary to monitor these events in the region between Iceland and Greenland with aerological ascents in greater detail than before. He stated that he would try to make ascents from the sea with the help of the German navy. It would be very useful if all nations would provide the results of their work in the Arctic. Finally, he supported Breitfuß's idea, because it seemed to him to be quite reasonable for working together to repeat the organisation of the IPY in one or two years.

After a long discussion between Wittenburg, Samoilowitsch, Dominik, Breitfuß and Georgi a resolution was adopted, which the Aeroarctic recommended should be executed:

1. The German and Russian observations already carried out as well as planned were highly important for the goal of the Aeroarctic. Especially aerological investigations should be continued and developed.
2. The Soviet government should be asked to develop the network of radio weather stations especially on Zemlya Frantsa Iosifa and on the northern tip of Novaya Zemlya, the New Siberian Islands and on Severnaya Zemlya (before 1926 = Zemlya Nikolaya II/Nicolaus II Land).
3. With the establishment of such stations the main goal of the Aeroarctic would be most effectively supported. "The permanent monitoring of the Arctic is so to speak thought of as a permanent repetition of the International Polar Year 1882/83, only with one difference that the airship as a means of transport would be introduced."[29] They would enable the setting up and maintenance of permanent stations more or less at the same time and at any place even in the inner Arctic. This was the major difference from the IPY-1 which acted only at the continental periphery of the Arctic.

A year later Georgi acted on Breitfuß' idea of a second Polar Year and opened another route for promotion, when he made a suggestion to that effect during a meeting at the German Maritime Observatory on 23 November 1927.[30] Finally, on 30 December 1927, it had been Dominik's task as official German representative of the IMO, to send the proposal to the president of the IMO van Everdingen about the organisation of a second Polar Year in 1932–1933 at the 50th anniversary of the first Polar Year in order to repeat the measurements in the Arctic with much more sophisticated instruments.[31] Besides, repeated measurements of the very

---

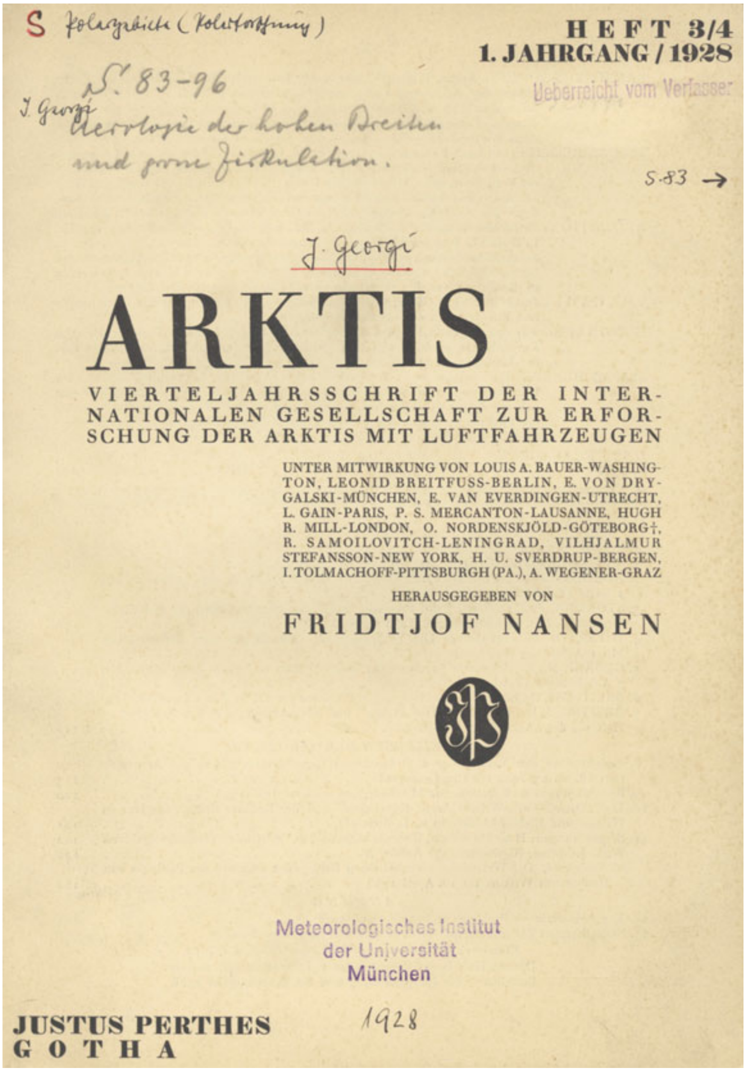
[29] Berson and Breitfuß (1927:112).

[30] Heidke (1932:85), Laurson (1982:218).

[31] Simpson (1930:147–152).

slowly changing magnetic field of the earth after half a century would also be very promising.[32]

In the first volume of the journal *Arktis* issued by the Aeroarctic in the first half of 1928 (Fig. 6.4), Nansen described the working programme of the society, including a network of observing stations on islands in the Arctic Ocean and additional



S Polargebiete (Polarforschung)

HEFT 3/4
1. JAHRGANG / 1928

S. 83–96
J. Georgi
Aerologie der hohen Breiten
und ferne Zirkulation.

S. 83 →

J. Georgi

ARKTIS

VIERTELJAHRSSCHRIFT DER INTERNATIONALEN GESELLSCHAFT ZUR ERFORSCHUNG DER ARKTIS MIT LUFTFAHRZEUGEN

UNTER MITWIRKUNG VON LOUIS A. BAUER-WASHINGTON, LEONID BREITFUSS-BERLIN, E. VON DRYGALSKI-MÜNCHEN, E. VAN EVERDINGEN-UTRECHT, L. GAIN-PARIS, P. S. MERCANTON-LAUSANNE, HUGH R. MILL-LONDON, O. NORDENSKJÖLD-GÖTEBORG†, R. SAMOILOVITCH-LENINGRAD, VILHJALMUR STEFANSSON-NEW YORK, H. U. SVERDRUP-BERGEN, I. TOLMACHOFF-PITTSBURGH (PA.), A. WEGENER-GRAZ

HERAUSGEGEBEN VON

FRIDTJOF NANSEN

JUSTUS PERTHES
GOTHA

1928

Fig. 6.4 Title page of the first volume of ARKTIS 1928

---

[32] Secrétariat (1930a:159ff).

radio weather stations on drift ice of the inner Arctic, installed with the help of airships or aircraft for monitoring the geophysical conditions of the Arctic.[33] In the same issue, Harald Ulrich Sverdrup (1888–1957) from the Geophysical Institute in Bergen, Norway, outlined the programme of a drifting station for one or two overwinterings in the inner Arctic and manned by five scientists, who together with their equipment, might be transported to an appropriate ice floe by an airship.[34]

It was in May 1928, when Ludwig Meinardus (1867–1952), geographer from the University of Göttingen, asked Alfred Wegener (1880–1930) in Graz, Austria on behalf of the German Science Foundation to test a new seismic method developed in Göttingen to measure the ice thickness in Greenland.[35] At that time the German meteorologist and experienced polar researcher, Wegener, had Austrian citizenship, since he became a professor of meteorology and geophysics at the University in 1924. This had made him an Austrian member of the Executive Board of the Aeroarctic. As Wegener ached to go back to Greenland to continue his meteorological and glaciological investigations, he was very happy about finally being offered a last chance, before he would be too old. He immediately made a programme with a preliminary expedition in 1929 to train some participants and to find a way to transport his equipment for two aerological stations and the seismic measurements of the main expedition 1930–1931 onto the ice cap at the west coast at 1,000 m height and in the ice centre at 3,000 m height. He then withdrew his paper on the *Working conditions and tasks of a station on the ice cap of Greenland*, submitted for the 2nd General Assembly of the Aeroarctic in Leningrad, and instead submitted another paper on *Astronomical position determination in an airship*, which then was read in his absence.

In the meantime, Everdingen, also a member of the Executive Board of the Aeroarctic, forwarded Dominik's proposal to George Clarke Simpson (1878–1965), President of the Commission for the Réseau Mondial and Polar Meteorology, who invited Dominik, Everdingen and Hergesell to a first meeting at the British Meteorological Office in London on 2 June 1928. This meeting resulted in the conclusion that a second Polar Year might lead to a valuable enrichment of the geophysical knowledge.[36]

As Breitfuß had fled from Russia soon after the Revolution, he could not attend the 2nd General Assembly of the Aeroarctic which took place in Leningrad on 18–23 June 1928.[37] Now it was Wittenburg's turn to present a resolution concerning the implementation of preparatory work for employment of international meteorological observations at the polar stations, similar to IPY-1. For the start of this observing period the 50th anniversary 1932/1933 should be chosen.[38] This was

---

[33] Nansen (1928).

[34] Sverdrup (1928).

[35] Lüdecke (1995:40–42), Wutzke (1997:160).

[36] Heidke (1932:85).

[37] Lüdecke (2001).

[38] Berson and Breitfuß (1928:119).

adopted by the assembly on 23 June 1928.[39] The activities in the Arctic in the year 1928 are usually considered as the most important for the future development of Soviet Arctic science and exploration. In addition to the successful meeting of the Aeroarctic, it was the year of the international rescue mission for the dirigible *Italia*, during which the Soviet icebreakers and aviation were proved to be efficient. On 31 July 1928 a decree on the intensification of the scientific research in the Arctic was adopted by the Soviet government and a special Commission was organised for the planning of this research.[40]

The elaborated 5-year plan included the demand for organisation of a network of radio and hydro-meteorological stations on the remote Arctic islands and sea coasts with a main aim to start the operations on the Northern Sea Route, which became the core of the Soviet activities during IPY-2. In addition the idea of the drifting ice station, which was fulfilled later in 1937, was widely discussed already at this time.

In the second half of 1928, Georgi published his elaborated plan to set up a wintering station at Nualik on the east coast of Greenland and a station on the inland ice cap at 2,500 m height close to the Polar Circle (Fig. 6.5).[41] The use of an airship for transportation seemed to him very promising. An additional cordon of stations along the east coast of Greenland, Iceland, Thorshavn (Faroe Islands) and a station at or north of Bergen in Norway should provide enough data to estimate the air balance of the polar basin and especially answer the question of whether the region between Greenland, Iceland, Norway and Norwegian Svalbard has its own air regime or receives cold air masses erupting from the polar basin. Of course the task would be improved substantially by further measurements during another polar year.

Parallel to this attempt a proposal for the IPY-2 was circulated to the members of the IMO on 26 October 1928[42] and a small sub-commission was formed thereafter consisting of the IMO president van Everdingen and three members of the Commission for the Réseau Mondial and Polar Meteorology (Simpson, Hergesell and Philippe Wehrlé from the French Meteorological Office and also member of the Aeroarctic) and two members of the Commission for Terrestrial Magnetism and Atmospheric Electricity (Dan La Cour (1876–1942) from the Danish Meteorological Institute and member of the Aeroarctic Executive Board, and Norwegian H.U. Sverdrup). This sub-commission compiled the following main objects:

1. "Investigation of the polar atmosphere in the light of the new theories, chiefly upper air.
2. Investigation of terrestrial magnetism.
3. Investigation of aurora."[43]

---

[39] Wittenburg (1930:11).

[40] Belov (1959:348).

[41] Georgi (1928a:96).

[42] Simpson (1930:157).

[43] Simpson (1930:148). See their reports in: Secrétariat (1930a:157–173).

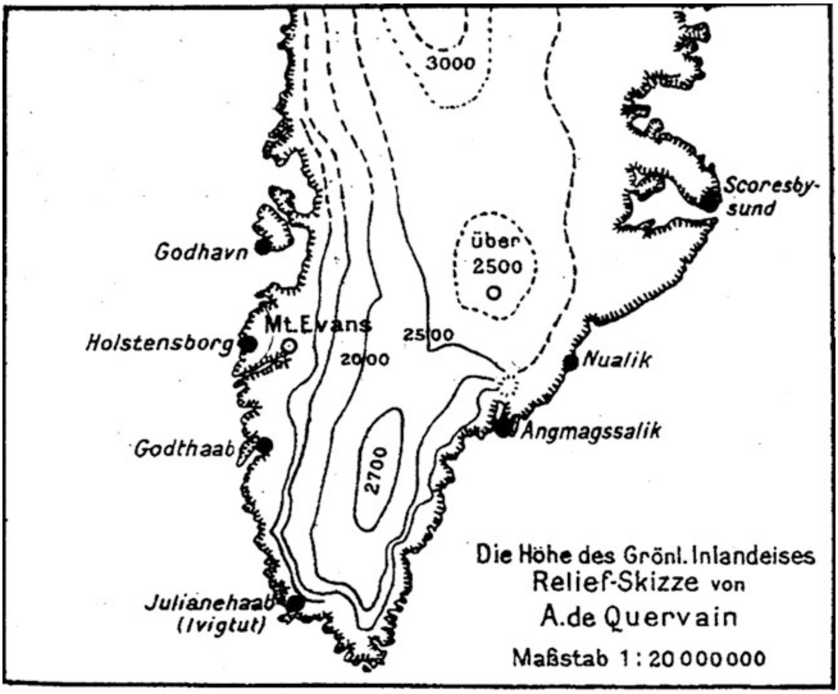


Abb. 7. Lageplan der meteorologischen Beobachtungspunkte auf Südgrönland

○ projektierte Inlandeis–Station

Fig. 6.5 Location of Georgi's planned meteorological station in southern Greenland (Georgi 1928a: table 24, figure 7)

During a meeting of the German Science Foundation (Notgemeinschaft der Deutschen Wissenschaft) on 5 November 1928, a special Greenland Commission to support Wegener's expedition to Greenland was established.[44] Twelve members of this commission also were members of the Aeroarctic (10 members) and/or members of the German Polar Commission (8 members). Wegener presented his combined plan including Georgi's ideas, thus making his former student a partner.[45] After a training expedition he wanted to establish three stations along 72°N: a station at the edge of the ice cap on the west coast of Greenland and a second station on the centre of the ice cap, as well as a separate third station at Scoresby Sund on the east coast. At these three stations a cross section of aerological ascents with

---

[44] See Wutzke (1997:160–195), K. Wegener (1933:11–12).

[45] A. Wegener (1928).

kites and balloons should allow a detailed investigation of the so-called glacial anticyclone, i.e. the high-pressure system over Greenland. In addition, the thickness of the ice cap should be measured between the west coast and the station at the centre.

Four months later, a first meeting of the IMO sub-commission took place in Cologne on 4 March 1929 with Hendrik Gerrit Cannegieter (1879–1964), chief of the IMO secretariat, replacing Simpson and the German Karl Keil (1898–1987) from the Commission for the Investigation of the Upper Air instead of Sverdrup.[46] On the 27th of the same month Wegener started his preliminary expedition from Copenhagen, arriving in Holstenborg, Greenland, on 21 April together with Georgi, meteorologist Fritz Loewe (1895–1974) and Ernst Sorge (1899–1946) for glaciological measurements.[47]

Cannegieter organised a second meeting of the IMO sub-commission on 17 July 1929 in De Bilt (The Netherlands) with Viggo Laurson (1904–1995) from the Danish Meteorological Institute replacing Wehrlé to develop a draft of the Polar Year programme.[48] Wehrlé expanded the programme and prepared an additional memorandum concerning stations in the southern hemisphere with the aim to "établir sur le front polaire austral un rèseau provisoire d'observations fonctionnant simultanément pendant quesques mois".[49] Stations should be set up on the coast of the Antarctic continent, on islands of the southern oceans and on whaling ships as well as on ships of organised expeditions. The German Maritime Observatory proposed intensifying observations aboard merchant and navy ships sailing north using pilot stations for ships as already practised.[50] Dominik also suggested staffing a station on the east coast of Greenland, i.e. Wegener's station of his main expedition 1930–1931, for meteorological, geophysical and oceanographic observations during the Polar Year (Fig. 6.6). Finally, influenced by the goals of the Aeroarctic, he wanted to supply and relieve inner Arctic stations on drift ice for meteorological and oceanographic observations with the help of airships.

On 9 August 1929 president of the Aeroarctic Nansen wrote to Dominik explaining that he had been corresponding with Everdingen about the 2nd Polar Year since 1928.[51] Nansen was very pleased to note that a lot of participants of the 6th Ordinary Conference of Directors of Offices and Observatories of the IMO, to take place at Copenhagen 10–18 September 1929, were members of the Aeroarctic and even members of the Executive Board. During three expeditions planned for the following year, the Aeroarctic wanted to gain experience in using the airship as a means of Arctic transport. If Dominik's proposal should be adopted, Nansen offered the collaboration of the Aeroarctic concerning the use of airships as a means of transport or of communication. In context with the concrete planning of the airship expedition

---

[46] Heidke (1932:85).

[47] Wutzke (1997).

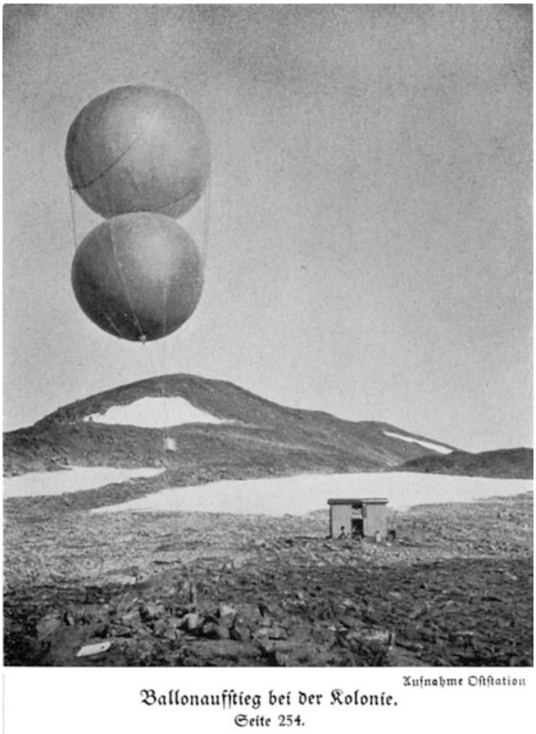
[48] Heidke (1932:85).

[49] Wehrlé (1930:178).

[50] Secrétariat (1930a:177).

[51] Nansen (1930).

Fig. 6.6 Balloon ascents at Wegener's "Oststation" at the east coast of Greenland (Kopp 1932:256)



in 1930, Wegener had been urged to participate, but referring to the preparations for his own expedition he declined, as he considered the exploration of the ice cap of Greenland in situ to be more important than flying above it.[52]

During the meeting in Copenhagen, Dominik's formal proposal for a new polar year was presented on 10 September 1929.[53] In the discussion Hergesell mentioned the German development of a wireless apparatus to transmit signals from meteorological soundings of the upper atmosphere from the balloon to a ground station. It would be very useful to have four stations around the Arctic. In addition he hoped that "it would be possible to re-establish a station for upper air work on the inland ice in Greenland (3000 metres), Prof. Wegener was making experiments there now and next year and it might be possible to re-occupy his station in 1932."[54] In the end the conference was "of the opinion that magnetic, auroral and meteorological observations at a network of stations in the Arctic and Antarctic would materially advance present knowledge and understanding of the magnetic, auroral and meteorological phenomena not only within the polar regions but in general. . . ., this increased knowledge will be of practical application to problems

---

[52] Lüdecke (1995:41).

[53] Simpson (1930).

[54] Simpson (1930:150).

connected with terrestrial magnetism, marine and aerial navigation, wireless telegraphy and weather-forecasting".[55] This resulted in the foundation of an International Commission for the Polar Year 1932–1933 under the presidency of La Cour.[56] An "Outline of the scheme for a Second Polar Year" focusing on stations in the Arctic was circulated to governments and meteorological services in the autumn of the same year.[57]

After his return from Greenland on 2 November 1929, Wegener was advised in this context to postpone his expedition for a year for it to be incorporated into the IPY-2.[58] This would add three German stations in Greenland to the meteorological network in the Arctic. Although this would be very promising – the financial support had been already agreed upon – Wegener, however, decided not to change his plans, arguing that he would be 60 years old on 1 November 1930. Consequently other plans for a German contribution to the Polar Year had to be made during an extraordinary meeting of directors of German meteorological institutes on 25 January 1930, during which a German Polar Commission was established with Dominik as chairman (Fig. 6.7).[59]

Finally, on 1 April 1930 Wegener left Copenhagen together with 13 expedition members heading for the west coast of Greenland with the aim of returning to

Fig. 6.7 Hugo Dominik (1872–1933) director of the German Maritime Observatory in Hamburg (BSH Archives: Archiv der Bundesanstalt für Seeschiffahrt und Hydrographie, Hamburg)

---

[55] Cannegieter (1963:153–163), Everdingen (1930:153–154) .

[56] Heidke (1932:85), Laurson (1982).

[57] Secrétariat (1930b:56–62).

[58] Lüdecke (1995:41–42).

[59] Heidke (1932:85–86).

Denmark in November 1931.[60] When Nansen died on 13 May 1930 his successor, the famous airship captain Hugo Eckener (1868–1954), suggested Sverdrup or Wegener for the scientific leadership and the presidency of the Research Council of the Aeroarctic.[61]

In the Soviet Union the preparation for IPY-2 started before it was officially launched at the Copenhagen meeting in September 1929.[62] The initiative came from the participants of the All-Union Geomagnetic conference in April 1929, which addressed the Polar Commission of the Academy of Science (in existence since 1914) to take the work of preparation for IPY-2 on its shoulders.[63] Thus, at the beginning, it was the initiative of scientists themselves, not a governmental demand.[64] Already by 24 May 1929, the Polar Commission of the Academy of Science of USSR formed the Committee for the Preparation of the Second IPY, which at that day gathered for its first meeting.[65] Vice-President of the Academy Aleksandr E. Fersman (1883–1945), one of the leading polar geologists and outstanding organiser of scientific research, became chair of the Committee, while the secretary of the Polar Commission botanist Alexandr I. Tolmachev (1903–1979) continued to work as a secretary for this new Committee.

Like Samoilowitsch and Wittenburg, Fersman had very good connections within the German scientific community, as he had spent several years in Germany working on his doctoral thesis under the supervision of the crystalograph and mineralogist Victor Mordechai Goldschmidt (1853–1933) at the University of Heidelberg. In 1927 Fersman was a member of the delegation of Soviet scientists at the Week of Soviet Scientists in Berlin (Russische Naturforscherwoche), which is considered as a heyday of Soviet–German scientific connections of this period.[66] Later Fersman served as a chair of the Soviet group of Aeroarctic, and at its 2nd General Assembly in 1928 he was elected as one of the Aeroarctic vice-presidents.[67] That same year he became an honorary member of the Berlin Society for the Studies of the Earth (Gesellschaft für Erdkunde zu Berlin). Vice-chair position of the Soviet group of the Aeroarctic at that time went to oceanographer and marine zoologist Nikolai M. Knipowitsch (1862–1939) who had a lot of experience in international collaboration, being one of the vice-presidents of the International Council for the Exploration of the Sea just before the First World War.[68] He was a major

---

[60] K. Wegener (1933).

[61] Lüdecke (1995:A46–A47).

[62] For more details on Soviet preparation to IPY-2 see Lajus (2008)

[63] St Petersburg Branch of the Archives of Russian Academy of Science (further – PFA RAN), f. 75, op. 1, d, 224, l. 7.

[64] See Lajus (2008).

[65] PFA RAN, f, 75, op. 1, d. 189, ll. 1.

[66] Kolchinsky (ed) (2001:207–217).

[67] Wittenburg (ed.) (1930:5).

[68] Lajus (2002)

proponent of Soviet–German co-operation in the studies of the Barents Sea in 1926–1927 and an active member of the Polar Commission of the Academy of Sciences as well.

Among other attendees of the Committee's first session were Samoilowitsch and the director of the Geomagenetic Department of the Main Geophysical Observatory (GGO), Nikolai V. Rose (1890–1942). Rose was also a very active member of Aeroarctic; at the 2nd Assembly he was appointed to lead the Commission on Geomagnetism, in which among others La Cour participated.[69] Rose reported that in GGO they had already had a preliminary discussion on the IPY programme. Tolmachev proposed that the Committee should co-ordinate its activity with the international organisations developing the programme. It was decided to approach the Soviet Government with this question.

Unfortunately the academic Committee for the Preparation of the Second IPY was not as active as it was planned at the beginning because the second half of 1929 and first half of 1930 was a very hard time for the Soviet Academy of Sciences due to the well-known infamous "Academic Trial" – the attempt by the Soviet Government to put the Academy of Science under its full control.[70] Several hundreds of people were thrown out of the Academy or even arrested, among them was Wittenburg, the active proponent of IPY-2, who was removed from his position as a secretary of Yakutsk Commission and then arrested. In the trial of the Academy the scientific connections of Soviet scientists with Germany were often used in fabricated accusations of espionage.[71] Even Fersman turned out to be in a very unsafe situation: he lost his position of vice-president of the Academy and did not participate in any further activities connected with the preparation of IPY-2. The status of the President of the Academy, Aleksandr P. Karpinsky (1847–1936), was much more stable and this allowed him to invite Dan La Cour to Leningrad in November 1929. During this meeting they came up with the idea of organising the first meeting of the International IPY Commission in Leningrad in August 1930, just after the International Geodetical Congress in Stockholm, to facilitate travelling for the delegates.[72]

On 20 May 1930 the Soviet government issued the official decree on the participation of the Soviet Union in IPY-2. The leadership was placed with the Hydro-meteorological Committee (GMK) of the USSR, which was formed in August 1929. The GMK was tasked with establishing the official Russian Committee for the Preparation of the 2nd IPY, with the head of GMK, meteorologist Alexei F. Wangenheim (1881–1937), as its president.[73] By autumn 1930 the Polar Commission of the Academy in Leningrad and GMK in Moscow

---

[69] Wittenburg (ed.) (1930:13).

[70] See Graham (1967).

[71] Kolchinsky (ed) (2001:313–314).

[72] PFA RAN, f. 75, op.. 1, d 224, l. 7.

[73] Bedritsky et al. (1997:74).

shared the responsibility, organising together the First Meeting of the International Commission in Leningrad.

In August 1930, the General Assembly of the International Union of Geodesy and Geophysics (IUGG) accepted the invitation to co-operate. It set up a subcommission with members of the Section of Terrestrial Magnetism and Electricity (chair: Carl Størmer (1874–1957)), Sidney Chapman (1888–1970, from London), and members of the Section of Meteorology (La Cour, Wehrlé and Charles Maurain (1871–1967, from Paris)) to outline the co-operation of complementary observations outside the polar regions. Further polar committees were set up in the International Union of Radio Science (president of the committee Edward Victor Appleton (1892–1965)) and in the International Council for the Exploration of the Sea (president of the committee Martin Knudsen (1871–1949)).[74]

Finally 17 polar committees were established: Austria (president Hans Benndorf (1870–1953)), Belgium (president E. Lagrange), Brazil (president J. de Sampaio Ferraz), Bulgaria (president R. Rainoff), Great Britain (president Sir Henry Lyons), Germany (president Vice Admiral Dominik), France (president General Ferrié, from 1932 Fichot), Japan (president A. Tanakadate), The Netherlands (president E. van Everdingen), New Zealand (president Lord Bledisloe), Norway (president H.U. Sverdrup), Poland (president A.B. Dobrowolski (Polish member of the *Belgica* expedition) followed by I. Lugeon), Spain (president: director general of the Geographical Institute), Sweden (president Prof. Gavelin), USSR (president A. F. Wangenheim), from 1932 the Committee for the Establishment of a Dutch Aerological Station at Reykjavik (president H.G. Cannegieter) and Italy (president Luigi De Marchi).[75] As it was agreed between Karpinsky and La Cour the International Commission for the Polar Year had its first meeting in Leningrad from 26–30 August 1930.[76] In this commission of 13 members America, Germany, and the USSR had two representatives,[77] while Canada, Denmark, Finland, France, Great Britain, The Netherlands and Norway were represented by only one scientist. Most of the international delegates came directly from the Geodetical Congress in Stockholm and arrived in Leningrad by train from Helsinki (Fig. 6.8).

The members of the International Commission included: its president D. La Cour (Det Danske Meteorologiske Institut), H. Dominik (Deutsche Seewarte, Hamburg), J.A. Fleming (Carnegie Institute, Washington), H. Hergesell (Berlin), W.E.W. Jackson (later replaced by J. Patterson) (Meteorological Service, Toronto), A.P. Karpinsky (Academy of Sciences, Leningrad), J. Keränen (Valtion Meteorologinen Keskuyaitos, Helsinki), Ch. Maurain (Institut de Physique du Globe, Paris), G.C. Simpson (Meteorological Office, London), H.U. Sverdrup

---

[74] Secrétariat (1930b:14–15, 1932:234–235).

[75] Secrétariat (1932:234–241), Secrétariat (1933:118–125).

[76] Secrétariat (1930b).

[77] Initially the USSR had one representative (Karpinsky), while after the establishment of the official Committee for Preparation of the 2nd IPY, its president Wangenheim became a member of the International Commission, while Karpinsky also remained.

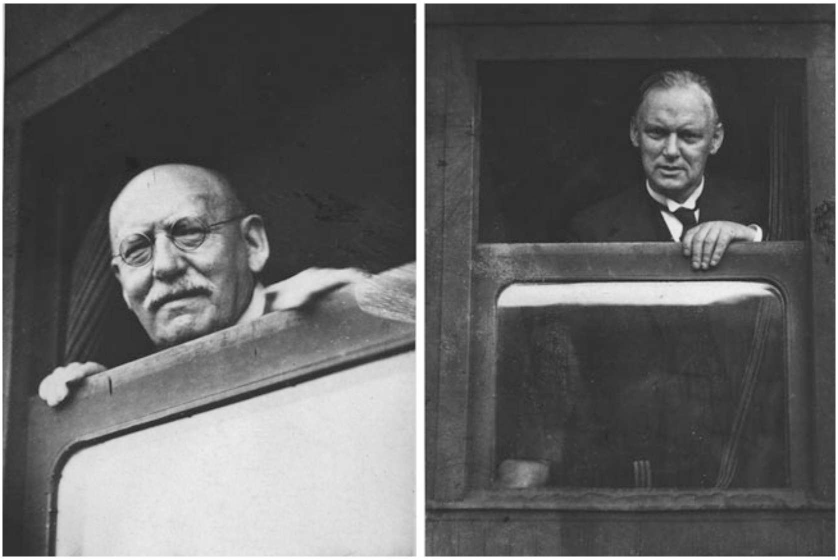


Fig. 6.8 Members of the International IPY Commission in the train at arrival to its first meeting in Leningrad, August 1930: Hugo Hergesell (*left picture*); Dan Barfod La Cour (*right picture*). Courtesy of the St Petersburg Branch of the Archives of Russian Academy of Science. F. 75, op. 5, d. 14

(Det Geofysiske Institutt, Bergen), and A.F. Wangenheim (Hydro-Meteorological Committee, Moscow). G. van Dijk (Royal Dutch Meteorological Institute De Bilt) and N.H. Heck (US Coast and Geodetic Survey, Washington) apologised for not being able to attend the conference. In addition La Cour's secretary V. Laursen, as well as H.D. Harradon (Carnegie Institute, Washington) and A. Tanakadate (Japan) attended the meeting (Fig. 6.9). From the Soviet side there were an additional 21 participants; eight of them were oceanographers, whose aim was to have oceanographic research included in the IPY programme. As van Dijk and Heck could not attend the meeting, seven European countries (Denmark, Finland, France, Great Britain, Germany, Norway, USSR) and three non-European countries (Japan, Canada, USA) were represented at the Conference and reported about the status of their preparations for the Polar Year, while others had sent written reports. It is remarkable that there was an overlap of seven members of the polar year commission and the Aeroarctic, among them four members who were also members of the Council of Aeroarctic. This underlies the good result of the Aeroarctic network for receiving optimal support for their project through the most efficient channels.

In addition to this, Argentina wanted to co-operate with magnetic measurements on sub-Antarctic islands. Australia offered the collaboration of the Meteorological Service. Austria announced that it would reoccupy its magnetic station on Jan Mayen dating from IPY-1. Brazil showed a strong interest in a meteorological collaboration with aerological stations close to the equator and meteorological stations

Fig. 6.9 At the meeting of the International IPY Committee, 26–30 August 1930 in the Small Conference Hall of the Academy of Sciences of the USSR, Leningrad: *Standing (from left to right)*: V.V. Timonov, N.V. Rose, A.I. Tolmachev, V.N. Obolensky, M. Kartsev, A.V. Sokolov, N.N. Kalitin, J. Keränen, D.D. Rudnev, H.U. Sverdrup, P.N. Weinberg, J.A. Fleming, V. Laursen, P.A. Molchanov, H.D. Harradon, T.V. Klado, Ju. M. Schokalsky, E.A. Tolmacheva-Karpinskaya, V. Arnold-Aliab'ev. *Sitting (from left to right)*: B. Vorob'ev, A.A. Kaminsky, A.F. Wangenheim, A.M. Schenrok, H. Hergesell, A.P. Karpinsky, Ch. Maurain, W.E.W. Jackson, G.C. Simpson, H. Dominik, B. de Neergard, D.La Cour. Courtesy of St Petersburg Branch of the Archives of Russian Academy of Science F. 75, op. 5, d. 14

on the islands of Tristan da Cunha and Trinidade, in order to obtain synoptical charts of the southern hemisphere. Bulgaria informed the Commission about aerological investigations with aircraft and pilot balloons. Canada already had meteorological northern stations at Dawson, Mayo, Aklavik, Simpson, Smith, Churchill, Nottingham, Resolution and Hopes-Advance, which would be functioning also during the IPY. That summer, stations for pilot balloon soundings would be established at Chesterfield and Pond Inlet and ordinary meteorological stations at Lake Harbour, Burwell, Pangnirtung, Pond Inlet, Dundas Harbour and the Bache Peninsula. A magnetic station was to be established at Meanook and another one envisaged at Chesterfield. In addition to a permanent magnetic station at Godhaven in Greenland, Denmark intended to establish two magnetic stations at Thule and Godthaab and two mountain stations on the east coast within the Polar Circle. Possibly there might be an additional mountain station on the Faroe Islands. Denmark would also make accommodations at Angmagssalik and at Scoresby Sund available for foreign expeditions. Finally, the Austrian station on Jan Mayen, erected with financial aid from Hans Wilczek (1837–1922) for IPY-1, would be remodelled for a second occupation by the Austrians.[78] Estonia was ready to perform cloud observations and pilot balloon soundings. Finland promised to finance a magnetic station at Sodankylä and to investigate height and spectrum of the Aurora Borealis as well as the sun radiation and soil temperatures. Foreign scientists were invited to join there and to make the observations more efficient. A provisional observatory was planned in Petsamo. France included its colonies and protectorates, resulting in the development of a station for meteorological and magnetic observations at Dakar, west Africa. Further observations could be made in Algeria and in the Sahara. A station at Scoresby Sund, Greenland was also envisaged as well as on Kerguelen in the southern Indian Ocean. Great Britain wanted to reoccupy its station at Fort Rae in Canada independently of Canada, and also the high mountain station on Ben Nevis in Scotland. Besides intensified aerological, climatological and magnetic measurements, as well as observations of radiation and electricity, Germany wanted to focus on Wegener's East Station 150 km northwest of Scoresby Sund on the east coast of Greenland.[79] A magnetic station was envisaged at the southern tip of Greenland close to Julianehaab. Aerological investigations were also planned from ships sailing in the European part of the North Atlantic and the Barents Sea, for example.[80] Hungary had only very restricted means for participation.[81] The Meteorological Institute in Reykjavik (Iceland) announced that it would carry out magnetic measurements, if they could borrow the necessary instruments. Italy still had to wait for the decision of the National Council of the IUGG, while Japan hoped to make observations at Mount Fuji and also at Sagalie. Mexico would expand the measurements of the National Weather Service.

Besides the permanent observations at Tromsø, Norway planned (1) establishment of two magnetic observatories at Hammerfest and at Kautokeino and – if possible – equipment of the existing meteorological stations at Bjørnøya (Bear Island, Svalbard) and at Myggbukta, east Greenland with magnetic instruments. (2) Observations of aurora at permanent stations in southern Norway and in Tromsø, and provisional observations at Myggbukta. (3) Pilot balloon ascents from Bjørnøya and Myggbukta. (4) Possible meteorological measurements on three mountain stations (Fanaråken, Gausta and Haldde). (5) Meteorological observations aboard whalers sailing in the Antarctic Ocean. The Netherlands decided to provide funds to establish a station at Angmagssalik, Greenland, and plans to include aerological investigations by aircraft in the Arctic at that station. Poland was still studying how to collaborate during the IPY. Portugal had already provided a budget to establish a high mountain station combined with aerological investigations at the Cap Verde Islands and also for some other Portuguese colonies in Africa and the Far East. The

---

[78] In fact this was unusable and a new, smaller station was used – see Barr (2003:55–56, 134–135).

[79] See also Dominik and Hergesell (1930).

[80] A detailed programme of the investigation of the meteorological and aerological conditions at sea is given by Dominik (1930).

[81] Secrétariat (1930b).

Soviet Union had already chosen 69 stations in the Arctic and Siberia for meteorological or magnetic observations, 10 of them would be set up in 1931–1932. One station was to be built on Severnaya Zemlya in 1930. Spain focused on establishing an aerological station on the island of Fernando Poo close to the equator. Sweden proposed to set up a basic mountain station in Svalbard for magnetic, meteorological and aurora observations and an additional meteorological mountain station. Sweden would also participate with a magnetic station at Abisko and the mountain station at Riksgränsen. The magnetic observatory at Lovö close to Stockholm was also going to collaborate. Switzerland could not participate due to a lack of funds. Besides Swiss polar researcher Paul-Louis Mercanton (1876–1963) hoped to organise a Swiss mountain station in Greenland. USA had already well-organised stations in Alaska, for instance at Point Barrow. Upper air observations were made at Fairbanks and Nome. An additional meteorological station would possibly be built for the IPY.

At the end of the day five resolutions of the sub-committee of the IUGG were presented: the first resolution stressed "the very great importance of the 2nd Polar Year for the advancement of geophysical science. /.../ [and] that the observations should not be confined only to Polar regions."[82] Support of international co-operation was addressed in the second resolution. The third resolution proposed that the magnetic section should give 15,000 gold francs to provide standard instruments (cameras, plates, spectroscopes) for the aurora observations. The fourth resolution suggested an agreed plan for all observations and the availability of the detailed observations for further study by others including the sale of all published volumes. Acceptance of the invitation by the IMO to co-operate during the organisation and carrying out of IPY-2 was the subject of the final resolution.

After the discussions of the previous day a list was set up by the magnetic sub-commission of the International Polar Commission with 43 magnetic stations around the Arctic Ocean north of 55°N (Fig. 6.10). Maurain explained that 22 of them had already been assured; a further 16 stations plus additional stations at Fort Rae close to the magnetic pole and two in east and west Iceland close to the maximum zone of aurora were desirable. In addition, five stations from IPY-1 (Godthaab, the Lena delta – actually replaced by nearby Bouloun, Sodankylä, Malye Karmakuly – replaced by a station at Matotschkin Shar nearby, and Bossekop – replaced by Tromsø) should be reoccupied. It seemed also to be desirable to reoccupy the five stations at Kapp Thordsen (Spitsbergen), Fort Rae, Kingua Fjord, Lady Franklin Bay and Jan Mayen. Later during the discussions the sub-commission even mentioned installing magnetic stations in Antarctica. Finally, the use of registering magnetometers with a fast paper-run to investigate strong magnetic disturbances was proposed.[83]

---

[82] Secrétariat (1930b:15, 30).

[83] See detailed programme in Secrétariat (1930b:54–55).

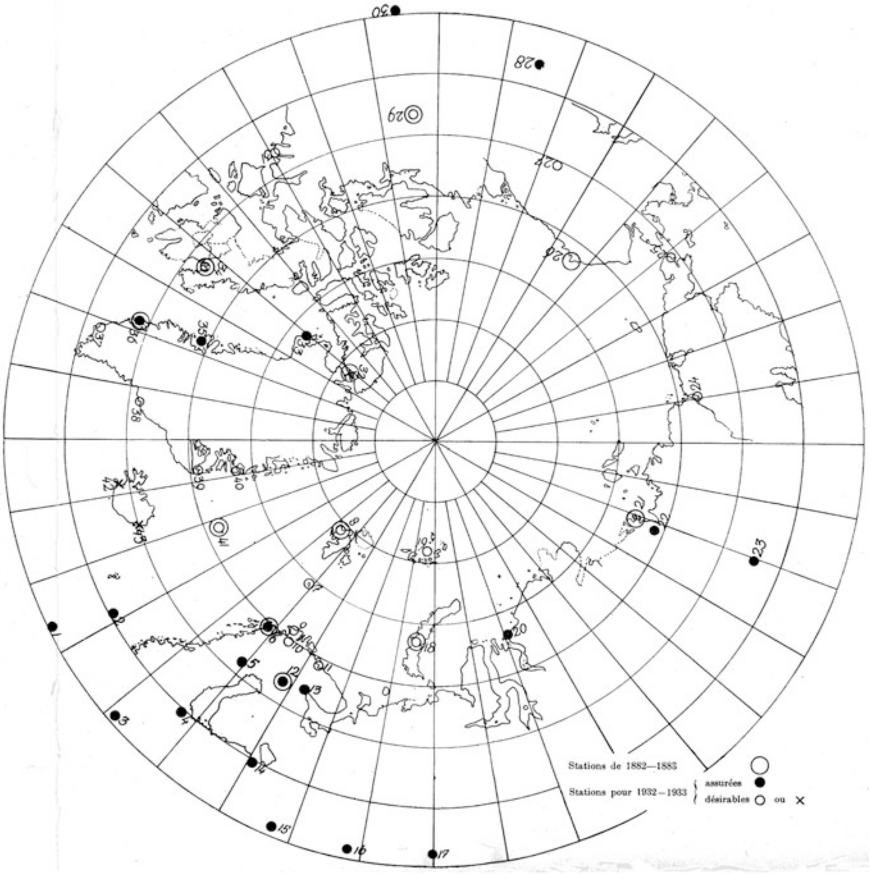


Fig. 6.10 Arctic stations (O) of IPY-1 and (•) assured magnetic stations or (o, x) desirable magnetic stations of IPY-2 (Secrétariat 1930:24, 25)

A detailed programme for auroral observations had already been defined by the leading figure of aurora research, Størmer, and published in the journal *Arctic.*[84] They should either be made in connection with magnetic observations or for the study of the phenomenon itself.[85] In addition to the magnetic stations in the Russian Arctic, a number of expeditions were planned to explore the magnetic conditions in the surroundings of these stations (Fig. 6.11).[86]

The overall aim of the meteorological programme was to investigate the Arctic and Antarctic regions as well as the general circulation between the Poles and the

---

[84] Størmer (1928).

[85] Secrétariat (1930b:55).

[86] Rose (1930).

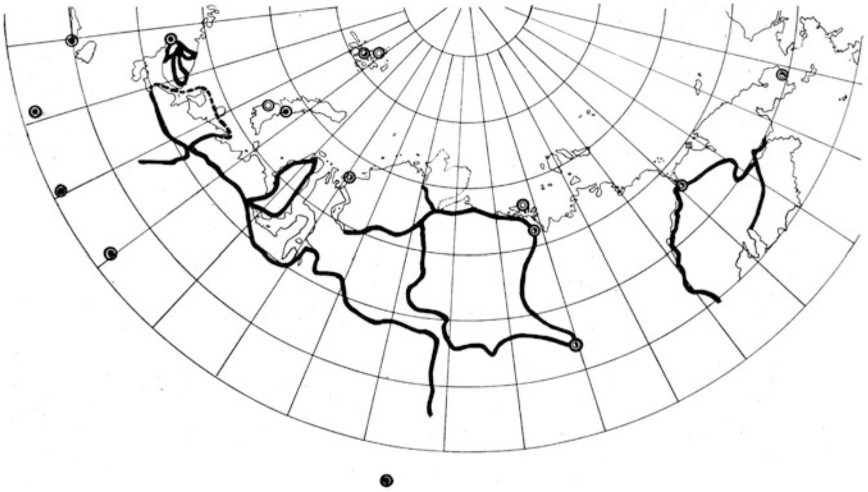


Fig. 6.11 Planned routes of expeditions in the surroundings of magnetic stations in the Russian Arctic (Rose 1930:109)

equator with all its side effects in synoptic, climatological and aerological respects. Objects were:

A. "Preparation of weather maps representing the state of the atmosphere at sea level in the two polar regions of the earth.
B. Investigation of the air currents (air circulation) between the polar regions and lower latitudes.
C. Exploration of the upper air over the polar regions."[87]

Leading the meteorological sub-commission, Hergesell reported that meteorological measurements should be made at all magnetic stations.[88] Observing times were fixed to 7:00, 13:00 and 19:00 Greenwich mean time. Also 18 high mountain stations should be installed (Table 6.1, see also Fig. 6.12).

Sverdrup suggested equipping the high mountain stations with a crew of three: two meteorologists and a radio-operator.[89] Due to possible difficulties of transport, the accommodation should be as simple as possible. He calculated the weight of the provisions to be transported to the station to about 1.6 kg per person per day resulting in about 1,800 kg per year for three persons. Cooking, heating and lighting with paraffin made another 410 kg per year. Instruments were calculated to about 150 kg. Some desk tops, three camp beds and sleeping bags, some blankets, as

---

[87] Secrétariat (1930b:56).

[88] Secrétariat (1930b:30, 45).

[89] Sverdrup (1930).

Table 6.1 Planned high mountain stations in the northern hemisphere for IPY-2 (Secrétariat 1930b:40, 45)

2 on the west coast of Greenland
1 on the south coast of Greenland
2 on the east coast of Greenland
1 on the northeast coast of Greenland
2 on Iceland
1 on Jan Mayen
1 on the Faroe Islands
2 in Norway (mainland)
1 on Svalbard
1 at Khibiny (Kola Peninsula, 1,400 m)
1 at Matotschkin Shar (1,059 m)
1 on Zemlya Frantsa Iosifa
1 at Bulbuk (Werchojansk Mountains)
1 close to the Bering Sea

well as some reserve clothing and a good tent until the wintering house was set up, would add up to 450 kg. Another 750 kg was calculated for a hut of 2.5 m × 4.6 m, which should be protected by stone walls against winter storms (Fig. 6.13). The hut should be separated into two rooms. The outer room close to the door (2.5 m × 1.4 m) should house most of the provisions and the kitchen, while the inner room (2.5 m × 3.2 m) was designed to hold the camp beds, some instruments and the wireless radio station.

Aerological stations should be set up close to railway stations or at the coast to ensure supplies of hydrogen.[90] Nevertheless, it would be most desirable to organise pilot balloon ascents at each meteorological station if the question of hydrogen production at the place was solved. Pilot stations as well as aerological and meteorological observations were encouraged aboard ships. The application of radiosondes in polar regions was already solved by the Russian aerologist Pavel A. Moltschanoff[91] (1893–1941) from the Aerological Observatory in Slutsk (near Leningrad) and Paul Duckert (1900–1966) from the German Aeronautic Observatory at Lindenberg close to Berlin.[92] Especially for studying the stratosphere there should be five aerological stations well distributed in Alaska, Canada, Greenland, Svalbard and in the Soviet Union to study the outburst of cold air as suggested by Moltschanoff.[93] Moltschanoff designed his radiosonde already in 1927 and presented the idea in Leipzig at the international conference for the studies of the high levels of the atmosphere, and then had shown it at the Aeroarctic conference in Leningrad in 1928 and at the first meeting of the International Commission

---

[90] Secrétariat (1930b:30, 40–41).

[91] Modern English spelling is Pavel Molchanov.

[92] The special construction of wireless stations for expeditions during the polar year is described in Duckert (1930a), while he informs about the status quo of the German development of a wireless registering balloon meteorograph in Duckert (1930b).

[93] Moltschanoff (1930b). See also Moltschanoff's description of different methods for investigating the polar atmosphere (Moltschanoff 1930a).

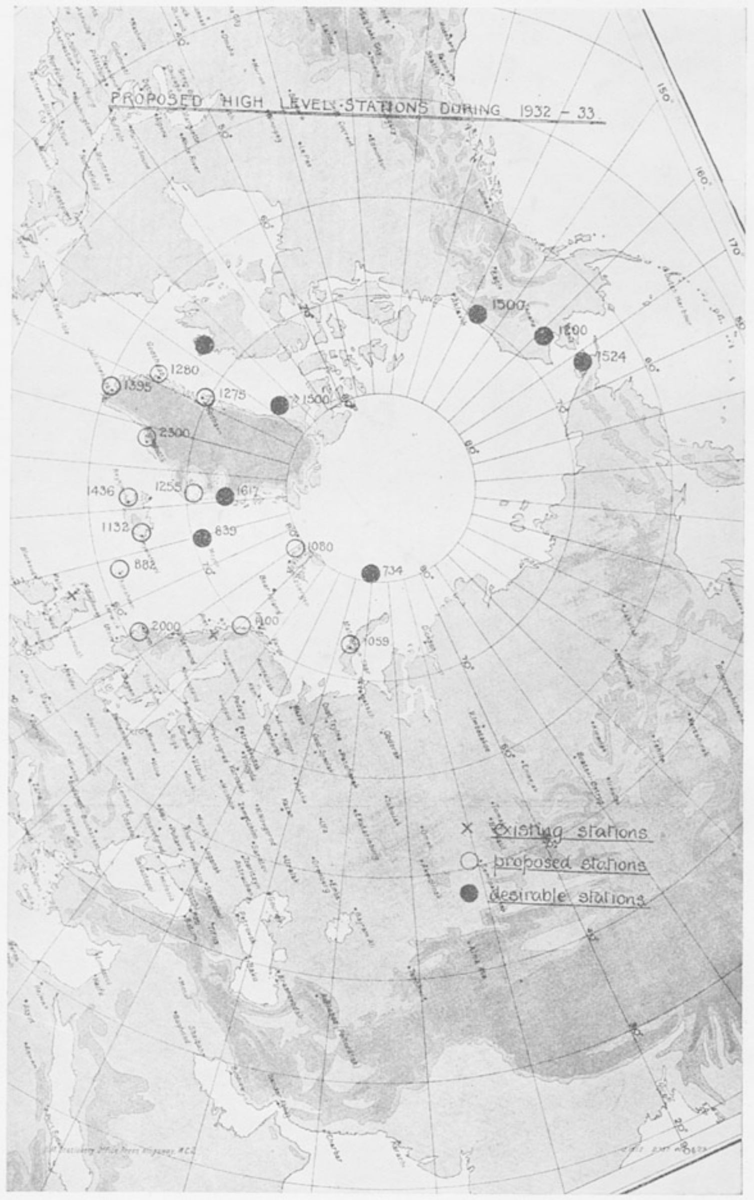


Fig. 6.12 High mountain stations (x) existing, (o) proposed, and (•) desirable for IPY-2 (Secrétariat 1930:44, 45)

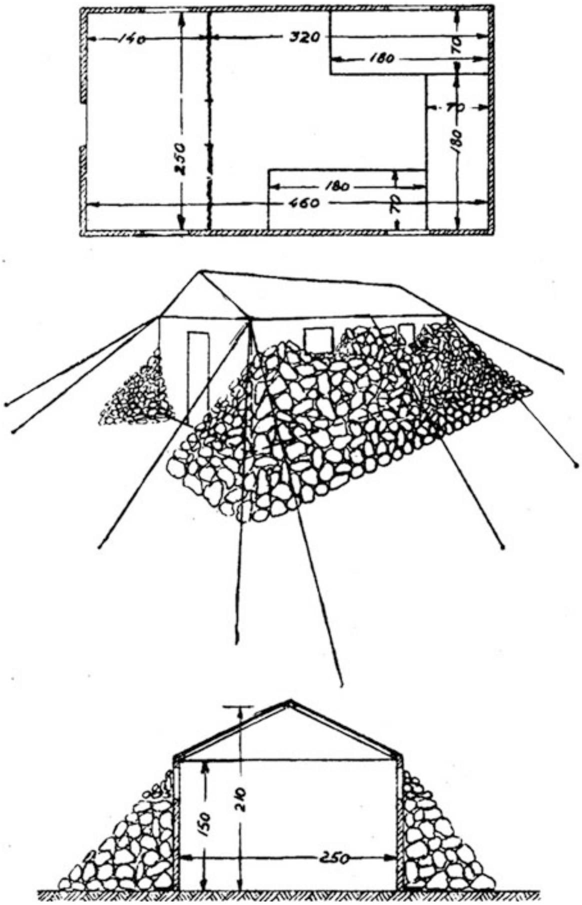


Fig. 6.13 Sverdrup's proposal of a wintering station in the Arctic for IPY-2 (Sverdrup 1930:70)

for the Preparation of the 2nd IPY in August 1930 in Leningrad. He successfully used radiosonde during the *Graf Zeppelin* flight in 1931.[94]

Considering the different conditions in the Arctic, where many stations already existed, and Antarctica, where all stations had to be set up first in a certain time limit of the southern summer, it was finally decided to fix the period of the Polar Year provisionally from 1 August 1932 until 31 August 1933. Besides it was recommended to prolong the magnetic measurements as long as possible, especially in Antarctica, and if possible six months before and six months after the Polar Year, although it was mentioned that the Polar Year must not be two years.

In addition to the planned programme, further investigations were encouraged such as special cloud observations concerning the development and decay, height, speed and direction of drift as well as cloud cover, submitted by Richard Süring

---

[94] For Moltschanoff's biography see Selezneva and Tudorovskaia (1958).

(1866–1950), director of the Meteorological Observatory at Potsdam close to Berlin, who was to organise an International Year of the Clouds 1932–1933.[95] The Soviet Actinometric Commission of the Hydro-meteorological Committee proposed a detailed actinometric programme with stations close to the Arctic Ocean at:[96]

(1) Zemlya Frantsa Iosifa (80°19′N, 52°48′E)
(2) Matotschkin Shar (73°15′N, 56°23′E)
(3) Bolshoi Liakhovsky Island (73°05′N, 142°20′E)
(4) Wrangell Island (70°55′N, 181°57′E)

and some station more to the inland by the Khatanga River (72°20’N, 104°20’E).

Each station should be equipped to measure the solar radiation, the diffuse radiation, the terrestrial radiation and some other parameters such as the colour and the clarity of the sky.[97] Electro-meteorological observations were needed to solve the still-existing problem: the earth bears a considerable amount of negative charge, which should be neutralised within 15 min due to the electrical conductivity of the atmosphere, but the conditions never change.[98] Proposed were continuous registrations of the voltage of the electrical field and the electrical conductivity, observations of the space charge and vertical currents registration of the penetrating radiation, observation of earth currents and finally observations of the height of the Heaviside-Kennedy layer with short-wave radio sets.

Head of the Soviet Hydro-Meteorological Committee A.F. Wangenheim reported at the First Meeting of the International IPY Commission about the Soviet IPY programme, in which he stressed that meteorological studies are not possible without hydrological investigations at the same time. V.V. Schuleikin (1895–1979) from the State Oceanographic Institute developed this statement further and wrote a memorandum, which was published in the materials of the conference.[99] He

---

[95] Süring (1930).

[96] Kalitine (1930).

[97]

(A) The solar radiation should be measured with an Angström-Volochine pyrheliometer, a Michelson Actinometer with three filters to measures different parts of the spectrum, and a Richard-Gorcrynski solarigraph to register continuously the incoming radiation,

(B) The diffuse radiation should be measured with an absolute Angström pyranometer and a relative Angström-Volochine pyrheliometer,

(C) The terrestrial radiation should be measured with an absolute Angström pyrgeometer and a relative Savinoff pyrdeometer,

(D) Some supplementary measurements should be taken with a Linke cyanometer, some photometers, an albedo meter, a spectrograph and a device to measure the clarity of the sky.

[98] Obolensky (1930).

[99] Schouleikin (1930).

stressed: "It is evident /. . ./ that unless the hydrology of the Polar basin is brought to light in every detail there can be no adequate way of linking together the results of separate meteorological (e.g. aerological) observations, carried out both on shore and in marine expeditions. In particular, so far as the European coasts are concerned, one of the most important problems consisted of a careful study of the regime of the Gulfstream together with its branches. [The task of IPY was to join] these separate researches into one detailed plan in which the systematic investigations made near the Florida and Newfoundland coasts are to be taken into account."[100] The programme included eight cruises with the research vessel *Persei*, regular cross-sections along the Kola and the 38th meridians, work on small expedition ships inshore of the Barents and White Seas and on the large ice-going ships which were set to supply the polar stations, measurements on the hydro-meteorological stations, and ice observation from aircraft. The last point was the organisation of a special expedition for the work in high latitudes along the whole north coast of the USSR.

The conference acknowledged the importance of hydrological studies and decided to include them into the general IPY programme. 17 February 1931 Wangenheim wrote to La Cour to make an inquiry on the progress of including oceanographic studies into IPY.[101] La Cour wrote to Knudsen, head of the Hydrographic Commission of ICES. Knudsen replied that he was very pleased to learn about the Soviet programme of hydrographic research and that his commission would like to offer that ICES extend its usual research during the IPY, but there was not much hope that the full ICES programme would be known much in advance. He thought that this should not affect the Soviet studies and the results could be compared later on.[102] Thus no joint programme of oceanographic research was developed.

Finally, La Cour's memorandum on *The International Polar Year 1932–1933*, stressing the global character of the project, was distributed in March 1931.[103] A second meeting of the International Commission for the Polar Year took place in Innsbruck 21–26 September 1931. Now 44 countries confirmed their participation.[104] It was finally decided that the Polar Year was to last from 1 August 1932 until 31 August 1933 during a minimum of solar activity. The observing period in Antarctica should start on 1 January 1933, because ships could only go there during the southern summer.[105]

The Association for Terrestrial Magnetism of the IUGG not only gave substantial financial support for equipment, special cameras and spectroscopes, but also for

---

[100] Schouleikin (1930:131).

[101] PFA RAN, f. 75, op. 1, d. 246, l. 19a.

[102] PFA RAN, f. 75, op. 1, d. 246, l. 59–60.

[103] La Cour (1932), Baker (1982:283).

[104] Heidke (1932:86–87).

[105] Heidke (1932:86–87).

archiving the results, and for the publication of the *Photographic atlas of auroral forms* and the magnetic character figures, while the Association for Meteorology financed the purchase of radiosondes with 50,000 Francs and the production of daily synoptic charts for the northern hemisphere (40,000 Francs) and the publication of the results of the Polar Year (100,000 Francs).[106] But until this could happen many problems had to be solved. Due to the worldwide financial crisis, many countries had difficulties in joining the IPY and in sending out expeditions. Even the idea of including Antarctica had to be abandoned. During the meeting at Innsbruck the English £ Sterling was devaluated on 21 September. This caused a serious drawback to the planning, and some members asked to postpone the whole undertaking.[107] Thanks to La Cour's enthusiasm a resolution to carry out IPY-2 during a minimum of solar activity in 1932–1933 was adopted despite these unfavourable circumstances.

Wegener's death was not known in Germany before June 1931.[108] For his replacement the German Science Foundation sent his brother Kurt Wegener (1878–1964) to continue the leadership of the expedition under Wegener's name. The so-called "Wegener disaster" and the efforts for his rescue until his body was found tied up a lot of money which was then no longer available for other polar projects such as the IPY.

Shortly afterwards the third meeting of the International Meteorological Committee was held at Locarno, in October 1931. With additional grants from the Rockefeller Foundation (US $40,000 for the purchase of magnetic and electrical measuring equipment and additional US $10,000 for the purchase of radiosondes) and the Rask-Ørstedt fund, the Polar Year could finally take place during a minimum of sun activity. In November 1931 La Cour again came to the USSR. This time he had a meeting in Moscow with the leaders of the Hydro-Meteorological Committee (GMK), which took over all the Soviet preparations for IPY-2. One of the main aims of his visit was an agreement for the purchase of Molchanoff's radiosondes by other countries participating in IPY-2. GMK promised to provide about 100 radiosondes and to organise the training of foreign meteorologists in Slutsk observatory near Leningrad.[109] Molchanoff's radiosondes were used during IPY-2 by several countries including The Netherlands, Denmark and Sweden.[110]

Finally, 44 countries participated in IPY-2, while 12 European states, Canada and the USA established 27 stations in the Arctic (Fig. 6.14), 18 of which had been equipped with magnetic gear. Five additional magnetic stations were next to or south of the equator. Some stations also had special radio equipment to investigate the ionosphere as well as aurora in connection with magnetic disturbances. The Netherlands made aerological observations with an aircraft stationed at Reykjavik

---

[106] Laurson (1982).

[107] Cannegieter (1963:153–163), Laurson (1982).

[108] Wutzke (1997:224).

[109] Mezhdunarodnye nauchnye sviazi (1992:305).

[110] Selezneva and Tudorovskaia (1958:63).

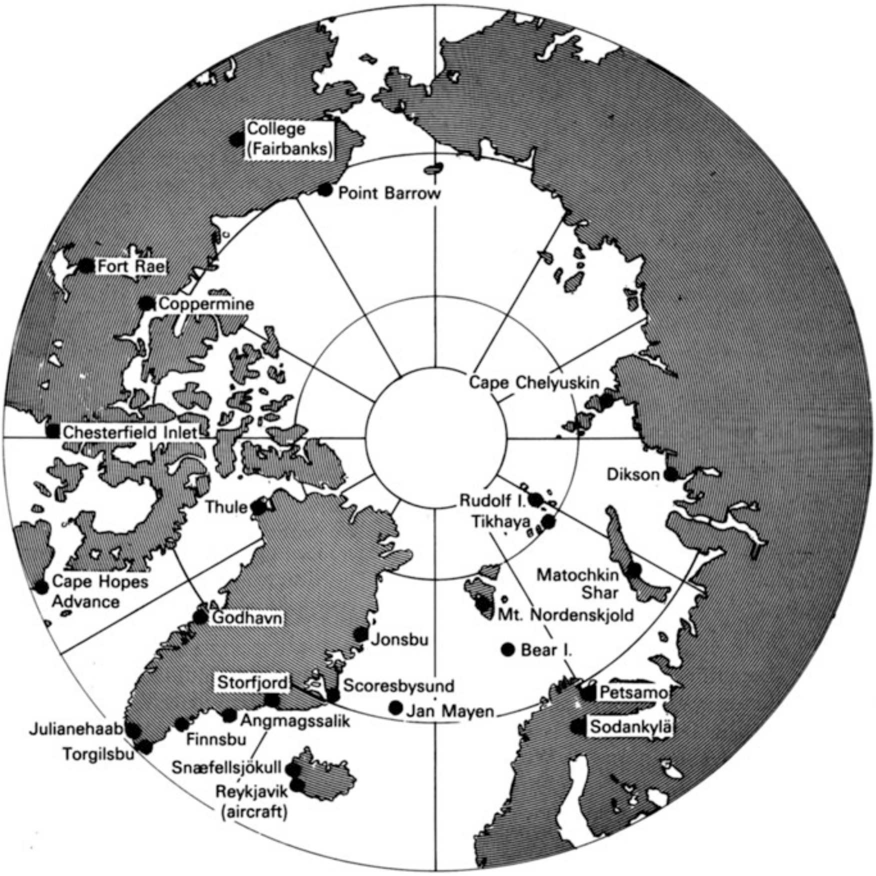


Fig. 6.14 Circum-Arctic stations of IPY-2 (Laursen 1982:215)

in Iceland. Due to financial limitations there was no station set up in Antarctica, but the Meteorological Office in London took charge of collecting all ship observations made in the southern hemisphere.

There had been no financial support in Germany to reoccupy Wegener's aerological station on the east coast of Greenland from his expedition of 1930–1931. Instead routine measurements were intensified in Germany and only one small radio technical expedition of the Deutsche Gesellschaft des Funkwesens (German Society of Radiotelegraphy) was sent to the centre for auroral research in Tromsø.[111] Two German scientists participated in Soviet expeditions. On Novaya Zemlya Kurt Woelken (1904–1992), a member of Wegener's Greenland expedition 1930–1931, worked in the team of glaciologists on the newly established station Russkaya Gavan

---

[111] Heidke (1932, 1933).

under the leadership of young geologist Mikhail M. Yermolaev (1905–1991), a pupil of Samoilowitsch. Another German scientist, Joachim Scholz (1903–1937), assistant at the Meteorological Magnetic Observatory in Potsdam, worked at the best Soviet geophysical observatory at Tikhaya Buchta on Hooker Island in Zemlya Frantsa Iosifa, which had been founded in 1929. Additionally, German geophysicist Max Grotewahl (1894–1958) set up a private station on Kajartalik in southwest Greenland.[112]

The table (Table 6.2) of stations, including also non-Arctic stations set up during IPY-2, totals a different number than Fig. 6.10. Soviet reports on activities during IPY-2 include a very long list of stations – more than 100.[113] This list includes not only Arctic stations, but also a network of mountain stations in Siberia and Soviet Asia, which participated in IPY-2. Another source reported that by 1931 the Soviet Union had already 17 Arctic stations and a large number of new stations were opened in 1932.[114] An American source listed the most important Soviet IPY-2 stations in the Arctic with the date of their opening.[115]

If IPY-1 was conducted during unfavourable ice conditions in the Arctic Ocean, the period of IPY-2 was on the contrary very good for navigation. This warm period was predicted several years in advance by Soviet oceanographers Nikolai Zubov (1885–1960) and Vladimir Wiese (1886–1954). Their favourable predictions were realised during several record voyages such as the first navigation of the Northern Sea Route (Northeast Passage) in one season, which was achieved by the ice-ship *Sibiriakov* with a scientific expedition on board led by Otto Yu. Schmidt (1891–1956) and Wiese. In the same year an oceanographic expedition headed by Zubov on a small wooden research vessel *Nikolai Knipowitsch* for the first time circumnavigated Zemlya Frantsa Iosifa.[116] In total during IPY-2 the Soviet Union specially organised 15 marine expeditions. In addition, oceanographic data for the IPY programme were collected also from other ships, thus the total number of Soviet marine expeditions is counted as 26.[117] The results of oceanographic research very much improved the general knowledge of the thermal balance and ice distribution of the Arctic Ocean as well as provided detailed data on the seas and straits important for establishing the navigation along the Northern Sea Route.

Another important field of research during IPY-2 was glaciology. The Soviet Union alone organised seven expeditions, however, most of them were not to the Arctic, but to the glaciers in Tian-Shan, Pamir and other mountain regions. These expeditions were very much based upon the activities of Soviet–German Pamir

---

[112] Grotewahl (1934:4).

[113] Zubov and Kozitsky (1959:31–34).

[114] Zotin (1957).

[115] Stanka (1963).

[116] Zubov (1933).

[117] Zubov and Kozitsky (1959:14).

Table 6.2 Thirty-four stations during IPY-2 (after Centkiewicz 1956: 225–226)

Country	Station	Location
Austria	Jan Mayen	Greenland Sea
Canada	Cape Hope Advance	North America
Canada	Chesterfield	North America
Canada	Coppermine	North America
Canada	Meanook	North America
Canada	Sakatoon	North America
Denmark	Godhavn	Greenland
Denmark	Julianehaab	Greenland
Denmark	Thule	Greenland
Finland	Kajaani	Finland
Finland	Petsamo	Finland
France	Scoresby Sund	Greenland
Great Britain	Fort Rae	Canada
Great Britain	Tromsø	Norway
Japan	Tojohara	Sachalin (Asia)
The Netherlands	Angmagsalik	Greenland
The Netherlands	Reykjavik	Iceland
Norway	Jonsbu	Greenland
Norway	Finnsbu	Greenland
Norway	Torgilsbu	Greenland
Norway	Storfjord	Greenland
Poland	Bjørnøya/Bear Island	Barents Sea
Sweden	Lycksele	Sweden
Sweden	Nordenskiöldfjellet	Svalbard
Sweden	Sveagruvan	Svalbard
Switzerland	Snafellsjökull	Iceland
USA	Fairbanks	Alaska
USA	Point Barrow	Alaska
USA	Peary Lodge	Greenland
USSR	Rudolf Island	Zemlya Frantsa Iosifa
USSR	Hooker Island	Zemlya Frantsa Iosifa
USSR	Matotschkin Schar	Novaya Zemlya
USSR	Tsheljuskin Peninsula	Siberia
USSR	Dickson Island	Siberia

expedition of 1928.[118] In the Arctic the most important work on the measurement of the ice thickness by sound waves was done on Novaya Zemlya (station Russkaya Gavan) by Yermolaev and Woelken, who established the methodology. Woelken also conducted the studies of stratosphere by sounding, which was done for the first time in the polar area.[119] He organised 12 large explosions, the sounds from which were registered from several places.

---

[118] Zubov and Kozitsky (1959:20).

[119] Wölken (1934), Zubov and Kozitsky (1959:21) .

Copenhagen, 1933 — Members of the International Polar Year Commission. *Back row, left to right:* M. Tenani (representing L. de Marchi), J. Bartels (representing J. A. Fleming), S. Chapman (representing N. H. Heck), G. van Dijk, M. Bruun de Neergaard (secretary), J. Keränen, H. U. Sverdrup, and Ch. Maurain. *Front row, left to right:* G. C. Simpson, A. Wallén, H. Hergesell, D. la Cour, A. Schmidt, H. Dominik, and C. Störmer (representing J. Patterson)

Fig. 6.15 Members of the International Polar Year Commission during a meeting in Copenhagen 1933 (Baker 1982:194)

In the end, the IPY-2 was very successful although no station could be established in Antarctica as previously planned. The members of the International Polar Year Commission met again in Copenhagen in 1933 to organise the publication of the data gathered (Fig. 6.15).

After the Second World War a Liquidating Commission was set up during a meeting of the IMO in Paris in 1946, with some funds still available from the grant of US $15,000 made by the Rockefeller Foundation in 1934, to complete the map project and printing the magnetic data from South America.[120] The IUGG Association for Terrestrial Magnetism and Electricity established a comprehensive archive of magnetic data kept on microfilm in Copenhagen at its own expense. The German Maritime Observatory at Hamburg was entrusted to produce the daily synoptic weather charts (Fig. 6.16). Only data from the last 15 days of the Polar Year (17–31 August 1933) were lost during the Second World War. The Central Bureau of the Commission at Copenhagen gathered a complete archive of all data as well as of published and unpublished reports, which finally was given to the library of the Danish Meteorological Institute in Copenhagen. It also collected over 800 publications of magnetic results.

---

[120] Laurson (1982).

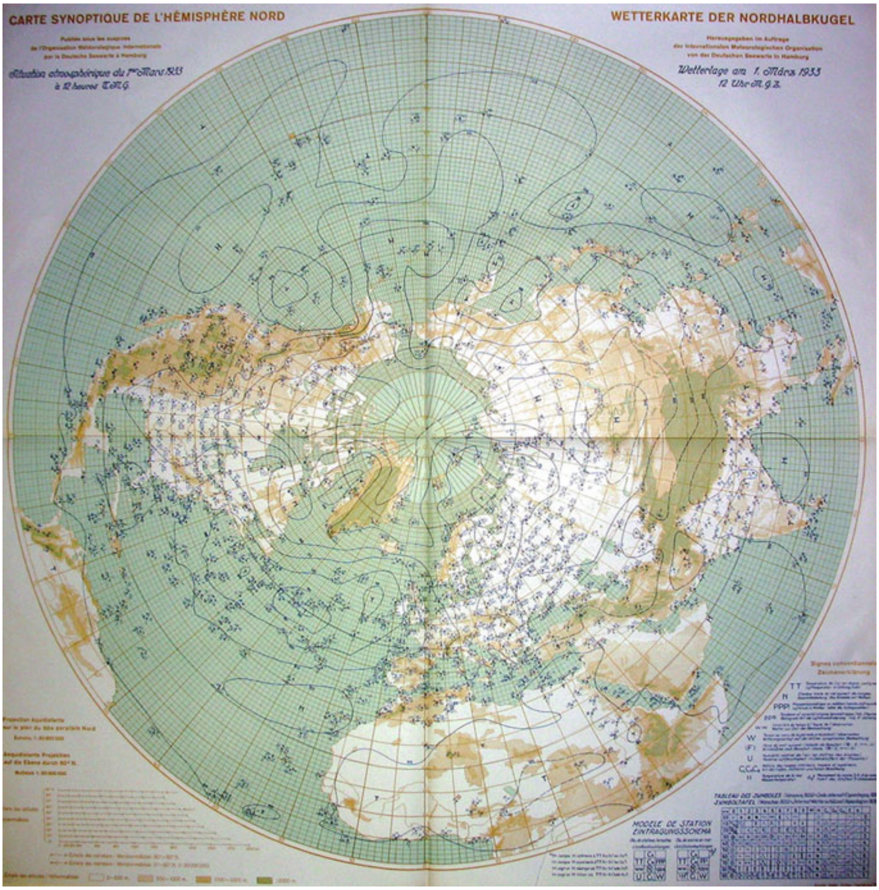


Fig. 6.16 Wetterkarte der Nordhalbkugel für den 1. März 1933 12 GMT (Deutsche Seewarte Hamburg)

Acknowledgements We want to give our thanks to the Archives of the Bundesanstalt für Seeschiffahrt und Hydrographie in Hamburg and the St Petersburg Branch of the Archives of Russian Academy of Science, which allowed us to publish pictures from their archives. The research by Julia Lajus was supported by the ESF EUROCORES Programme "Boreas: Histories from the North", project "Colony, Empire and Environment: A Comparative International History of Twentieth Century Arctic Science (CEE)".

References

Baker, F.W.G. 1982: The First International Polar Year, 1882–1883. *Polar Record* 21(132): 275–285.

Barr, S. 2003: Det første internasjonale polarår 1882–1883 [The First International Polar Year 1882–1883]. In: Jan Mayen – Øyas historie gjennom 1500 år [The Island's History Through 1500 years]. Oslo. 2nd edition published by S. Barr.

Bedritsky, A.I., E.P. Borisenkov, A.S. Korovchenko, V.M. Pasetsky 1997: *Ocherki po istorii gidrometeorologichaskoi sluzhby Rossii*. St Petersburg: Gydrometeoizdat.

Belov, M.I. 1959: Sovetskoe arkticheskoe moreplavanie, 1917 – 1932 gg. In: *Istoria otkrytia i osvoenia Severnogo morskogo puti. T.3.* Leningrad: Morskoi transport (in Russian).

Berson, A., und L. Breitfuß 1927: Sitzung des Sonderausschusses am 16.11.1926. *Petermanns Geographische Mitteilungen, Ergänzungsheft* 191: 110–113.

Berson, A., und L. Breitfuß 1928: Bericht über den Verlauf der 2. ordentlichen Generalversammlung der Aeroarctic vom 18. bis 23. Juni 1928 zu Leningrad. *Arktis* 1(3/4): 113–120.

Breitfuß, L. 1939: The most important voyages and events in the Arctic since the beginning of our history. In: Breitfuß, L., *The Arctic*, pp 126–183. Berlin: Dietrich Reimer Verlag.

Bruns, W. 1927: Praktische Wege für den Einsatz des Luftschiffs großen Typs zu ausgedehnter wissenschaftlicher Erforschung und ständiger Überwachung der Arktis. *Petermanns Geographische Mitteilungen, Ergänzungsheft* 191: 19–25.

Cannegieter, H.G. 1963: The History of the International Meteorological Organization 1872-1951. *Annalen der Meteorologie* 1: 1–280.

Dege, W. 1962: Deutsches Observatorium Ebeltofthafen – Spitzbergen. Zur 50. Wiederkehr der 1. Überwinterung 1912/13. *Polarforschung Bd.* V, 32 (1/2): 136–140.

Dominik, H. 1930: Erforschung der meteorologischen und aerologischen Verhältnisse auf See. In: Ir Rapport de la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des Traveaux de la Commission pendant sa Première annèe de Travail. Procès-verbeaux des séances de la Réunion à Leningrad Aoùt 1930. Edouard Ijdo S.A., Leyde, 6: 137–138.

Dominik, H., and H. Hergesell 1930: Ueber die beabsichtigte Teilnahme Deutschlands an dem internationalen Polarjahr 1932–33. In: Ir Rapport de la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des Traveaux de la Commission pendant sa Première annèe de Travail. Procès-verbeaux des séances de la Réunion à Leningrad Aoùt 1930. Edouard Ijdo S.A., Leyde, No 6, pp 142–143.

Duckert, P. 1930a: Ueber den Bau von funkentelegraphischen Stationen für die Zwecke der Expeditionen im Polarjahr 1932–1933. Ir Rapport de la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des Traveaux de la Commission pendant sa Première annèe de Travail. Procès-verbeaux des séances de la Réunion à Leningrad Aoùt 1930. Edouard Ijdo S.A., Leyde, No 6, pp 95–100.

Duckert, P. 1930b: Der Stand der Arbeiten zwecks Einrichtung eines funkentelegraphisch-fernmeldenden Registrieballonmeteorolgraphen. I^{r} Rapport de la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des Traveaux de la Commission pendant sa Première annèe de Travail. Procès-verbeaux des séances de la Réunion à Leningrad Aoùt 1930. Edouard Ijdo S.A., Leyde, No 6, pp 138–142.

Everdingen, E.v. 1930: International Commissions for the Reseau Mondial & Polar Meteorology and for Terrestrial Magnetism and Atmospheric Electricity. In: Secrétariat du Comitè Météorologique International (eds) Procès-verbeaux des seances de la Conférence Internationale des Directuers, due Comité Météorologiques International et de diverses commissions. Copenhague, Septembre 1929. Kemik & Zoon, Utrecht, No 3, Part 2, pp 154–156.

Friedman, R.M. 1989: *Appropriating the Weather: Vilhelm Bjerknes and the Construction of a Modern Meteorology*, 251 pp. Ithaca, NY: Cornell University Press.

Georgi, J. 1928a: Aerologie der hohen Breiten und große Zirkulation. *Arktis* 1 (3/4): 83–96, Tables 23 and 24.

Georgi, J. 1928b: Ergebnisse der Pilotaifstiege im Gebiet um Island. *Zeitscrift für Geophysik* 4(7/8): 352–356.

Graham, L. 1967: *The Soviet Academy of Science and the Communist Party, 1927–1932*. New York, NY: Princeton.

Grotewahl, M. 1934: Die deutsche Polarstation Kajartalik. *Polarforschung* 4(2): 3–5.

Heidke, P. 1932: Das zweite Internationalen Polarjahr 1932/1933. *Annalen der Hydrographie und Maritime Meteorologie* 60(3): 81–93.

Heidke, P. 1933: Deutsche Beteiligung an ausländischen Expeditionen im Rahmen des Internationalen Polarjahres 1932/1933. *Annalen der Hydrographie und Maritime Meteorologie* 61(11/12): 379–381.

Hergesell, H. 1913: Report of the Commission for Scientific Aeronautics. In: *Report of the tenth meeting, Rome, 1913. International Meteorological Committee*. London: Darling and Son.

Hoinka, K.P. 1997: The Tropopause: Discovery, Definition and Demarcation. *Meteorologische Zeitschrift N.F.* 6(12): 281–303.

Kalitine, N.N. 1930: L'Organisation des travaux actinométriques pendant la seconde Annéе Polaire Internationale. In: I^{r} Rapport de la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des Traveaux de la Commission pendant sa Première annèe de Travail. Procès-verbeaux des séances de la Réunion à Leningrad Aoùt 1930. Edouard Ijdo S.A., Leyde, No 6, pp 102–105.

Kohlschütter, E. 1927: Bericht über die Entstehung der Internationalen Studiengesellschaft zur Erforschung der Arktis mit dem Luftschiffe und ihre bisherige Tätigkeit. Petermanns Geographische Mitteilungen, Ergänzungsheft 191, pp 12–15.

Kolchinsky E.I. (ed) 2001: Sovetsko-Germanskie nauchnye sviazi vremeni Veimarskoi respubliki. St Petersburg: Nauka.

Kopp, W. (1932). Die Oststation. In: E. Wegener (ed), *Alfred Wegeners letzte Grönlandfahrt. Die Erlebnisse der deutschen Grönlandexpedition 1930/1931 geschildert von seinen Reisegefährten und nach Tagebüchern des Forschers*, pp 247–295. Leipzig: F.A. Brockhaus.

Koriakin, V.S. 2007: *Rudolf Lazarevich Samoilovich, 1881–1939*. Moskva: Nauka.

La Cour, D. 1932: The International Polar Year 1932–1933. In: Secrétariat du Comitè Météorologique International (eds) Procès-verbeaux des séances du Comité Météorologiques International à Locarno, Octobre 1931. Et Rapports de 3 Commissions et d'une sous-commission á Innsbruck et Locarno, Septembre et Octobre 1931. Edouard Ijdo S.A., Leyde, No 10, pp 107–117.

Lajus, J.A. 2002: Foreign science in Russian context: Murman Scientific – Fishery Expedition and Russian participation in early ICES activity // 100 Years of Science under ICES. *ICES Marine Science Symposia* 215: 64–72.

Lajus, J.A. 2008: Podgotovka Vtorogo Mezhdunarodnogo Poliarnogo goda v SSSR: ot kooperatsii uchenykh k gosudarstvennomu proektu. Ekologicheskoe planirovanie i upravlenie, No 3–4 (8–9): 92–108.

Laursen, V. 1982: The Second International Polar Year (1932/1933). *WMO Bulletin* 31(3): 214–222.

Lewis, J.M. 2003: Ooshi's observation viewed in the context of jet stream. *Bulletin of the American Meteorological Society* 84(3): 357–369.

Lüdecke, C. 1995: Die deutsche Polarforschung seit der Jahrhundertwende und der Einfluß Erich von Drygalskis. PhD thesis, Berichte zur Polarforschung, Nr. 158, 340pp.

Lüdecke, C. 2001: Leonid Ludwig Breitfuß (1864–1950) in Deutschland – Chronist der Polarforschung und die Umstände des Verkaufs seiner Bibliothek nach England. *Polarforschung* 71(3): 109–119 (published 2003).

Meteorological Committee 1913: Report of the tenth meeting, Rome, 1913. International Meteorological Committee. London: Darling and Son.

Mezhdunarodnye nauchnye sviazi 1992: *Akademii Nauk SSSR. 1917–1941*. Moscow: Nauka.

Moltschanoff, P. 1930a: Methoden der Erforschung der Atmosphäre in den Polarregionen während des Polarjahres. In: I^{r} Rapport de la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des Traveaux de la Commission pendant sa Première annèe de Travail. Procès-verbeaux des séances de la Réunion à Leningrad Aoùt 1930. Edouard Ijdo S.A., Leyde, No 6, pp 113–116.

Moltschanoff, P. 1930b: Projekt eines programms der Erforschung der höheren Atmosphärenschichten während des Polarjahres. In: I^{r} Rapport de la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des Traveaux de la Commission pendant sa Première annèe de Travail. Procès-verbeaux des séances de la Réunion à Leningrad Aoùt 1930. Edouard Ijdo S.A., Leyde, No 6, pp 116–117.

Nansen, F. 1928: Geleitwort zum Arbeitsprogramm der Aeroarctic. *Arktis* 1(1/2): 45–46.

Nansen, F. 1930: Letter to Dominik from 9 August 1929. In: Secrétariat du Comitè Météorologique International (eds) Procès-verbeaux des seances de la Conférence Internationale des Directuers, du Comité Météorologiques International et de diverses commissions. Copenhague, Septembre 1929. Kemik & Zoon, Utrecht, No 3, Part 2, pp 178–179.

Obolensky, V. 1930: Ueber die Organisation von elektometeorologischen Beobachtungen in Polarländern. In: I^{r} Rapport de la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des Traveaux de la Commission pendant sa Première annèe de Travail. Procès-verbeaux des séances de la Réunion à Leningrad Aoùt 1930. Edouard Ijdo S.A., Leyde, No 6, pp 111–113.

Rose, N. 1930: Projet de recherches géomagnetiques dasn L'U.R.S.S. pendant la 2^{e} Année Polaire 1932–1933. In: I^{r} Rapport de la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des Traveaux de la Commission pendant sa Première annèe de Travail. Procès-verbeaux des séances de la Réunion à Leningrad Aoùt 1930. Edouard Ijdo S.A., Leyde, No 6, pp 106–111.

Rykatcheff, M. 1913: Proposal. In: Report of the tenth meeting, Rome, 1913. International Meteorological Committee, pp 43–44. London: Darling and Son.

Schouleikin, M.V. 1930: Hydrological investigations in the period of the International Polar Year. In: I^{r} Rapport de la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des Traveaux de la Commission pendant sa Première annèe de Travail. Procès-verbeaux des séances de la Réunion à Leningrad Aoùt 1930. Edouard Ijdo S.A., Leyde, No 6, pp 131–136.

Secrétariat du Comitè Météorologique International (eds) 1930a: Procès-verbeaux des séances de la Conférence Internationale des Directuers, du Comité Météorologiques International et de diverses commissions. Copenhague, Septembre 1929. Kemik & Zoon N.V., Utrecht, No 3, Part 2, pp 127–401.

Secrétariat du Comitè Météorologique International (eds) 1930b: I^{r} Rapport de la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des Traveaux de la Commission pendant sa Première annèe de Travail. Procès-verbeaux des séances de la Réunion à Leningrad Aoùt 1930. Edouard Ijdo S.A., Leyde, No 6, 152 pp.

Secrétariat du Comitè Météorologique International (eds) 1932: Procès-verbeaux des séances du Comité Météorologiques International à Locarno, Octobre 1931. Et Rapports de 3 Commissions et d'une sous-commission á Innsbruck et Locarno, Septembre et Octobre 1931. Edouard Ijdo S.A., Leyde, No 10, 385 pp.

Secrétariat du Comitè Météorologique International (eds) 1933 III^{e} Rapport des la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des Traveaux de la Commission, Octobre 1931 – Mai 1933. Procès-verbeaux des séances de la Réunion de Copenhague Mai 1933. Kemik & Zoon, Utrecht, No 16, 128 pp.

Selezneva E.S., and E.A. Tudorovskaia . 1958: P.A. Molchanov, vydaiuschiisia sovetskii aerolog. Leningrad: Gidrometeoizdat.

Simpson, G.S. 1930: International Commsision for the Reseau Mondial and Polar Meteorology. In: Secrétariat du Comitè Météorologique International (eds) Procès-verbeaux des seances de la Conférence Internationale des Directuers, du Comité Météorologiques International et de diverses commissions. Copenhague, Septembre 1929. Kemik & Zoon N.V., Utrecht, No 3, Part 2, pp 147–152, Annex V_2: p 157.

Stanka, V. (ed) 1963: Institutions of the USSR Active in Arctic Research and Development. Sec. ed. Washington, DC: Arctic Institute of North America.

Størmer C. 1928: Probleme und Richtlinien der künftigen Polarlichtfroschung. *Arktis* 1(3/4): 70–81.

Süring, R. 1930: Wolkenforschung während des Internationalen Polarjahres 1932–1933. In: I^{r} Rapport de la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des

Traveaux de la Commission pendant sa Première annèe de Travail. Procès-verbeaux des séances de la Réunion à Leningrad Aoùt 1930. Edouard Ijdo S.A., Leyde, No 6, pp. 101–102.

Sverdrup, H.U. 1928: Aufgaben, Bemannung und Ausrüstung einer Wissenschaftlichen Beobachtungsstation auf dem Treibeis bei 1-2jähriger Überwinterung in der Inneren Arktis. *Arktis* 1(1/2): 29–38.

Sverdrup, H.U, 1930: Sur les maisons des stations de montagne. In: Secrétariat du Comitè Météorologique International (eds) In: I^{r} Rapport de la Commission Internationale de l'Anneè Polaire 1932–1933. Compte-Rendu des Traveaux de la Commission pendant sa Première annèe de Travail. Procès-verbeaux des séances de la Réunion à Leningrad Aoùt 1930. Edouard Ijdo S.A., Leyde, No 6, pp 68–72.

Talman, F. 1914: International Observations. *The Arctic Monthly Weather Review* (3): 181–182.

Wegener, A. 1909: Drachen und Ballonaufstiege. Danmarkshavn Ekspeditionen til Grønlands Nordøstkyst 1906–1908. Bd. II, No. 1, Bianco Lunos Bogtrykkerie, København pp 1–75.

Wegener, A. 1928: Plan einer Inlandeisexpedition nach Grönland. In: K. Wegener (ed) Wissenschaftliche Ergebnisse der Deutschen Grönland-.Expedition Alfred Wegener 1929 und 1930/1931 herausgegeben im Auftrag der Notgemeinschaft der Deutschen Wissenschaft, Bd. I: Geschichte der Expedition, pp 3–9. Leipzig: F.A. Brockhaus 1933.

Wegener, K. (ed) 1933–1940: Wissenschaftliche Ergebnisse der Deutschen Grönland-Expedition Alfred Wegener 1929 und 1930/31. Bd. I (1933), Geschichte der Expedition, 198 pp. Leipzig: F.A. Brockhaus.

Wehrlé, M.P. 1930: L'Année Polaire Internationale dans l'Hemisphere Sud. In: Secrétariat du Comitè Météorologique International (eds) Procès-verbeaux des seances de la Conférence Internationale des Directuers, du Comité Météorologiques International et de diverses commissions. Copenhague, Septembre 1929. Kemik & Zoon, Utrecht, No 3, Part 2, pp 177–179.

Wittenburg P.V. (ed) 1930: Trudy Vtoroi Polarnoi Konferentsii. Leningrad, 18–23 iiunia 1928 g. Izdanie Gruppy SSSR Aeroarctic, Leningrad.

Wölken, K. 1934: Schallausbreitung im Polargebiet. *Zeitschrift für Geophysik* 10(3/4): 222–234.

Wutzke, U. 1997: *Durch die weiße Wüste*, 240 pp. Gotha: Justus Perthes.

Zotin, M.I. 1957: Razvitie seti poliarnykh stantsii. Problemy Arktiki, No 1: 99 – 109.

Zubov, N.N. 1933: Vokrug Zemli Franza Iosifa. Izd. Gidrometeorologicheskogo komiteta, Moskva.

Zubov, N.N., and Kozitsky N.I. 1959: Uchastie Sovetskogo Soiuza v provedenii Vtorogo Mezhdunarodnogo Poliarnogo goda (1932–1933). Izd. Moskva: Akademii Nauk.

Chapter 7
Some IPY-2 Histories

Susan Barr, Louwrens Hacquebord, Cornelia Lüdecke

7.1 14 Months in the Arctic – The Austrian Polar Expedition to Jan Mayen 1932–1933

Cornelia Lüdecke

Already 44 countries had agreed upon their participation in IPY-2 when the International Polar Commission met in Innsbruck in 1931 for the second time. Although the world economic crisis took its toll, the execution of the Polar Year finally was decided. Austria's economic situation was very tight, but it was agreed that the Commission's invitation to join the international co-operation of scientific measurements of physics of the earth would be accepted. Relating to IPY-1, Austria should occupy a station on Jan Mayen once again. Norway offered free transportation on its annual supply ship to the Norwegian radio station on Jan Mayen, established in 1921.[1]

The Academy of Science in Vienna was in charge of the Austrian participation in the Polar Year. Additional financial aid came from the Federal Ministry of Education. The director of the Central Institute for Meteorology and Geodynamics in Vienna, Prof. Dr. Wilhelm Schmidt (1883–1936), organised the expedition and gave much valuables advice. Scientific instruments, two prefabricated observatories for magnetic measurements, equipment and food had to be bought and tested before departure. This was done by the participants: expedition leader Dr. Hanns Tollner (1903–1986), assistant at the Institute for Meteorology and Physics at the University of Vienna, who was also in charge of earth-magnetic measurements; German meteorologist Dr. Rudolf Kanitscheider (1906–1971), who was a stipendiary of the German Science Foundation (Notgemeinschaft der Deutschen Wissenschaft) from the university in Innsbruck, and engineer Fritz Kopf from Vienna. The Norwegian

C. Lüdecke (✉)
Institute of History of Science, Mathematics and Technology, University of Hamburg, Germany
e-mail: C.Luedecke@lrz.uni-muenchen.de

---

[1] Tollner et al. (1934).

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_7,

weather station in Tromsø, the German Science Foundation in Berlin, the Austrian Federal Ministry of the Army and various Austrian companies gave further support. Nevertheless, it was a feat to get all the things needed for such an expedition with only a small amount of money available.

Preparations started at the Central Institute in Vienna in late autumn 1931. Besides buying, testing and packing the equipment, the participants had to be trained with the new instruments. Some goods were already gathered in Hamburg and Tromsø, when bought abroad. Kanitscheider was entrusted to travel to Hamburg and to overview the loading of the goods on the steamship *Leo* for transportation north. Some time later Tollner and Kopf travelled via Stockholm and Narvik to Tromsø, where they met. On 10 June 1932 the whole equipment consisting of an inventory of 1,000 items was ready on the pier to be loaded on the small relief ship *Fridthjof*, a 105-ton two-master with steam engine, which should bring the material securely to Jan Mayen in the high north at 71°N (Fig. 7.1).

Finally, on 17 June 1932 the expedition departed from Tromsø and arrived at Jan Mayen after 5 days, where they landed at Jameson Bay and unloaded 25 tons of equipment. They were allowed to move into what became called “Hotel Austria”, which was the Norwegian radio station reserve hut in case of fire in the main station and which lay a distance of 150 m from the station. On the next day, 23 June, a storm with strong south-easterly wind and high surf made unloading impossible. In the end disembarkation in the high seas was the most vulnerable part during the whole expedition. When they had to wait for better conditions, the existing small trolley railway was rebuilt and prolonged and a petrol motor added to help to transport the goods across from the top of the landing site to the place where the station was located. Seventeen men were involved in transporting altogether about 50 tons

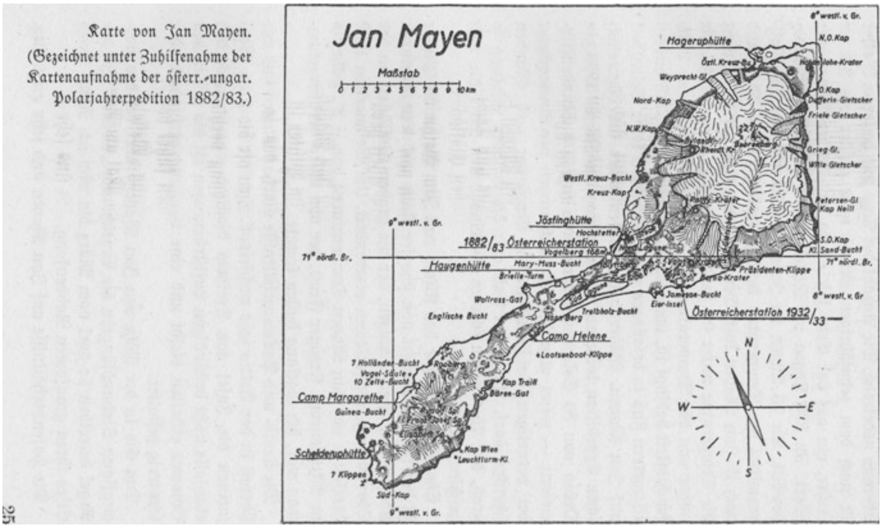


Fig. 7.1 Map of Jan Mayen drawn with the help of a survey from the Austrian–Hungarian expedition of the Polar Year 1882/1883 (Tollner 1934:25)

for the Norwegian and Austrian overwintering stations, a job which took several days. It was very exhausting, because sometimes they had to work 20 hours in a row with totally wet clothes. This experience gave them a little outlook on the harsh and windy polar-oceanic climate of that remote island. They had to be adjusted themselves for low temperature variations during summer and higher changes during winter due to the mixing zone of the cold east Greenland current and the warm Gulfstream usually causing foggy weather. The 10-year mean value resulted in 238 days of total cloudiness and 33 days of storm. The mean temperature was –2°C, which is felt much colder because of the prevailing high wind. The soil is frozen and covered by snow and ice during 9 months of the year. During the rest of the year sand is more or less continuously blowing.

About 3.5 weeks after landing, in the middle of July, the *Polarbjörn* with the Norwegian survey expedition (predecessor to the present Norwegian Polar Institute) on board paid a visit to Jan Mayen on its way to Greenland. Germans and Norwegians were invited on board, which all of them enjoyed very much. After this pleasant event they had to catch up with their work. Research priorities were meteorological and earth-magnetic observations. But before measurements for the Polar Year started on 1 August 1932, they had to finish all preparations including furbishing the hut of 3 × 9 m^2 for accommodation. Due to the strong winds it was fixed to the ground by iron chains and wire ropes. It had a small vestibule, a kitchen on the right side from the entry, and a bigger living room of 12 m^2. The loft above the kitchen and living room was used for storing 300 kg of provisions. The rest had to remain in boxes and barrels covered by a tent in front of the house (Fig. 7.2).

Unſere Wohnhütte

Fig. 7.2 Accommodation hut of the Austrian IPY-2 expedition at Jan Mayen (Tollner 1934: left of p. 47)

They also had to set up the two temporary magnetic observatories for absolute and variation measurements. The prefabricated huts had been constructed in Austria and consisted of single sections which could be fixed together by brass bolts. Unfortunately, this system did not stand the test. The wooden parts had become wet from the waves on the outward journey and became distorted so they did not fit together any longer. But worse of all was the discovery that the brass bolts had been lost somewhere during the transport between Hamburg and Jan Mayen. Now the parts had to be fixed by wooden bolts, which was a very tricky and time-consuming task.

Additionally, an electric cable connected the two observatories with the accommodation hut to provide light for the four registering instruments. The time-marker apparatus was installed in the living room together with the relay, switch board and pendulum clock. Each midnight the time signal from Nauen in Germany was taken from the radio. Right from the beginning of the Polar Year strong magnetic storms were observed. Unfortunately, problems with the high-speed registering instrument never could be totally resolved in contrast to the standard registering instrument.

Daily routine was divided between magnetic observations, cooking and washing, or other tasks like getting water from the lake, or melting snow, fetching coal, and cleaning the stove. Tollner was in charge of the astronomical and meteorological instruments, Kanitscheider took care of the magnetic material, and Kopf was in charge of provisions. In addition Kopf had promised to collect and prepare rare species of birds for the Museum of Natural History in Vienna.

The most important requisition for magnetic measurements was an iron-free surrounding. Although the observatories were only about 60 m away, it sometimes became an adventure by itself during snowstorms, when one only could move by crawling. After arrival one had to unfreeze the eyes, remove snow carefully from the clothes and heat the observatory. Changing the 20 kg accumulators was the hardest task, because they had to be carried to the engine house of the radio station and back again to the accommodation hut or the absolute hut. Fortunately, daily routine was exchanged between station members each week.

In the middle of August the *Quest*, Shackleton's ship from his last expedition 1921–1922 and now chartered by French tourists, stopped near the coast for a visit. A boat was lowered for the captain and part of his crew, bringing mail from home. This was the last visit from outside. On 12 November sun set for the last time and the polar night began. Spectacular northern lights[2] became the only distraction for the six men overwintering on Jan Mayen, who alternatively experienced strong storms of up to 123 hours or more. Later, on Palm Sunday 1933 for instance, the station experienced a storm of 80 m/s or nearly 300 km/h with rocks of 75 g being flung through the air.

Two dogs from the Norwegian radio station and their offsprings were the only relief during the long polar night. Comradeship was great, but nevertheless everybody had problems with sleeplessness, when there were little changes in light during

---

[2] Tollner (1935a).

the dark period. Midwinter was the first important marker during the stay and was commemorated accordingly, although Kopf had experienced a bad injury to his mouth when he fell on the ice. Three days later Christmas was celebrated in the ratio station with music from radio and gramophone. After the first friction between Austrians and Norwegians due to the big differences of personalities, something like real friendship between single persons developed, but it seemed that it was the Austrians who adapted to the Norwegian peculiarities. New Year started with a winter gale, Tollner fell from a ladder, Kopf got a stomach upset and the stove made problems, which only could be solved by cleaning it several times, always causing a big mess. All in all January 1933 became a month of crisis, which was underlined by monotonous food, because the potatoes were already totally rotten before Christmas. No wonder that the demand for fresh meat was growing from day to day.

Frost, storm from the east and rain took turns. Finally, at the end of January, a change in the weather to high pressure, no wind and cold temperatures prompted Tollner and Kopf to go looking for polar bears or seals, since the first indicators of scurvy had occurred. They started at 10 a.m. on 29 January. Unfortunately, after some hours of nice weather, the storm returned with such a great force that it nearly became impossible to get the windproof rubber jackets and trousers on. They dug a hole in the snow that had collected in a hollow. Soon they were totally covered by snow and breathing became difficult. Falling asleep would be their death. On the next day the power of the storm diminished a bit and the temperature increased. They started their return, but Kopf was already so exhausted that he had to stay behind, while Tollner went to get help from the radio station. Luckily, they could save Kopf on the same day just in time, before he experienced severe frostbite.

At that time a radio communication picked up by the Polish station on Bjørnøya (Bear Island) revealed that one of Austrians already was in a strong shattered state.[3] In February another accident happened on Jan Mayen, which caused long discussions on the air.[4] One of the Austrians had left the accommodation house for observations during a snowstorm and got lost. His comrades together with the three Norwegians found him after a long search lasting several hours. The man was unconscious after being hurled by the strong wind and thrown down on a stone, where he was severely hurt. A detailed description of his injuries (vomiting and strong pain in the chest) was communicated to a physician in Tromsø, who gave his advice over the radio. Questions and answers went back and forth and filled the air for many hours. Some days later he was out of danger.[5] This can be counted as one of the first occasions of tele-medicine, which still is in the state of development in the early twenty-first century.

In March 1933 Tollner and Kopf visited the remains of the old Austrian Polar Year station from 1882–1883.[6] Vertical driftwood indicated the former place of the

---

[3] Centkiewicz (1956:116–117).

[4] Centkiewicz (1956:131).

[5] It is interesting to note that both dramatic events were not mentioned in the Austrian account.

[6] Tollner et al. (1934).

Fig. 7.3 Accommodation hut of the Austrian IPY-1 expedition on Jan Mayen (Tollner 1934: right of p. 82)

boathouse. Some walls of the anemometer hut and the hut for the supplies were still standing. Nothing more than pillars commemorated the former astronomical and magnetic observatories. The accommodation hut still held its body structure, but only one single room was habitable, because Norwegian hunters had used to wood from the others parts of the house for heating. Otherwise this house, considered to be the best of its kind, might be still standing (Fig. 7.3). Later in the summer they returned to the old station to carry through a magnetic survey and to determine the azimuth of the sun.

Although Tollner and Kopf still had symptoms of scurvy, i.e., headache and heavy tiredness, they left the new Austrian station on 8 May for an exploration of the southern part of Jan Mayen. Each of them had to carry a backpack of 25 kg with provisions and equipment for one week. The weather improved. Sunshine and calm was rather unusual and helped them a lot to reach Sjuhollendarbukta (Seven Dutchmen Bay), where the Austrians had erected a cross in 1883 to commemorate seven Dutch whalers who died there during an overwintering in early 1634. Tollner's aim was to reach Sørbukta (South Bay), because he wanted to perform a first exploration for a planned later survey expedition. In the end this could not be accomplished due to a change in the weather and they had to return to their station on 15 May. In the meantime Kanitscheider had used his solitude to calculate the horizontal intensity. Usually, there was neither room nor silence to do this.

The last expedition was dedicated to climbing Beerenberg, the dominating volcano of 2,548 m, which was determined by the Austrians during IPY-1. This seemed to be too high compared with the current measurement of 2,277 m. The first exploration was made in July 1932; an attempt to climb the mountain top had to be aborted in the beginning of September, when a severe snowstorm set in. A third expedition started in July 1933. Marching on not yet frozen snow was very exhausting. Nevertheless, they reached a height of 1,800 m before they had to return. They did not felt strong enough to continue due to previous hard physical work and scurvy caused by tinned food.

During summer *Veslekari* was the first ship to stop at Jan Mayen on 8 July 1933. It carried the expedition led by Louise Boyd from San Francisco, who wanted to chart the northeast coast of Greenland. On her outward trip she agreed to pass by Jan Mayen and to deliver the long expected mail and fresh food. She even took the effort to land on the island. In the evening, dinner for the islanders was served on board.

Finally, departure came closer. The outside walls of the station were painted, the chimneys cleaned and the equipment, including instruments and temporary magnetic observatories, packed. On the afternoon of 31 July 1933 – after 14 months – the Norwegian relief ship *Suzan* arrived to bring new equipment and new overwintering personnel for the Norwegian radio station, while the Austrian expedition started to load the ship for sailing home again. They departed on 5 August and arrived after an odyssey of three days during a heavy storm at Lofoten at about 9 August.[7]

On 10 December 1933 a festive meeting after the return of the Austrian Jan Mayen Expedition took place in Vienna.[8] In the same month an exhibition at the Central Institute of Meteorology and Geodynamics and later at the Museum of Natural History showed instruments, registrations, pictures and collections of the expedition to the public. The Austrian expedition gathered a huge data set of astronomical, magnetic[9] and meteorological observations. A first comparison of simultaneous measurements of the earth-magnetic elements at Jan Mayen and Vienna-Audorf was made for 1 June 1933 and indicated high variability in the early morning between 3 and 7 a.m. close to the magnetic pole (Fig. 7.4).

During the course of the Polar Year, Tollner performed an astronomical determination of the geographical position at the Austrian IPY-1 station.[10] Fifty years ago they had used circum-meridian heights of the stars to determine the geographical latitude and the culmination of the moon to calculate the geographical longitude. In contrast to the old method, Tollner measured the zenith distance of Polaris at various hour angles to determine latitude, while he used zenith distance from stars close to the first vertical for the calculation of the longitude. With this new method Tollner was able to eliminate some systematic mistakes in the observations during IPY-1. Otherwise if both (uncorrected) determinations would be correct, Jan Mayen had drifted 1,270 m to the west, i.e. 25 m per year. But this could not be realistic according to Tollner, although in principle he was not against Alfred Wegener's continental drift theory.

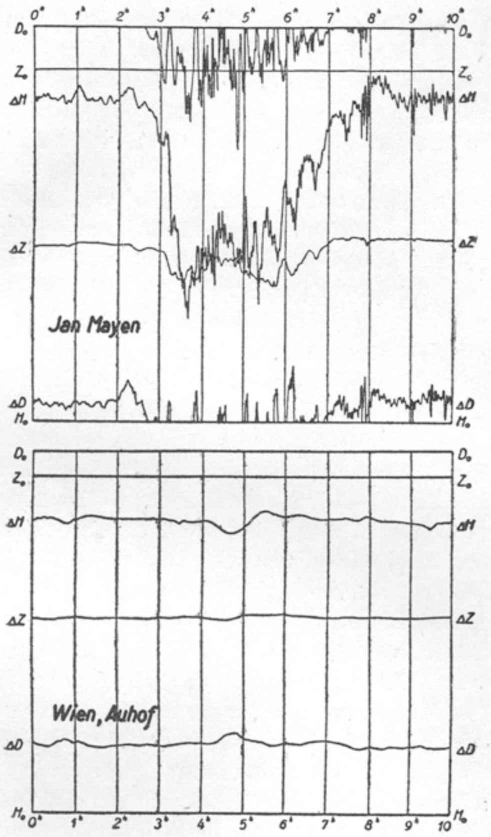
---

[7] Tollner et al. (1934).

[8] Hammerl et al. (2001:161).

[9] Kanitscheider no year, Kanitscheider and Troperczer (1935).

[10] Tollner (1934), Riedl (1973).



Gleichzeitige Regiſtrierungen der erdmagnetiſchen Elemente auf Jan Mayen und in Wien-Auhof am 1. Juni 1933.
(D₀, H₀, Z₀ ſind die Baſislinien der Deklination, Horizontalintenſität und Vertikalintenſität.
ΔD, ΔH, ΔZ ſind der zeitliche Verlauf der Deklination, Horizontalintenſität und Vertikalintenſität.)

Fig. 7.4 Simultaneous measurements of the earth-magnetic elements at Jan Mayen and Vienna-Audorf on 1 June 1933. D_0, H_0 and Z_0 are base lines of declination, horizontal intensity and vertical intensity. ΔD, ΔH and ΔZ show the variation in time of declination, horizontal intensity and vertical intensity (Tollner 1934:45)

When Tollner observed the emission of heat during the winter night, he recognised that the high humidity prevailing on Jan Mayen protected against heat loss by emission.[11] He also calculated the atmospheric radiation and could show that it was nearly identical from clouds in the high cirrus level and in the lower altus level. In addition Tollner also performed geographical investigations of the patterned ground from lava and lava sands.[12] He measured the depth of the permafrost and developed

---

[11] Tollner and Kopf (1934), Tollner (1935).

[12] Tollner (1937a).

a theory of flowing soil in river-like meanders, which some decades later became part of the periglacial theory concerning transition from closed structures to open solifluction structures. Tollner also provided genetic analysis of mixed sand and snow cones.[13]

7.2 The French Expedition to Greenland

Susan Barr

The International Commission for the Polar Year 1932–1933 proposed that France[14] establish its IPY base at Scoresby Sund on the east coast of Greenland. The reason for this was that the French polar scientist and explorer Jean-Baptiste Charcot (1867–1936) had worked in the area since 1925 with the famous polar ship *Pourquoi-Pas?*. The small Greenlandic settlement at Scoresby Sund had been established in 1924 when, as a political move in the dispute between Denmark and Norway over traditional hunting rights in Northeast Greenland, the Danish East Greenland pioneer Ejnar Mikkelsen had moved a group of Greenlanders from their settlement further south at Ammassalik northwards to create the new settlement that is now known as Ittoqqortoomiit.[15] France accepted the proposal and a French IPY-2 committee was established with leaders General Gustave Auguste Ferrié (1868–1932) and M. Fichot and secretary Charles Maurin, Director of the Geophysical Institute of the Earth. Ferrié was an engineer and pioneer of radio-diffusion and a member of the Académie des sciences since 1922.[16] He died before the Polar Year started.

The site for the IPY-2 station was chosen during *Pourquoi-Pas?*'s voyage to Greenland in 1931. Meteorologist Louis Gain, who had participated on Charcot's expedition to Antarctica with *Pourquoi-Pas?* in 1909–1910, had the responsibility of finding where the altitude observatory should be situated. The Danish supply ship *Gertrud Rask* transported the materials for the station to the site that same year and the local carpenter, M. Hansen, was engaged to erect the buildings. For the start of the Polar Year in 1932 the French Navy commissioned both the *Pourquoi-Pas?* and the *Pollux* (formerly the Russian *Wrangel*) to bring 500 tons of supplies and the men who were to man the new station. The *Gertrud Rask* this year transported the Dutch IPY group to Ammassalik for their stay (see Hacquebord under). The French

---

S. Barr (✉)
Directorate for Cultural Heritage, PO Box 8196 Dep. NO-0034 Oslo, Norway
e-mail: susan.barr@ra.no

[13] Tollner (1937b).

[14] This short summary is based on Simonin (2008).

[15] Barr (2003a:151).

[16] Wikipédia.

group consisted of five naval officers and eight orderlies, together with two civilian scientists who were in charge of the aurora and cosmic ray observations, and the magnetism and geology. Naval ltn. Habert was leader of the group.

The station consisted of the two buildings *Ker Doumer* (*Ker* is Breton for House and Paul Doumer was President of the French Republic who had been murdered in May that year) and the observatory *Ker Virginie* (after the person who had generously sponsored its construction).[17] The station was officially inaugurated on 11 August in the presence of secretary Maurin of the French IPY committee and scientist Jean-Louis Faure.

The Polar Year passed fairly uneventfully and the two ships returned in summer 1933 to collect the winterers and most of the scientific instruments. Some were lent to the Danes for one more year, to be picked up by *Pourquoi-Pas?* in 1934. The main building was donated to the Danish Crown and was used as the local hospital until it burned down 25 years later.[18]

7.3 The Dutch Contribution to the Second International Polar Year 1932–1933

Louwrens Hacquebord

On December 1927 Prof. E. van Everdingen (1873–1955), president of the International Meteorological Committee, received a letter from the President of the "Deutsche Seewarte" in Hamburg with the following text: "In wenigen Jahren wird die meteorologische Welt den fünfzigjährigen Gedenktag des Internationalen Polarjahres 1882/1883 feiern. Ich würde mich freuen Ihr Interesse dafür zu gewinnen, dass das Internationale Meteorologische Komitee, dessen Präsident Sie ja sind, im Jahre 1932 wiederum ein solches 2 Internationales Polarjahr veranstalten sollte".[19] This letter started the preparation of the Second International Polar Year 1932–1933. The International Meteorological Committee was asked to take the lead in the organisation (see previous chapter for the introduction to IPY-2).

The object, it was said, had to be attained by small expeditions of three–four men to easily accessible places and not by big, expensive expeditions to places as difficult to reach as some during IPY-1. The execution of the science and implementation plan for an IPY-2 started on 1 August 1932[20] and the Netherlands participated in

---

L. Hacquebord (✉)
Willem Barents Polar Institute, University of Groningen, Netherlands
e-mail: L.Hacquebord@rug.nl

[17] Simonin (2008).

[18] Thing (2008).

[19] RA Utrecht/Cannegieter:1.

[20] RA Utrecht/Cannegieter:1–2.

Hangar and airplane in Reykjavik, Iceland. The Fokker planes were used to collect information in the atmosphere. Photo from the Archive of the KNMI, De Bilt

The Dutch earth magnetic station in Ammassalik, Greenland. Photo: KNMI, De Bilt

the Second International Polar Year with two stations: a meteorological and earth-magnetic station in Ammassalik in East Greenland and an aerological station very near to Reykjavik in Iceland.

The coordination of the IPY research in the Netherlands was in the hands of a National IPY Committee chaired by Dr. E. van Everdingen, general-director of the Royal Dutch Meteorological Institute (KNMI) in Utrecht. It consisted of directors and former directors of the KNMI, the Chairman of the Dutch Society of Meteorology and Astronomy and interestingly enough the leader of the radio research of the NV Philips Glow-Lamp Industry. As in IPY-1 most of the money should come from the national societies and private persons. The government was only asked for recommendation and instruments.

According to the letters sent by the National IPY Committee to the Minister of Education, Arts and Sciences, the Royal Academy of Sciences and the Royal Dutch

The Dutch team in Ammassalik: Jaap van Zuylen, Karel van Schouwenburg, Henk van Lohuizen, Andre de Bruine, Niko and Lies van Tinbergen. Photo: Van Zuijlen collection, Rijksmuseum voor Volkenkunde, Leiden

Geographical Society, the Dutch research endeavour this time would concentrate on the two easily accessible places already mentioned. Two small expeditions should increase the knowledge in the field of earth-magnetism, meteorology and aerology in these places.[21]

7.3.1 The Dutch IPY-Station in Ammassalik

The expedition to Ammassalik was organised by Van Everdingen and financed with money from national societies and private persons and some additional support from the government.

The money was already available in the beginning of June 1932 and therefore the expedition to Ammassalik could leave Copenhagen with the steamship *Gertrud Rask* on 14 July 1932. They arrived in East Greenland on 2 August. The expedition team consisted of Dr. J.van Zuylen as expedition leader and J.A.de Bruine, H.P.Th van Lohuizen and K.L. van Schouvenburg as members.

Already in the beginning it became clear that as a location for the Dutch IPY-station Ammassalik was a far better choice than Dickson Harbour was in IPY-1. It was relatively easy to reach and it had more possibilities for communication. After the *Gertrud Rask* had left, the *Sökongen* visited Ammassalik. This ship left on 9

---

[21] RA Utrecht/van Everdingen and the concept brochure.

September with letters from the expedition members to inform the home front about their situation. Some days later the trawler *Lord Talbot* showed up and gave the expedition members another possibility to report about their well-being.[22]

A short report of this expedition was published in German in "Bulletin of the Arctic Institute of Leningrad". In this report Dr. G. van Dijk informed about the meteorological and earth-magnetic research activities in the Dutch station in Ammassalik. At the end of August the installation of the instruments was partly ready, so that, for instance, on the day of the solar eclipse 31 August, absolute magnetic measurements could be made showing a jump on the magnetic variation instruments. The radio was not so far installed that the reflections against the Kennelly Heaviside layer could be registered. This was possible for the first time on 6 September. In the second half of September the installation was ready for all observations of the programme.

The programme included observations in the field of meteorology; visual observations and registering of the air pressure, temperature, humidity, wind direction and wind power. The wind power was measured with an Anemometer of Dines. Clouds were recorded with a Nephometer in the same way as Dr. Stüve's method, and in the field of aerology observations with pilot and registration balloons were done; for this registration 15 visual signalling meteorographs of Patterson were taken along. In the winter of 1932–1933 only a few balloons were flown because the hydrogen production caused problems during the winter conditions in Ammassalik. In the spring of 1933 these problems were solved so that aerological observations by balloons could be done in the last months of the polar year. On 9 June 1933 a balloon could be observed at a height of more than 14 km.[23]

Radiation observations and aurora were also studied. The aurora was photographed and visually registered. In the beginning the aurora photographs were not very successful, but after a change in the developing process the results were much better. This aurora photography was performed in co-operation with the French station in Scoresby Sund and the German station in Kajartalik.

An enormous storm with an average wind power of 11 Beaufort caused an intermezzo of 32 hours on 14 and 15 January 1933. Some of the buildings were damaged, a weather vane was blown away and an electric wire was cut. The masts of the expedition radio station withstood the storm.

The observations in the field of radio-electricity consisted of a daily measurement of the height of the Kennelly-Heaviside layer. The measurements were very successful, just as the estimations of the strength of the signals of other stations and the observations of the air interferences were. Special attention was given to the observation of halos and comparable optical phenomena.[24]

---

[22] van Dijk (1933:261–263).

[23] H.G.Cannegieter (1933), van Dijk (1933:263).

[24] van Dijk (1933:263).

7.3.2 First Biological Research in an IPY

In 1932 Dr. Niko Tinbergen together with his wife got the opportunity to join the Dutch expedition to Ammassalik as a guest. Tinbergen and his wife spent a whole year in this region in East Greenland. The Ammassalik district is a broad coastal belt divided up by big fjords and sounds because the margin of the Greenland ice-sheet runs far inland. In two of the three larger fjords big calving glaciers cause a permanent ice stream, which is the reason for many fog days and other climate features influencing the vegetation. But in the third fjord, Ammassalik-fjord, no big glaciers are found flowing off to sea level. The inner part of the fjord bears rather luxuriant vegetation, forming a real inner-fjord zone. In this fjord the breeding places of many land birds were found.[25]

Tinbergen and his wife travelled in this area with a collapsible canoe and camped during the summer. In the company of an Eskimo hunter they wintered in a hut. During this wintering they learned the language and the hunter introduced them into the Eskimo culture. Tinbergen became very interested in the Eskimo hunting culture and during the wintering he had all the time and possibilities to study the hunting strategies, tools and kayaks of the hunter. As a biologist he was also interested in the dogs and he used his time to study their behaviour. He also admired the artistic qualities of the Eskimos and collected wood and ivory carvings for the Museum of Education in The Hague. All his admiration for the Eskimos, their friendly attitude and hospitality he wrote down in his book *Eskimoland* that was published for a broad reading public soon after his return to the Netherlands.[26]

In the Torsukattak, a little side fjord of the Ammassalik Fjord, Tinbergen and his wife spent the spring and summer of 1933 to study the behaviour of the Snow Bunting, the Red-necked Phalarope and the Wheatear.[27] With his research, life sciences entered the domain of the natural sciences. For the first time biological research was going further than observing, collecting and making inventories. Tinbergen analysed and explained the behaviour of the three bird species and that was new. He inspired a whole generation of ornithologists to study birds in the Arctic. Within biology his research has been trendsetting and has caused a shift in the discipline from observational biology into more ethological and ecological biology.[28]

7.3.3 The Dutch IPY Aerological Station at Reykjavik

The second scientific activity was initiated by Dr. H.G. Cannegieter, also working at the Royal Dutch Meteorological Institute. This project had a late start because of the military and political complications of the utilisation of military planes. Because

---

[25] Tinbergen (1935).

[26] Tinbergen (1934).

[27] Tinbergen (1935:1–38); Tinbergen (1939).

[28] Hacquebord (1995).

of the late start it was difficult to raise money for this project. However, on 29 June 1932 the committee especially established for this activity decided to continue with the project “albeit with the smallest possible costs”.[29] Two planes and three staff members were transported to Iceland by a ship of the Dutch Royal Navy and the men did meteorological observations at several heights in the atmosphere during a whole year. The observations began on 2 September. The programme comprised in the first place a daily airplane ascent to at least 5,000 m; once a day during the winter months and twice a day in the summer. Second, a pilot balloon ascent once a day during the winter and twice a day during the summer. Third, a synoptic message three times a day. Fourth, regular nephoscopic observations and cloud observations every hour at the international days of the first and second order, and, fifth, the calculation of climatological tables for frequencies of wind velocities in eight directions and for visibility and height of low cloud at a selected number of Icelandic stations.[30] The station worked in close co-operation with the regular Meteorological Service at Reykjavik. According to van Everdingen the team was equipped with the necessary instruments for measuring and registering barometric pressure, temperature and humidity and with a Besson nephoscope.[31]

The aerological station was located very close to the town of Reykjavik and the three men, flying-lieutenant J.H.van Giessen and the sergeants H. Bosch and C.van der Leden, communicated with the inhabitants of Reykjavik by radio and newspapers on a very regular basis. The ascents were made with two Fokker airplanes type D-VII of the Military Air Service at Soesterberg. Snowstorms and heavy gales were the chief difficulties in the wintertime. In November a gale with a mean velocity of 31 m.p.sec. during one hour caused much damage to the hangar and some damage to the planes. On 29 December a long-lasting snow shower made it impossible for the pilot to return to the aerodrome and necessitated a forced landing with much damage to the plane. In the middle of January heavy snowstorms made ascents impossible for many days. Altogether the team made 226 ascents in 9 months with 208 flights higher than 5,000 m. A balloon was flown 189 times of which 145 reached higher than 1,000 m. The results of the daily observations were transmitted by radio to Oslo and inserted in the European daily weather reports.

The project leader Dr. Cannegieter stayed some weeks in Reykjavik during the summer 1933. All observations continued until 31 August 1933.[32]

7.3.4 Conclusions

The IPY-2 was an initiative of the meteorology community. As in IPY-1 the International Meteorology Congress played an important role in the preparatory

---

[29] RA Utrecht/Cannegieter.

[30] van Everdingen (1933).

[31] van Everdingen (1933:263).

[32] van Everdingen (1933:263).

process. As in IPY-1 the financing of the Dutch participation in polar research activities leaned heavily on societies and private persons. The government was willing to give moral and material support, but was not financing the expeditions. In 1932 the world economic crisis must have made it difficult to raise money, but raising money was not harder than in 1882. In both IPYs it turned out to be difficult to collect the necessary money for the expeditions. Buys Ballot had to deal with a competing Willem Barents Society which made it difficult to gather the money he needed for his expedition (see Chap. 3 – The Netherlands). The strategy of the scientific entrepreneurs was, however, different. In 1882 there was no national IPY committee as in 1932. There were local committees during IPY-1, but the collection of the money was centrally managed by the assistant director of the KNMI, Mr. B.J.G.Volck. In both years brochures were made and the international character of the research was emphasised to push the national societies and private persons to donate money. Newspapers and illustrated magazines were used to inform the public before and after the expeditions and reports and books were published after the research programmes were finished.[33]

The results of the Dutch participation in IPY-2 were excellent. The locations of the stations were much more easily accessible than the proposed location of the Dutch station in IPY-1. Two groups of scientists got the opportunity to work on international issues in the fields of meteorology, aerology, earth magnetism and optical phenomena. They were equipped with instruments that were at that time very modern and the aerological station in Reykjavik used modern airplanes to study the highest layers in the atmosphere.

Very interesting was the first contribution to an IPY of a biologist. This research has not only set a trend in biology, but it has also strongly pushed generations of biologists to do polar biological research. This innovative biological research meant that life sciences entered into the IPY world of natural science for the first time.

7.4 Norwegian Participation

Susan Barr

At the end of the 1920s–beginning of the 1930s Norway was pushing boundaries on two important fronts: on the territorial side this was a period of polar expansion, where polar activists in Norway forged ahead of the government in staking claims to and also annexing some of the last unclaimed white spots on the globe.[34] On the other side, Norway had produced several geophysicists of international renown who were leading figures in their fields, fields that were also at the foundation of the idea of a second IPY. Harald Ulrik Sverdrup (1888–1957) was one of the world's leading oceanographers with studies of the dynamics of the oceans and atmosphere as

---

[33] Snellen (1886); Tinbergen (1934).

[34] Barr (2003a:149–50).

his particular interest.[35] Theodor Hesselberg (1885–1966) was the Director of the Norwegian Meteorological Institute for 40 years (1915–1955), Secretary General of the International Meteorological Organisation (IMO) 1923–1929 and President 1935–1946. His speciality was the theory of dynamic meteorology and climatology.[36] Carl Størmer (1874–1957) was professor in mathematics at the University of Kristiania/Oslo for more than 40 years (1903–1945). Picking up on the ideas of physicist Kristian Birkeland (1867–1917) in 1903, Størmer became fascinated with the theory of the aurora, and he dedicated his research activities thereafter to the physics of the sun and of cosmic radiation. In 1913 he was the first to manage to calculate the height of the aurora.[37]

In October 1928 Sverdrup was invited as one of the seven members of the IMO sub-commission which was to compile the main objects of the planned 2nd Polar Year, and in August 1930 the General Assembly of the International Union of Geodesy and Geophysics (IUGG) set up a sub-commission with Carl Størmer as chair to outline the co-operation of complementary observations outside the polar regions, including aurora research (see previous chapter). When the Norwegian Polar Committee was formed to organise Norway's participation in IPY-2, Sverdrup was appointed leader with Hesselberg as deputy leader. Sverdrup was not only a glittering international scientist, but also an enthusiastic field researcher, and he had a tendency to leave his desk job for long periods in order to be out where the action was.[38] In 1931, during the run-up to the Polar Year, he spent the summer on Sir Hubert Wilkin's (overly-)daring and pioneering attempt to cruise under the ice of the Arctic Ocean with the submarine *Nautilus*.[39] Hesselberg therefore had to take over the leadership of the Norwegian Polar Committee for long periods.

Norway's territorial expansion into the near Arctic had resulted in sovereignty over the archipelago of Svalbard, ratified by international treaty in 1925, and the island of Jan Mayen, officially annexed by Norway in 1929 after having first been annexed by the Norwegian Meteorological Institute in 1922 and 1926. The Norwegian Meteorological Institute had established itself as the only permanent presence on Jan Mayen in 1921, at the request of several northern European countries that had the need of weather observations from this stretch of the north-western ocean area.[40] A meteorological observation and telegraphing station had been run permanently since. The three-man crew of the Norwegian station did not have actual IPY duties themselves, but they had the three-man Austrian IPY expedition staying in the reserve hut nearby, and they provided company, practical assistance and telegraphing service to the Austrians throughout the Polar Year (see Lüdecke, above in this chapter).

---

[35] Friedman (2004:147).

[36] Grøn, In: Store norske leksikon.

[37] Grøn, In: Store norske leksikon.

[38] Barr (2003a:286–330), Friedman (1994).

[39] Sverdrup (1931).

[40] Barr (2003b:119).

In Svalbard the Norwegian claim to the archipelago had been strengthened among other ways by the history of research there that had started with expeditions supported by Prince Albert I of Monaco in 1906 and 1907. Cavalry captain and cartographer Gunnar Isachsen (1868–1937) had been invited along with a small group of Norwegians who had conducted topographical and geological surveying on land while Albert's yacht expedition had explored the sea area.[41] The Norwegian expeditions had become a permanent annual activity which led in turn to the establishment of other supporting functions. Since 1918 there had been a small Norwegian meteorological observation and telegraphing station on the southernmost island, Bjørnøya (Bear Island) that had been established by the Geophysical Institute in Tromsø, together with a private coal-mining project.[42] The coal mine had closed down, but the Polish IPY-2 expedition to Bjørnøya was able to gain from close co-operation with the small crew of the Norwegian meteorological station (see Lüdecke, below in this chapter).

In east Greenland this period end 1920s–beginning 1930s was a turbulent time. Norway and Denmark disagreed as to whether the one or the other had sovereignty over the uninhabited area in the east, originally north of the settlement of Ammassalik, then north of Scoresby Sund (today's Ittoqqortoormiit settlement).[43] The claims were supported by use of the area, which meant wintering hunters and trappers and their scattered huts and cabins. The strategy was to erect as many as possible of these small trapping stations throughout the area. In 1922 the Geophysical Institute in Tromsø had established a meteorological and telegraphing station at Myggbukta, in the centre of the "Norwegian area", in the same way and for the same reason as the one on Jan Mayen: weather reports from this uninhabited area were important for weather forecasting in Norway and northern Europe. The Myggbukta station became the most important and longest-running of the Norwegian stations in east Greenland (Fig. 7.5). The man behind the establishment and running of the majority of the Norwegian trapping stations was Adolf Hoel (1879–1964) who led the institution NSIU, predecessor to today's Norwegian Polar Institute. Hoel was also on the board of the Norwegian Polar Committee. In addition to the fact of Myggbukta's obvious suitability as an IPY observing platform, there was also political advantage to be gained for Norway by offering as many as possible of the Norwegian trapping stations in east Greenland as official IPY observing stations. Hoel could therefore recommend this strategy with the two viewpoints in mind.

In addition to the existing Myggbukta, the station Jonsbu was erected especially on the basis of the IPY. It took its name from John Giæver (1901–1970) who spent the years 1929–1931 and 1932–1934 as a trapper in east Greenland and was employed as institute secretary and later office manager at NSIU from 1935.[44]

---

[41] Barr (2003a:61–62).

[42] Hoel (1967).

[43] See about the East Greenland question in Barr (2003a:151–159).

[44] Barr (2003a:240).

Fig. 7.5 The Myggbukta station in 1991. Photo Susan Barr

Giæver was as convinced as Adolf Hoel of the Norwegian "right" to east Greenland and willingly took the task of establishing a radio station north of 75°N in 1932 and sending daily weather reports in connection with the IPY programme. It continued thereafter as a trapping station.[45] Torgilsbu in the uninhabited area south of Ammassalik was erected as a radio and trapping station in 1932 with annexation of this area as the main reason,[46] but also this station carried out meteorological observations that could be used in the IPY programme. Two other trapping stations, Finnsbu and Storfjord, also carried out observations for the IPY.[47]

There was also a central political understanding that Norway should participate in IPY-2. The budget committee in the Storting (parliament) advised support and the relevant Ministry (of Church Affairs and Education) was of the opinion that "our interests and traditions in arctic research to a large degree make it obvious that Norway should join in this large-scale international co-operation".[48] It was agreed that Myggbukta be expanded to be able to participate with all types of observations, and that a number of Antarctic whaling factory ships also be equipped with meteorological instruments for the same reason. The latter was not, however, to be paid for by the Storting. The observations from the Antarctic whaling fleet were apparently of great interest.[49]

In fact, the worldwide difficult economic situation led also in Norway to a reduction of the original plans that had included the establishment or expansion of observations and instrumentation at several stations in mainland Norway, as well

---

[45] Mikkelsen (1994:138).

[46] Barr (2003a:154).

[47] Bones (2007:199).

[48] Quoted in Barr (2003a:154).

[49] Bones (2007:200).

as the Arctic stations mentioned above. Several stations in Norway did, however, participate with the observations they could manage. In addition this was compensated for in part by inviting other nations to participate on Norwegian territory, such as the Poles on Bjørnøya and Austrians on Jan Mayen (see Lüdecke in this chapter). Sweden also returned to Svalbard, although not to its IPY-1 station (see Barr, below). Sir Edward Appleton, winner of the Nobel Prize in Physics in 1947, led a British scientific group that worked in Tromsø,[50] together with a small radio technical expedition of the Deutsche Gesellschaft des Funkwesens (German Society of Radiotelegraphy).

7.5 Island of Fogs and Gales – The First Polish Expedition to Bjørnøya (Bear Island) during IPY-2

Cornelia Lüdecke

7.5.1 Preparation

When a second International Polar Year was promoted by meteorologists interested in the movements of low pressure systems in the Arctic and geophysicists interested in the magnetic field and the northern lights, industrialists and economists of the western countries, however, were thinking about the development of trans-Arctic airlines. The economic importance was one of the motivations to organise another joint meteorological and magnetic programme. In this context, Poland wanted to prove that it never excluded itself from teamwork, when it served peaceful aims and harmonisation of people.[51] Consequently, a committee was also established in Poland. It consisted among others of several renowned professors including Antoni Dobrowolski (1872–1954), former assistant meteorologist of the Belgian Antarctic Expedition (1897–1899), Czesław Białobrzeski (1878–1953) and the director of the National Meteorological Institute, Jean Lugeon, who became responsible for the organisation of the Polish scientific station in the Arctic. This was not an easy task, because Poland suffered very much from the world economic crisis. Unfortunately, governmental departments did not understand the scientific importance of the enterprise and so many drawbacks had to be mastered. When it seemed to be absolutely hopeless to receive the financial support needed to organise a polar expedition, the president of the International Polar Year, Dan La Cour (1876–1942), paid a visit to Warsaw in early 1932. After many conferences he achieved a promise of support from the Polish government. But after some weeks it turned out that of asum

---

[50] Bones (2007:200).

[51] Centkiewicz (1934, 1956).

of 100,000 Złotys, only a small part would be available at some undefined time in the future. Instead, enthusiasm and readiness to make sacrifices had to replace the deficit of capital.

Originally, the Polish expedition was to consist of 12 members, but due to the decrease of financial support, the plan was changed to eight participants, later six and four, and, finally, was to be realised with three scientists, who were responsible for the whole programme. Among 200 applications Czesław Centkiewicz (1904–1996) was chosen to be station leader. He was also responsible for radiometeorology, i.e. the investigation of the propagation of electromagnetic waves which were caused by flashes of lightning. Władysław Łysakowski was in charge of earth-magnetic measurements, while Stanislaw Siedlecki, the youngest participant, was to make meteorological observations. The three men were only allowed to travel if each one was prepared to replace his comrade in any scientific task if needed. The overall demand was to limit the expenditures to an absolute minimum. This led to the – perhaps once-and-only – decision of the participants to do without any earnings and also to follow the principle of economic measures for their personal equipment as far as possible. These ideas also determined the choice of their station on Bjørnøya (Bear Island), part of Norway's archipelago of Svalbard. There was already a Norwegian radio-telegraphy/meteorological station there with an unused, but habitable house which could be used by the Poles. A station on Bear Island was also very interesting from the scientific point of view, because of its location in the alley of big low pressure systems and the region of maximum of northern lights. Situated 600 km north of North Cape in mainland Norway and about 600 km south of the rest of Svalbard, there were very favourable conditions for radio-meteorological measurements and the investigation of twilight appearances, as well as the determination of the centre of the electro-magnetic disturbances from the American and the European side of the North Pole.

Centkiewicz was the first to receive special meteorological training at the Observatory Morskiego and the Naval Observatory in Gdynia and a general introduction in earth magnetism and measurement of the absolute earth-magnetic field at the weather station on the Hel peninsula. When the other participants had been chosen, the preparations were divided among them. Most important was to find sponsors. Above all the Poles had to organise their expedition against negative press releases, which demanded that older and merited scientists be sent to Bear Island. It was not easy to explain to the public the difference between the polar expedition itself, for which a young and physically strong crew was needed, and the later scientific analysis of the data by specialists. Despite these and other obstacles, the three men decided to act positively and to prepare everything in very small steps as the amount of the budget was still unclear. One of the problems was that there were no polar clothes available in Poland unless they would order a very expensive individual production. So they agreed to the idea of buying the equipment in Poland as far as possible and the rest as cheaply as possible in Copenhagen to save foreign currency. Referring to provisions, the Commission for the 2nd International Polar Year provided a list for three men and 400 days, which was adapted for the Polish taste, i.e. cans of tortoises in single cream were exchanged for pork and lard.

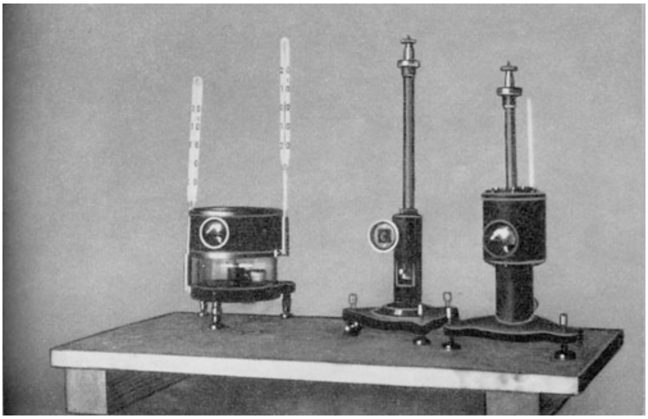


Fig. 7.6 A kit of magnetic variometers constructed by Dan La Cour installed in the Polish station on Bear Island (Centkiewicz 1956: right of p. 80)

During the course of the preparation they travelled to the Meteorological Institute in Copenhagen, where Łysakowski was trained to operate the variometers constructed by La Cour, while Centkiewicz learnt to assemble and to handle these instruments (Fig. 7.6). Usually, they had lunch together with La Cour's family, which was counted as special treatment of the poor Polish participants of the Polar Year. In addition La Cour visited them daily in the basement of his institute, where they received their instructions from a young Danish specialist. Very often La Cour was accompanied by members of other expeditions, who were introduced to each other.

In addition to their scientific training the Poles also had a big shopping programme. When ordering provisions in a canning factory, they were astonished about the fast handling, which they were not used in their home country. On the last day in Copenhagen, they worked together with members of the Swedish and Danish expeditions. While the two of them stayed in Copenhagen, Siedlecki was trained in meteorological observations at the Aerological Observatory in Jabłonna close to Warsaw.

Finally, all the scientific instruments were packed up carefully, among them a fast and a slow registering variometer lent by La Cour to determine declination (D), horizontal intensity (H) and vertical intensity (Z), an atmo-radiograph 27 kC/s constructed by Lugeon for radio-meteorological observations, various instruments for the measurement of meteorological parameters, and, finally, a spectroskop and a theodolite for the observation of northern lights. Additionally, 3,000 kg of provisions and all material for a fitter's workshop, a carpenter's workshop, a shoemaker's workshop and a photographic laboratory had to be packed. The expedition pharmacy consisted of 90 different medicines and the most important instruments for surgery, because there was no medical aid within a surrounding of 600 km. In the end the packing list consisted of over 10,000 items, which were packed in 140 boxes and 120 sacks with an overall weight of 21,000 kg.

The departure of S/S *Polonia* from Gdynia was timed to 16 July 1932 and the baggage was to be at the harbour five days earlier. But when they wanted to order the railway cars, they found that the capital had expired to pay the freightage. Of the 35,000 promised Złotys only a part had been made available up to that time. Thus the expedition was already in debt at several institutes, which luckily allowed a credit. In this difficult situation the head of the bookkeeping of the National Meteorological Institute did not hesitate long and decided in favour of the expedition and committed a financial crime in paying the transport of the equipment from the pay office of the institute.

7.5.2 The Expedition to Bear Island

Director Lugeon and his assistant, engineer Jan Gurtzman who was to help them with the installation of Lugeon's atmo-radiograph, and professor Białobrzeski accompanied the three expedition members up to Narvik, which they reached on 24 July. On their way they stopped in Copenhagen to see La Cour again and to thank him personally for his friendliness and help. In Narvik five of them had to change to another ship to travel to Tromsø, while the official Polish representative of the Polar Year, Białobrzeski, travelled home.

When they arrived in Tromsø, they visited director Thrane at the "Vervarslingen for Nord-Norge" (Meteorological Office of North Norway). He told them that the house on Bear Island was already prepared for the Polish overwintering including beds and mattresses, a luxury the Poles had never dared to dream of. They were allowed to install their atmo-radiograph in the Aurora Observatory in Tromsø, where director Leiv Harang was very co-operative. The diagram of the new instrument showed a characteristic picture over 24 hours. After sunset the number of interferences increased fast and suddenly. Fifteen minutes before sunrise it fell back again. The effect was seen in connection with the high-ionised atmospheric level, where electromagnetic waves were reflected. During daytime, when sun rays strongly ionised these levels, electromagnetic waves were absorbed and thus led to a low number of interferences. During night-time it was the other way round. The diagrams were used to determine the location where these interferences were transmitted. These locations were connected to special meteorological conditions, the knowledge of which might be useful for weather forecasting. At the same time a British expedition used echoes of radio waves to measure the height of the ionised levels.

Due to the fact that Lugeon and Gurtzman would stay with the expedition at Bear Island for some weeks, they had to buy additional food. Thrane recommended a company which had specialised in supplies for polar expeditions for many years. Now the Poles regretted very much that they did not wait to do most of their shopping in Tromsø, which would have saved them freightage, but nobody had told them before. They had to find out all by themselves. Finally, on 2 August 1932 they boarded the little ice-strengthened ship *Sverre* with all their baggage.

Fig. 7.7 Place for unloading at the former silo of the mining camp on Bear Island (Centkiewicz 1956: left of p. 33)

At 4:00 a.m. on 5 August, they arrived at Tunheim Bay on the north-eastern coast of Bear Island, where there had been a coal-mining camp 1916–1925. There was a construction with a crane on the plateau 12 m above the steep shore which had originally been a coal silo and which could facilitate the unloading of the ship (Fig. 7.7).

The five Poles were welcomed by the crew of the Norwegian radio station consisting of Fritz Øien (leader), his wife Margaret and his 14-month-old son Björn, his brother Ewald and Sverre Andersen, with whom they all became close friends during the overwintering. After repairing a small railway track and using a small lorry they could transport all goods for the two overwintering groups close to their houses. The Poles were very happy to move into an existing house (Fig. 7.8) and were very busy putting everything away and arranging the house. When they were looking through the boxes delivered, they recognised that a big part of the meat supply was rotten. It seemed that there was no more fresh meat in the cans. This was a bad surprise for the overwintering party.

The kitchen and a small storeroom were on the ground floor. All registering instruments except magnetographs, hydrographs and thermographs were set up in the biggest room, which became the "brain room" of the expedition. Only the registering pyrheliometer to measure the intensity of the solar radiation was stopped during the polar night. The battery-charging station was placed in the adjacent room. The other room with the desk was used as office and library. It also contained the barometers. A workshop and dark room were set up in the room on the first floor

Fig. 7.8 The Polish IPY-2 station (*left building*) close to the Norwegian radio station (*building in the back ground*) on Bear Island. The magnetic pavilion is to the right and the meteorological station in the foreground (Centkiewicz 1956: right of p. 48)

next to the stairs. They were followed by two sleeping rooms, while the fourth room became a second storage for about 2,000 kg food. Magnetographs for variation measurements were installed in a small hut near by the so-called "magnetic pavilion" (Fig. 7.8), while the instruments for absolute magnetic measurements were placed in a tent stiffened by a timber frame at 300-m distance. Gurtzman helped Lugeon to bring his atmo-radiograph into service, because his superior wanted to investigate possible changes of the ionised atmosphere during the total eclipse of the sun on 31 August 1932, measured on Bear Island, at Tromsø and at Jabłonna at the same time.

Nine days after landing they started to set up the meteorological station, but the up-coming strong southerly wind delayed it a bit. A rain gauge, a wind vane (Type Wild) and a nephoskop to determine direction and apparent speed of the moving clouds were established 15 m away from the house (Fig. 7.8). At a distance of 50 m they built a little platform for the theodolite for observing the northern lights. In a circle of 20-m radius around the platform they also drove in metre high stakes each 30 degrees to facilitate the determination of the azimut of very lively northern lights. Finally, they connected the Norwegian radio station and their accommodation house with a telephone system.

During the Polar Year, exact time was crucial for co-ordinating all measurements worldwide. They had two universal-mounted ship chronometers, which were calibrated two times within 24 hours by radio reception of time signals sent from the Nauen Transmitter Station close to Berlin (Germany) or alternatively from Rugby in Warwickshire (England) transmitted from 11:55 p.m. to 0:05 a.m. At noon they adjusted the chronometers with an accuracy of a tenth of a second and at midnight with an accuracy of a hundredth of a second.

Magnetic measurements began on 30 August. On 31 August, one month after the start of the Polar Year, director Lugeon held a meeting in the evening to define the observing programme according to Greenwich standard time:

1:00 a.m.	meteorological and northern light observations
4:00 a.m.	meteorological and northern light observations
7:00 a.m.	meteorological and northern light observations
9:00 a.m.	control of registering instruments and change of recording strips
11:00 a.m.	radio reception of the time signal as well as control of watches and chronometers
13:00 p.m.	meteorological and northern light observations
16:00 p.m.	meteorological and northern light observations
19:00 p.m.	meteorological and northern light observations
22:00 p.m.	meteorological and northern light observations
23:00 p.m.	second time control

During a Polar Day for special magnetic measurements (Fig. 7.9), the observation of northern lights was replaced by cloud observations. Besides, there were seven daily jobs to be done alternately by one of the three men:

1. Time and chronographical shift
2. Charging accumulators
3. Meteorological measurements
4. Observation and photography of aurora if not covered by clouds
5. Intensity of sun radiation
6. Atmo-radiograph, atmospheric electricity and related appearances
7. Earth-magnetism (registering instruments and absolute observations)

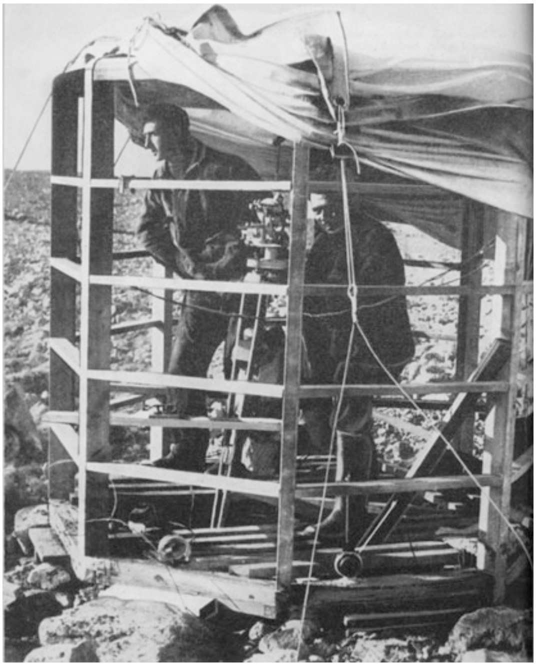


Fig. 7.9 Centkiewicz and Łysakowski in the magnetic tent perform absolute magnetic measurements of the earth magnetic field (Centkiewicz 1956: left of p. 97)

On 14 September Lugeon and Gurtzman were picked up by a boat in Sørhamna Bay in the south of the island, about 16 km by foot, because the boat could not hold itself close to the beach at the landing site at Tunheim Bay due to high surf. On the next day the Poles woke up with the feeling of loneliness, but starting work helped them to adapt to the new situation. Now they would be on their own (apart from their Norwegian neighbours on the island) and had to find new solutions independently. First of all, they decided to organise the observations among them as follows: The first person gets up at 7 a.m. to carry out all observations until 7 p.m. The second gets up at 9 a.m. to take care of the physical well-being of the group and to tidy the house during the whole day. At 7 p.m. the third person takes over the observations until 1 a.m., while the one who got up at 7 a.m. the day before observes polar lights from 4 a.m. onward. Then the third person gets up at 7 a.m. This plan of work was changed every two days and held until May 1933.

1 October 1932 was the beginning of the international month of cloud observation, which had to be done each hour with notes about form and development. The men took pictures of the most interesting clouds with a special camera. Unfortunately, systematic cloud observation was impossible due to the difficult atmospheric conditions at Bear Island. Very often there was thick fog, which covered the whole landscape and sky. When they experienced the first gale, they found that the door of their accommodation house could hardly be opened against the wind, a bad construction mistake in such a windy area. Winds intruded into the house all over, even through the walls, although they had sealed the gaps by the door and windows. Other misfortunes were the old oven and the bad coal of the abandoned coal mine, on which they had relied.

During their visit to the Aurora Observatory in Tromsø, they had made an agreement with Leiv Harang to observe northern lights at the same time between 15 October 1932 and 15 March 1933. The time of the first observation and photograph should be announced from Tromsø by radio transmission. The photographs should then be taken every two minutes, i.e. 30 within an hour. The camera on Bear Island was directing south, while the camera in Tromsø was directing north. In practice calculation and analysis were very difficult due to the sphericity of the earth.

Except for regular radio transmissions with scientific instructions, encouraging talks and greetings of family and friends, communication was very slow. Whenever a ship coming from or sailing to Tromsø would pass by Bear Island, it was asked to deliver mail or supplies from Poland or mail from Bear Island. Sometimes a landing was impossible due to high surf, so there were periods when they had to wait months to receive or send letters. And when a ship came in sight it was unclear until the end whether mail and provisions could be landed by a rowing boat or by a fixed line or neither. Very often the Poles were informed by radio transmission that a ship was waiting for them at Sørhamna or at another place, which they then had to get to even during very unfavourable weather, which might take up to 6 hours one way. And sometimes the rowing boat had to retreat due to the dangerous surf just before landing, which was very disappointing for the expedition members.

Usually, they spent their free time with the Norwegians, talking and exchanging interesting stories. When all – including Margaret Øien – were sitting in the Polish station, they used the microphone of a telephone to monitor the sleep of the little boy left in the radio station. This may be the first baby-monitor in the High Arctic. Two weeks after the onset of the winter night a ship visited Bear Island to land a young German meteorologist, Dr. Henning, who would be picked up later by a Norwegian sealer heading for the Arctic Sea. He lived with the Norwegians for two weeks.

The monotony of everyday life during the winter night was encountered with a precise list of tasks. Listening to strong European and American broadcasting became very important in such a remote area. Between two observations in the morning they received press releases and later from 1 p.m. until late the radio was never switched off. This became a problem during stormy days, because then the accumulators had to be charged each day for two hours. Due to fire-safety reasons the charging station was placed in the old radio station about 500 m away from the new radio station (Fig. 7.10). In addition the combustion engine had to be cooled down with a lot of water, which had to be melted beforehand. Consequently, the task was divided between the Poles and the Norwegians. When the windy period was too heavy and too long, they had to restrict the radio programme to a minimum to save energy.

At midnight of one day in December all had to get up suddenly, because a very strong gale had turned over the four weather screens and damaged the instruments. The next day the registration unit of the magnetometers got totally dirty. Cleaning, set up and new adjustment cost two days of intensive work.

At Christmas Margaret Øien brought a small Christmas tree decorated with tiny Norwegian and Polish flags. On Christmas Eve they were officially invited to the Norwegian radio station. Before this, Siedlecki was detached to help to bake cakes in the Norwegian kitchen. The dress code for this special evening demanded "city

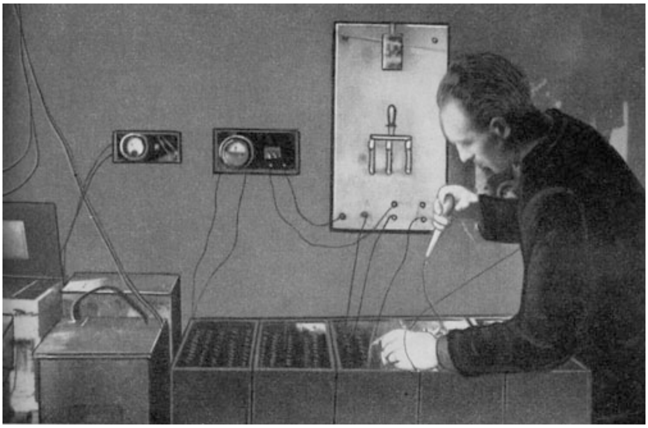


Fig. 7.10 Checking accumulators in the Polish station on Bear Island (Centkiewicz 1956: right of p.128)

clothes" instead of grey, dirty and patched "island clothes". This evoked intense washing, cleaning and hair-cutting activities and even attempts at manicure among the Poles. At 11:30 p.m. the broadcast from Warsaw for the Polish overwinterers started. Family members touched the hearts of everybody and even director Lugeon found words as not only a superior, but also as a friend to them. The three men were deeply impressed and even the Norwegians did not start talking right after the end of the broadcast.

Eight hours after their return home after a long Christmas party, Centkiewicz was woken up because the transmitting station had broken down. He got up immediately and helped to fix it better than before. Then the Norwegians were invited to lunch in the cleaned station. They paid great tribute to the Poles, who did everything alone, never avoided work, could assemble scientific instruments, as well as carry heavy loads and even knew how to cook. Unfortunately, on the following day Centkiewicz had an ugly accident. He felt a heavy stroke in his hand when he chopped wood. The arm swelled up to the elbow. It was bandaged and he continued working, because he told himself that he could not become ill. And luckily it worked somehow.

The monotony during the routine of the winter night was underlined by the monotony of the food: cans, cans and always cans. Vitamins were provided by lemon juice and cowberry (red whortleberry/tyttebær) juice and one cup of red wine each week. At the first opportunity, when they already had three hours of twilight around midday, four Poles and Norwegians decided to go hunting, while the other two kept their stations running. They got eight ducks, one for each inhabitant of the island. Later they started fishing before fishing boats stopping at Bear Island gave them a share of their catch.

On 29 January 1933 Centkiewicz listened just by chance to a Russian broadcast for the members of the Soviet polar expeditions. They had much better conditions, because each station had a radio station at their own disposal. This allowed them to receive answers to their questions within three hours and to send the results of their observations and measurements immediately.

The Poles would have liked to forget the events of February, when the *Borgenes* arrived at the silo with their mail and supplies, but could not land a rowing boat due to the high surf. Two days later the Norwegians got a notice that the *Borgenes* had arrived in Sørhamna after the heavy snowstorm. Four men prepared to go there the next morning (11 October). When they arrived at the plateau 40 m above the shore, they fixed a rope to climb down. Within three hours they had landed five barrels (three with machines, two with mail), the frame for the machines on floats, and a box of onions = vitamins. The men were wet in temperatures of –2°C and it was already dark. They decided to go back to their stations with two barrels and to return on the next day. The barrels weighed 50 kg and had to be pulled up the slope with a double rope; consequently, a man was positioned there every 15 m. Suddenly, when they pulled up the second barrel, a snowslide ran them down. Just by chance Siedlecki and Ewald Øien landed more or less on the snow surface and survived. After some searching they found their comrade Andersen unconscious under a snow cover close to the water. Finally, all four managed to reach the plateau after much trouble and to walk to a small hunting hut, where they fell asleep, while one of them had to keep the primus stove burning. Despite snow drifts the next day they took the one barrel they saved and arrived home on skis within three hours. Unfortunately, it turned out to be impossible to recover more than the motor. The rest of the supplies and the valuable mail were lost forever, which was a very sad event towards the end of the winter night, when apathy grew among them.

New spirits rose with the rising sun. From 26 March onward they experienced more hours of sun above the horizon than in Warsaw. Now they changed their duties. The observer who got up at 6 a.m. had to carry out all measurements and to service the instruments until 7 p.m. He also had to prepare breakfast for all and to tidy the house. The second got up later and was responsible for the ovens and the general order of the house. He had to cook lunch and dinner and made observations between 7 p.m. and 1 p.m. on the next day. In this way the third had a day off and could leave the house for skiing, hiking or hunting. After such a long time of living indoors they were desperate for action, fresh air and to counteract loneliness. During spring they also started to collect eggs from seagulls and auks.

In mid May the first visitors landed on the remote island and after a rich treatment by the Norwegians, all islanders were invited to come on board for a return visit. Many more visits by a whole fishing fleet followed. Especially, the little pharmacy and Centkiewicz's first aid capability for treating injuries became well-known in Arctic waters. Even a Russian expedition aboard the *Perseij* stopped to see the Norwegian and the Polish station, which was a great honour for the Poles.

Then Centkiewicz was ordered to travel to Tromsø with the next boat leaving Bear Island on 16 June to prepare the pick up of the expedition. When he returned on 2 July Bear Island presented itself from its best side (Fig. 7.11). The others had cleaned up the surrounds of the station by throwing 20 loads of ashes and rubbish into the ocean. At midnight on 16 August they finished their measurements since they were to leave the island on 18 August. They cleaned the whole building and packed only the most valuable things to save freightage. Many objects and food had to be left behind. Finally, the Polish expedition returned to Gdynia on 3 September 1933. Some days later the expedition members receive the Cross of Merit to honour their unselfish scientific work.

Fig. 7.11 View to the southwest coast (*left*) and southeast coast (*right*) of Bear Island as seen on 7 July 2009 (C. Lüdecke)

7.5.3 *Results*

Two months after their return Centkiewicz, Łysakowski and a meteorologist at the National Meteorological Institute started to evaluate the whole material consisting of 1.500 daily diagrams, recordings strips and about 2.000 observations.[52] In summer 1935, already two years after the Polar Year, the Polish results were published in four parts of altogether 200 pages of text and 74 tables, as one of the first publications. The Polar Year had been relatively warm at Bear Island with a yearly mean temperature of –4°C compared with 7°C in Warsaw.[53] Humidity was very high with a yearly mean of 90% (Warsaw 73) leading to constantly damp clothes and mildew on bedclothes. Winds had been very strong with a yearly mean of about 7 m/sec (25 km/h, Warsaw: 15 km/h). The strongest storms observed reached 160 km/h. Cloudiness was 8.5 of a scale of 10 (Warsaw: 6,7).

Magnetic measurements showed not only the regular appearance of magnetic storms and disturbances within 28 days in context with the rotation of the sun around its own axis, but also 14 and 5 day periods of still unknown origin.[54] Northern lights were constantly accompanied by magnetic storms, which also occurred often without northern lights.[55] The men were lucky to be able to make some photographs of the northern lights, which experts recognised as valuable scientific material. The atmo-radiographic registrations of radio interference due to atmospheric strokes were also very interesting.[56] They could show a correlation of the transmission of electromagnetic radio waves and the appearance of northern lights and storms in the earth-magnetic field. A comparison of the registrations of the atmo-radiograph on Bear Island, at Tromsø and Jabłonna would lead to a theory of the correlation of registered directions of radio interference and a change of weather.

These results were regarded with great favour by the international scientific community, especially with regard to the absolute low budget the Poles had to cope with. The Poles could be proud of their contribution.

7.6 Sweden in Svalbard

Susan Barr

The distinguished six-man committee that formed the Swedish Polar Year Commission,[57] under the Royal Swedish Academy of Sciences, included Professor Vilhelm Carlheim-Gyllensköld (1859–1934), who had been responsible for the

---

[52] Centkiewicz (1934, 1956), Lugeon (1933a, b).

[53] Lugeon et al. (1936a).

[54] Lugeon et al. (1936b).

[55] Lugeon et al. (1936d).

[56] Lugeon et al. (1936c).

[57] Liljequist (1993) is the main source for this summary.

aurora observations on the Swedish IPY-1 expedition at Kapp Thordsen, Svalbard and Professor Gerard De Geer (1858–1943), geologist, glaciologist and cartographer and leader of several expeditions to Svalbard between 1882 and 1910. Axel Wallén (1877–1935), head of the Swedish Meteorological and Hydrological Institute, was secretary to the Commission.

There was never any doubt that the Swedish station would be situated in Svalbard as for IPY-1, but by this time mining settlements had been established on the main island of Spitsbergen, including the main Norwegian settlement of Longyearbyen and the Swedish mining settlement of Sveagruvan. In fact the latter had been closed down as a mine in 1925, and was sold to the Norwegian mining company in Longyearbyen – Store Norske Spitsbergen Kulkompani (SNSK) – in 1934. However, in the period in between, summer caretakers kept the complex in a reasonable condition.[58] Sweden was in effect to have three small stations: one three-man station on the hilltop Nordenskiöldfjellet (1050 m a.s.l.) beside Longyearbyen (Fig. 7.12), a five-man group at Sveagruvan, 45 km from Longyearbyen, and a radio operator in Longyearbyen itself. In order to determine the height of the aurora, synchronous photographs or observations had to be taken at the two stations. Both stations thus had to be in radio contact with each other to coordinate the photographic exposures. Radio operator R. Widegren in Longyearbyen assisted in the coordination. Physicist and meteorologist Vilhelm Ferdinand Valdemar Lindholm (1883–1963) from the Swedish Meteorological and Hydrological Institute in Stockholm was the overall leader and based in Sveagruvan, while meteorologist Hilding Olsson (1904–1973) from the same Institute was in charge of the Nordenskiöldfjellet observatory.

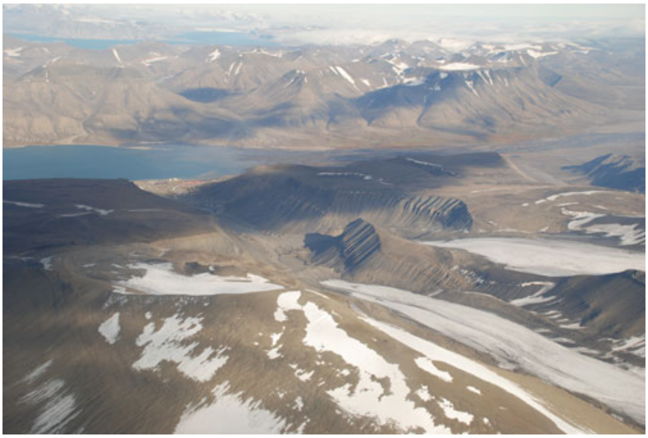


Fig. 7.12 The modern settlement of Longyearbyen in the valley, with Nordenskiöldfjellet hilltop to its left. Photo Susan Barr

---

[58] Hoel (1966:549).

In addition to Svalbard, the Swedish programme also encompassed increased activity at established stations in Sweden: more geomagnetic observations at Lovö geomagnetic observatory near Stockholm and Abisko in Swedish Lapland, and more meteorological observations at Riksgränsen, between Abisko and Narvik in Norway. The new Molchanoff radiosondes were used at Nordenskiöldfjellet, which was not usual for most of the IPY-2 stations. The Nordenskiöldfjellet station was the only building that had to be established from scratch. It was based on a mountain observatory at 1,835 m a.s.l. on Pårtetjåkkå in northern Sweden; a strong framework 6.4 × 4.4 m and roughly 25 m^2 inside space, with walls and roof covered inside and outside with large sheets of galvanised iron. The space between was filled with layers of insulating mats and padding. All the materials and equipment were shipped to the mining company in Longyearbyen in 1931 and SNSK arranged the transport up to the top of Nordenskiöldfjellet ready for the arrival of the Swedes the next summer.

Transport of heavy and bulky materials and equipment, and also coal for heating, to the top of the low mountain was not an easy job. Dogsleds were the only means possible, and an experienced Norweigan dog driver, Ludvig Sørensen (1893–1973) was hired to take the difficult task, together with Johannes Hagen. It took three months for the two men and teams of 7–16 dogs working almost every day and in sometimes extreme winter weather. In some places along the route it was impossible to pull the sledge upwards, so the load was fastened to a tackle so that the dogs dragged the load up while they themselves went downwards. At other points the slope was so dangerously near a precipice that only a few dogs could be used at once. Once a certain amount of equipment had been transported high enough, the men and dogs stayed for periods in a camp on the mountain as a base for the remainder of the route. The transportation started on 1 March 1932 and the first load reached the summit on 20 April. The operation was completed by 1 June, the men and dogs having then travelled more than 2,000 km – an average of 25 km per day – and taken 15 tons up the mountain.

The Swedish group arrived at the top at the end of June after a four-hour ascent from Longyearbyen and had to start by digging their goods out of the snow. There were still provisions and more equipment to be transported up and since the lower mountain was now snow-free, the dogs could only be used for the top part. However, before this could be effectuated properly the snow had begun to melt also there. The rest had to be done by manpower. The weather at the top of the mountain was typically strong winds, dense fog, low temperatures, frost and an occasional sunny day. Assembling the hut was a trial, since the materials had become deformed by moisture and temperature variations, and the men became soaked in their clothes with no chance of drying out. Sørensen and Hagen continued with the building work while the Swedes set up the instruments, some temporarily, in order to meet the first observation day, 1 August.

In the first week of August the dwelling tent was blown away, and the men had to move into the cabin while it was still in the process of construction. Both strong winds and heavy snowfalls created havoc, blowing away the wall and roof sheets or burying equipment. The hut was anchored to the ground with two half-inch wires fixed to 2-m iron rails buried in 1-m holes in the ground. “This anchoring job occupied one man entirely for two weeks. It was well done: the hut still stands on the summit of Nordenskiöldfjellet, in spite of hurricane winds . . .”[59] In mid-September the Norwegian helpers left and in October two of the Swedes were occupied with the back-breaking job of transporting the winter provisions up to the cabin from Longyearbyen while the third one kept the observations going. The furniture and final preparations in the cabin were not finished until Christmas. It was possible to scramble down to Longyearbyen if necessary, but this could take ten hours or more in difficult conditions, with the uncertainty of being unable to return for some days if the weather turned for the worse.

The cloud or fog on the mountain covered everything with ice up to 30 cm thick and snow filled the meteorological instruments. Drifting snow blocked up the entrance door and extreme weather more or less confined the men indoors for most of the winter, apart from strenuous forays outside to take the observations. The inside air was smoky and humid. Hilding Olsson’s diary entry for 2 February 1932 reads: “At 19.00 h I tried to reach the thermometer screen, but I came only 3 m [from the entrance]. Cederstam and I then made an attempt together by creeping on the snow. Cederstam lay under the thermometer screen holding my legs, while I rose to my feet and made the readings”.[60] This night the highest wind-speed on the year was recorded –59 m/s – and the recording instruments were destroyed or blown away. Hourly observations now had to be done manually, day and night, and the men could only sleep in shifts. By 1 May they were able to get recording instruments working again.

As the light returned in February–March, they were able to reach Longyearbyen again, although the ground was either covered by polished icy snow or knee-deep drifts. During their second summer, the ground at the summit was never clear of snow; not enough, however, for the dogs to be able to help them with the transport of instruments and goods back down the mountain in July. Again one man stayed at the station carrying out the observations while the two others struggled down to Longyearbyen and back. The station was closed after the midnight observation 31 August/1 September in a blizzard at –7°C.

According to Liljequist this was the first wintering at 1000 m a.s.l. at such a high latitude (78°N).[61] There had been dangerous episodes when the weather had threatened to overcome them either during observations outside the station or on trips to and from Longyearbyen, and there had been boring and depressing periods in the cabin in mid-winter. But on the whole the station on Nordenskiöldfjellet had been very successful.

The group in Sveagruvan met up with the others in Longyearbyen and could also report on a successful year. They left Svalbard together on collier on 6 September and arrived in Stockholm by train from Bergen on the 16th.

The cabin at the top of Nordenskiöldfjellet is now a popular goal for foot-tours up the hill from Longyearbyen.

---

[59] Liljequist (1993:472).

[60] Quoted in Liljequist (1993:475).

[61] Liljequist (1993:476).

References

Barr, S. 2003a: *Norway – A Consistent Polar Nation? Analysis of an Image Seen Through the History of the Norwegian Polar Institute*. Oslo: New edition 2010, Fram Museum.

Barr, S. 2003b: Jan Mayen. Øyas historie gjennom 1500 år [The Island's history through 1500 years]. Oslo, 2nd edition published by author.

Bones, S. 2007: Norway and Past International Polar Years – A Historical Account. In: *Polar Research* 26:195–203.

Cannegieter, H.G. 1933: Aerologische Beobachtungen und Terminbeobachtungen in Reykjavik und Angmagssalik während des Internationalen Polar jahres. Ergebnisse aerologischer Beobachtungen nr 21a KNMI pubicatie 106a.

Centkiewicz, C. 1934: Wyspa mgieł i wichrów. Pierwsza Polska Ekspedycja Drugiego Międzynarodowego Roku Polarnego 1932/33. „Rój", Warszawa, pp. 313. German Translation: Centkiewicz, C., 1956, Die Insel der Nebel und Stürme. Die erste polnische Expedition während des 2. Internationalen Polarjahres 1932/33. VEB. Brockhaus, Leipzig, 243 pp.

Centkiewicz, C. 1956: Die Insel der Nebel und Stürme. *Die erste polnische Expedition im Zweiten Internationalen Polarjahr 1932/1933*, 243 pp. VEB. F.A. Leipzig: Brockhaus.

Friedman, R.M. 1994: The Expeditions of Harald Ulrik Sverdrup: Contexts for Shaping an Ocean Science. San Diego: Scripps Institution of Oceanography, University of California.

Friedman, R.M. 2004: Nansenismen. In: Norsk polarhistorie II, Vitenskapene. Gyldendal Norsk forlag as.

Grøn, Ø.: Theodor Hesselberg. In: Store norske leksikon, www.snl.no. Accessed January 2010.

Hacquebord, L. 1995: Nederlandse Poolkringen; honderdvijfentwintig jaar Nederlands onderzoek in poolgebieden, 35 p. Groningen: Inaugurele rede Rijksuniversiteit Groningen.

Hammerl, Ch., W. Lenhardt, R. Steinacker, and P. Steinhauser (eds) 2001: *Die Zentralanstalt für Meteorologie und Geodynamik 1851–2001. 150 Jahre Meteorologie und Geophysik in Österreich*, 838 pp. Graz: Leykam.

Hoel, A. 1966: Svalbards historie 1596–1965, Bd II. Oslo, Sverre Kildahls boktrykkeri.

Hoel, A. 1967: Svalbards historie 1596–1965, Bd III. Oslo, Sverre Kildahls boktrykkeri.

Kanitscheider, R. (no year given): Bearbeitung des Erdmagnetischen Beobachtungsmaterials. 60 pp.

Kanitscheider, R., und M. Troperczer 1935: Bearbeitung des erdmagnetischen Beobachtungsmaterials der österreichischen Jan Mayen-Expedition im Polarjahr 1932/33. Sitzungsberichte der Akademie der Wissenschaften in Wien, mathematisch-naturwissenschaftliche Klasse IIa 144(1935): 517–559.

Liljequist, G.H. 1993: High Latitudes. *A History of Swedish Polar Travels and Research*. Stockholm: Swedish Polar Secretariat.

Lugeon, J. 1933a: Notice préliminaire sur l'expédition Nationale Polonaise de l'Année Polaire 1932–1933 à l'Ile des Ours. Biuletyn Towarzystwa Geofizyków 7–8:41–96.

Lugeon, J. 1933b: Polska Wyprawa Roku Polarnego (1932/33) na Wyspę Niedźwiedzią. [Polish Expedition of the International Polar Year (1932/1933) to Bjørnøya] Biuletyn Towarzystwa Geofizyków 7–8:3–5.

Lugeon, J., Centkiewicz, C., and W. Łysakowski 1936a: Wyniki spostrzeżeń polskiej wyprawy Roku Polarnego 1932/33 na Wyspie Niedźwiedziej. Résultats des observations de l'expédition polonaise de l'Année Polaire 1932/33 à l'Ile des Ours. Zesz. I. Fascicule I. Meteorologja. Météorologie. Państwowy Instytut Meteorologiczny, Warszawa, pp 88 + tabl. 1–5. [Bilingual text: Polish and French].

Lugeon, J., Centkiewicz, C., and W. Łysakowski 1936b: Wyniki spostrzeżeń polskiej wyprawy Roku Polarnego 1932/33 na Wyspie Niedźwiedziej. Résultats des observations de l'expédition polonaise de l'Année Polaire 1932/33 à l′Ile des Ours. Zesz. II. Fascicule II. Magnetyzm ziemski. Magnétisme terrestre. Erdmagnetismus. Państwowy Instytut Meteorologiczny, Warszawa, pp 73 + tabl. 33 + III. [Bilingual text: Polish and German (despite the title in French)].

Lugeon, J., Centkiewicz, C., and W. Łysakowski 1936c: Wyniki spostrzeżeń polskiej wyprawy Roku Polarnego 1932/33 na Wyspie Niedźwiedziej. Résultats des observations de l'expédition polonaise de l’Année Polaire 1932/33 à l′Ile des Ours. Zesz. III. Fascicule III. Trzaski atmosferyczne. Parasites atmosphériques. Państwowy Instytut Meteorologiczny, Warszawa, pp 18 + tabl. 21 + III. [Bilingual text: Polish and French].

Lugeon, J., Centkiewicz, C., and W. Łysakowski 1936d: Wyniki spostrzeżeń polskiej wyprawy Roku Polarnego 1932/33 na Wyspie Niedźwiedziej. Résultats des observations de l’expédition polonaise de l’Année Polaire 1932/33 à l′Ile des Ours. Zesz. IV. Fascicule IV. Zorza polarna. Aurores polaires. Państwowy Instytut Meteorologiczny, Warszawa, pp 21 + tabl. 15. [Bilingual text: Polish and French].

Mikkelsen, P.S. 1994: Nordøstgrønland 1908–1960, Fangstmandsperioden. Copenhagen: Dansk Polarcenter.

RA Utrecht, Archive KNAG R74/356, Lecture of Dr. H.G. Cannegieter, March 25, 1933, Gravenhage.

RA Utrecht, Archive KNAG R74/356, Letter of Dr E. van Everdingen 23 juni 1930 and the concept brochure.

Riedl, H. 1973: Lebenslauf und wissenschaftliches Werk von Hon.-Prof. Dr. Hanns Tollner. In: Lendl, E., Riedl, H. und G. Müller (eds) Beiträge zur Klimatologie, Meteorologie und Klimamorphologie. Festschrift für Hanns Tollner zum 70. Geburtstag. Arbeiten aus dem Geographischen Institut der Universität Salzburg 3, 13–25.

Simonin, P. 2008: 75th Anniversary of the French Station at Scoresbysund. Greenland Collector 13(3), September. Post Greenland, Tasiilaq:6.

Snellen, M. 1886: De Nederlandsche Pool-Expeditie 1882–1883. Firma L.E.Bosch en Zoon, Utrecht.

Sverdrup, H.U. 1931: Hvorledes og hvorfor med “Nautilus”. Oslo, Gyldendal norsk forlag.

Thing, H. 2008: Crumbs from the History of IPY. In: Polar Focus: IPY in the field. Danish Polar Center.

Tinbergen, N. 1934: Eskimoland. D. Van Sijn & Zonen, Rotterdam.

Tinbergen, N. 1935: Field Observations of East Greenland Birds. The Behaviour of the Red-necked Phalarope (Phalaropus lobatus L.) in Spring. Ardea XXIV, No.1–2, 1–38.

Tinbergen, N. 1939: *The Behaviour of the Snow-Bunting in Spring*. New York: The Linnaean Society of New York.

Tollner, H. 1934: Astronomische Ortsbestimmungen auf Jan Mayen 1882/83 und 1933. Zur Frage der Kontinentenverschiebungen A. Wegeners. Mit einem Vorwort von Wilhelm Schmidt. Sitzungsberichte der Akademie der Wissenschaften in Wien, mathematisch-naturwissenschaftliche Klasse IIa 143, 87–97.

Tollner, H. 1935a: Nordlichtbeobachtungen auf Jan Mayen. Commission Internationale de l’année polaire 1932–1933. Copenhagen, Commission Internationale de I’année polaire 1932–1933.

Tollner, H. 1935b: Ausstrahlungsmessungen in der Polarnacht 1932/33 auf Jan Mayen. Meteorologische Zeitschrift, 186–187.

Tollner, H. 1937a: Eine merkwürdige Form des Strukturbodens auf Jan Mayen. Mitteilungen der geographischen Gesellschaft in Wien.

Tollner, H. 1937b: Sandschneekegel auf Jan Mayen. Mitteilungen der geographischen Gesellschaft in Wien.

Tollner, H. unter Mitwirkung v. F. Kopf 1934: Messungen der Wärmestrahlung in der Polarnacht 1932/33 auf Jan Mayen. Sitzungsberichte der Akademie der Wissenschaften in Wien, mathematisch-naturwissenschaftlichen Klasse, IIa 143, 417–423.

Tollner, H., Kanitscheider, R., and F. Kopf 1934: Vierzehn Monate in der Arktis. Die österreichische Polarexpedition 1932/33 nach Jan Mayen, veranstaltet von der Akademie der Wissenschaften in Wien. Verlagsanstalt Tyrolia, Wien, Innsbruck, München, 126 pp.

van Dijk, G. 1933: Die Niederländische polarjahr-expedition nach Angmagssalik (Ost-Grönland). Leningrad: Bulletin of the Arctic Institute, no 8.

van Everdingen, E. 1933: Dutch Aerological Station at Reykjavik. Bulletin of the Arctic Institute, No. 8 Leningrad, 263–266.

Wikipédia: Gustave Auguste Ferrié.

Chapter 8
Achievements of the Second International Polar Year

Aant Elzinga

8.1 Introduction

The context and conditions of research and monitoring at the time of IPY-2 had changed dramatically compared to those obtaining during IPY-1. In this respect at least six aspects must be considered when it comes to assessing achievements and limitations 1932–1933: (i) geopolitics and economics, (ii) practical benefits and concerns at the time, (iii) the organizational framework of the enterprise, (iv) logistics, including new modes of communication and transportation, (v) new instruments and other tools for research on and monitoring of geophysical phenomena, particularly in the domains of meteorology, geomagnetics and aurorae and (vi) the advent of a new hypothetico-deductive ideal of science that to some extent moderated the force of the older inductivist epistemology that had permeated the activities of IPY-1.

When the idea of a second IPY emerged in the early 1920s, the western world was on the verge of an economic crisis. Following on the heels of the Black Friday of 29 October 1929, when the stock market collapsed and speculators jumped out of the windows of skyscrapers on Wall Street, a lack of financial support and scepticism almost put an end to the project before it could start. But a substantial grant from a private research body, the Rockefeller Foundation, combined with Dan Barfod la Cour's persistent and persuasive arguments turned the tables, albeit with substantial downscaling in the scope and intensity of operations. Extension of systematic activities to the Antarctic was impossible. Furthermore, the Western attitude towards the Soviet Union created some difficulties in scientific co-operation and regular communication across an east–west politico-ideological divide. The victorious allies after the First World War had excluded the USSR from the International Research Council (IRC); despite this, and though they were not in the IMO the

---

A. Elzinga (✉)
Department of Philosophy, Linguistics and Theory of Science, University of Gothenburg, Sweden
e-mail: aant.elzinga@theorysc.gu.se

Substantial parts of a text earlier published in *Polar Record* 45 (235): 313–336 (2009) Cambridge University Press are used here and the author and editors of this volume are grateful for the permission to reuse the text.

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_8,

Soviets embraced IPY-2 with great enthusiasm. Six years after the termination of IPY-2, the outbreak of the Second World War finally led to a breakdown of all normal intercourse between scientific communities and with it the possibility of concerted data analysis. Taken altogether these circumstances created substantial obstacles and limitations that meant the outcome of IPY-2 fell far short of what its architects had intended for it.

Since the question of geopolitics and economics is dealt with in Chapter 6, further consideration of these matters below will only be taken up incidentally under other headings. As to expectations and practical benefits these too are covered in the two previous chapters where some of the historical background to IPY-2 is traced. Suffice it to reiterate here that science itself was not enough to motivate the vast expense that would go into a new IPY. Many were the practical arguments for new data to construct weather maps and gain a better understanding of how earth magnetic and auroral events disturbed wireless radio communications that had become increasingly important, first with military aviation during the First World War and then in the 1920s in the civilian sector.[1] Sydney Chapman – who was later to play a central role in the IGY – spoke of the need for what he called a "girdle of polar stations" because "at present, partly because of lack of observations, we have no satisfactory theory at all as to the cause of magnetic storms", phenomena of interest not only to science but also increasingly in commerce. "If aerial transport across the Polar Regions is to go on, it will be necessary for us to have good magnetic maps of those regions, and also to keep those maps up to date by applying the secular variation".[2] This, in his view, called for a good magnetic survey of those regions and a few stations there permanently manned. Speculative ideas of commercial ventures to develop routes for aircraft to fly over the Arctic icecap were also important, spurring the need for developing capacities in Arctic weather forecasting.[3] In the eyes of a later writer, the fateful crash of the dirigible *Italia* "did more than any other single expedition to put the spotlight on the Arctic regions".[4] Because of their spectacular nature and the risks involved, such flights attracted a lot of media attention in many countries; scientists responded in different ways. Critics like Sir George Simpson, director of the British Meteorological Office and a member of the executive of IMO came out against the plan of the AEROARCTIC consortium. They pointed to the high risk entailed and questioned the value of the scientific outcome because of its sporadic nature.[5]

---

[1] Baker (1982) and Crewe (2002).

[2] Close and others (1929:264).

[3] Lüdecke (2008) and also see Chap. 6.

[4] Seidenfaden (1938:177); in hindsight the momentary success of the *Graf Zeppelin* as a research platform had to be counted as an anomaly (cf. Ellsworth and Smith (1932), Laktionov (1960:228–229), Lüdecke (2008:40), Reinhard und Anonymus (2008)).

[5] Simpson (1929:260).

8.2 Significance of the Organizational Framework of IPY-2 for the Quality of Its Results

When the proposal for a new polar year was sent over to the International Meteorological Committee its president, the Dutch physicist and meteorologist Ewoud van der Everdingen sent it over to a specialist organization within the IMO to review the appropriateness and feasibility. The name of the sub-organization was the Commission for Réseau Mondial and Polar Meteorology. After an affirmative response from those quarters an ad hoc sub-commission was set up to outline a formal proposal that was tabled and accepted at the International Meteorological Conference of Directors meeting in Copenhagen 1929, which in turn created a Special Commission for the Polar Year 1932/1933, with Dan Barford la Cour as its head. La Cour was the director of the Danish Meteorological Institute. He was a dynamic, resourceful and persistent person with good managerial abilities. Before specializing in geomagnetics, la Cour had participated in an aurora borealis expedition to Akureyri, Iceland (1899) and had led a second such expedition to Finland. He was also present at the meeting of the International Polar Commission (IPC) in Rome 1913, held in connection with the world congress of geographers.

Most accounts of the history of the polar years take official accounts of the key actors involved in the mobilization of IPY-2 at face value. Rarely does one find a mention of the IPC or an analysis of the character of the IMO's Commission for the Réseau Mondial and Polar Meteorology, the organization that was tasked to do the feasibility study for the new global exercise. It will be argued here that this organization deserves more than the perfunctory mention (without explanation as to its character) it is usually given. For an evaluation of the achievements of the enterprise it is important to understand what networks were in place, their different roles and capacities, as well as possible tensions that might attend a division of labour between those focused primarily on research and the IMO with its sub-commissions that were mainly oriented towards monitoring. Although their respective roles were complementary, they at the same time constituted the institutional bases for different epistemologies manifested in a hypothesis-driven approach on the one hand and a continuation of inductivism on the other. In general, research-oriented networks were more apt to foster the former while agencies set up for monitoring tended to prioritize the latter, with important exceptions of course. Further discussion on the differing epistemologies will be found below in a separate section, here the point is first of all to analyse the character of an important part of the organizational framework – i.e. the IMO – that had over the 50 years since the first polar year and in the 1920s overlapped with several other networks, especially the AEROARCTIC and members of the specialist scientific associations within IUGG/ICSU.[6]

---

[6] See further Chap. 6. Relevant in the present context, however, is to remind ourselves of the fact that under the auspices of the AEROARCTIC a quarterly journal called *Arktis* (Hrsg. F. Nansen) was published, appearing only for 4 years (1928–1931). E.v. Drygalski and O. Nordenskjöld, who had been part of the IPC network, and E. van Everdingen, president of the IMO contributed to it,

IMO is generally the name given to a whole network of organizations that had emerged in the late nineteenth century and successively expanded early on in the next century. From around the turn of the nineteenth century and onward the organization underwent an appreciable expansion and internal differentiation. It was formally defined in 1907 as comprising a conference of directors every six years, an executive (International Meteorological Committee – IMC – acting between conferences) and a variety of professional committees that came and went to deal with specific tasks that changed over time. In 1891, the IMO's core group of European members was expanded to include Australia, Canada, India, Japan and the USA, reflecting an increasingly global reach of meteorology.[7] Thereafter the IMO established a number of technical commissions that reflected two interrelated ambitions. One activity was the establishment of a network of well-distributed permanent meteorological observations stations spanning the Earth. The other was raising the gaze of observers from measurements only at ground level (a characteristic feature of IPY-1) successively upwards to the stratosphere, and a subsequent distinction between it and the troposphere.[8]

Regarding the first point, the development of a network, a commission for weather telegraphy to oversee and facilitate standardization in rapid transmission of weather information was established in 1899. A commission for terrestrial magnetism and atmospheric electricity was already in place since 1891, created in the wake of IPY-1 when the old IPC was finally dissolved (in Munich) and the research-oriented Neumayer had initiated a discussion on how to more systematically work up all the data that had been accumulated.[9] However, under the auspices of the IMC emphasis on systematic monitoring of geophysical parameters and thus further data collection appears to have been the stronger. The vision of a permanent world network of many observation posts reporting to a centre of compilation for synoptic weather mapping went back to the Dutch meteorologist Christophorus H.D. Buys Ballot who was active in the early history of the IMO.[10] By the end of the nineteenth century, the concept had gained some solidity, with two observations posts within each 10-degree latitude/longitude quadrangle in a global grid. Proposed in 1905 as a telegraph-based global weather data system the *réseau mondial*, as it was called, had 17 countries participating.[11] As Edwards has suggested it signalled the beginnings

---

as did C. Størmer who keenly backed the idea of simultaneous observations at many sites for one year during Amundsen's proposed (but failed) polar drift experiment (see Fig 8.1 below).

[7] Daniel (1973:16).

[8] It may be noted that mid-nineteenth century geophysicists like Maury and Adolf Mühry were well aware that they were trying to understand three-dimensional fluids, whether atmosphere or oceans, from observations taken along a two-dimensional surface. In Russia Rykachev explicitly criticized two-dimensional inductivism in the late nineteenth century (personal communication from Rip Bulkeley).

[9] See further Elzinga in Chap. 4.

[10] Cannegieter (1963:9), Also see Chap. 6.

[11] Cannegieter (1963:183–184).

of a “vast machine” for meteorological data collection.[12] Led by a commission that adopted the same name it eventually comprised some 450–475 land-based stations. From these stations data was sent by mail to the Meteorological Office in London for compilation in monthly reports for each year. In the meantime the number of the geophysical observatories that recorded terrestrial magnetic data was also increasing. Kristian Birkeland noted that during his aurora expedition 1902–1903 he had the good fortune of being able to compare magnetic data from 25 observatories and he argued for a doubling of this number in the future. He also recommended a chain of ten small expeditions with about ten stations suitably situated about each of the magnetic poles while correlating with magnetic data from all observatories in the world.[13]

Regarding the second point, moving the gaze successively upward, the IMC at its meeting in Uppsala in 1894 recognized the importance of manned and free balloons for studying the physics of the atmosphere. In line with this the Conference of Directors held in Paris two years later created a commission for aerology, which with the German meteorologist Hugo Hergesell as president was asked to organize the exploration of the air by means of sounding balloons.[14] Accordingly, the first simultaneous international ascents of free and manned balloons occurred in November that same year – the first International Aerological Day – with launchings from six stations strung across Europe, stretching from Paris to Strasbourg, Munich, Berlin, Warsaw and St Petersburg. In 1902 suspension of a recording apparatus from kites came into use, first in the United States.[15] The same year the permanent Commission for Aeronautics was renamed Commission for Scientific Aeronautics, which in turn was reconstituted in 1919 as the Commission for the Investigation of the Upper Atmosphere, with the dynamic Norwegian scientist Vilhelm Bjerknes as its president.[16] These were steps in a process that the president of the Commission for Aerology in a speech in Paris in 1957 in connection with the IGY, looking back into the past, called “the conquest of the third dimension”.[17] A major discovery on this road forward was that of the stratosphere in 1902, prompting nearly all the national meteorological services to set up an aerological section and affiliated sounding stations.

Exploration of the atmosphere was also extended over the oceans. Instrumental in this respect was the interest displayed by Prince Albert I of Monaco who placed his yacht *Princess Alice II* at Hergesell’s disposal, enabling the latter to organize

---

[12] Edwards (2006).

[13] Birkeland (1908).

[14] See further Chap. 6.

[15] The year before, Richard Assmann in Germany constructed the ventilated barothermohydrograph specially designed for suspension from balloons; it was the first exemplar of an aerological sonde that was subsequently further developed by others and superseded in 1930 by the radiosonde.

[16] Bjerknes had already shortly after the turn of the century begun to apply hydrodynamic equations to develop a two-step plan for rational weather forecasting, first diagnostic (based on empirical data), then prognostic (making extrapolations) – cf. Lynch (2006:3432).

[17] *WMO Bulletin*, vol VII, no. 1, Jan. 1958.

expeditions on the Mediterranean Sea, across part of the Atlantic Ocean and into the Arctic in the period of 1904–1906. Therewith, using kites launched from the deck of the ship, Hergesell was confirmed in his ideas about the stratosphere above the Atlantic and the circulation of trade winds. Polar regions were particularly important but constituted a significant gap in the attempt to expand the *réseau mondial*. Here the interest of Prince Albert took the form of several expeditions with the same yacht to Svalbard in 1906 and 1907.[18]

Before the war, and again after in the 1920s Svalbard was a magnet for economic, political and scientific interests as well as for sportsmen, adventurers and tourists. After involvement in some of the early campaigns, Hergesell introduced a permanent meteorological station on Spitsbergen in 1911, which with the start of aerological ascents in the following year produced annual series of data for the sunlit part of the year, helpful for gaining a better understanding of variations in weather conditions.[19] Integrating single outlier observation points, however, was a problem, and remained so also during IPY-2.[20] To spur further efforts a special Commission for Polar Meteorology was created in 1913 within the IMO. This coincided with the announcement by Roald Amundsen that he intended to attempt a drift across the North Pole in a vessel, a plan that was not put into operation until four years later with the *Maud* (1918–1925 expedition), when the polar drift attempt failed (although a variety of other scientific data was accumulated under the scientific leadership of H.U. Svedrup).[21] Nevertheless, the International Polar Aerological Commission, as it was also called, at its meeting in Copenhagen 28 February 1–March, 1914, on the assumption that Amundsen was only momentarily delayed and would at least set out in the summer of 1915, submitted a map with a plan for aerological observations at a chain of stations extending around the north polar basin (Fig. 8.1).[22]

In essence it was a miniplan for a network of geophysical stations in the Arctic, up to 20 in number, to operate for at least one year or even two years in parallel with Amundsen's intended north polar drift in the *Maud*. Observations were to be made simultaneously (ensured through radio contact) on a daily basis during the year September 1915–September 1916 with similar observations to be made by Amundsen during his intended north polar drift. Membership of the

---

[18] See further S. Barr's chapter on the Norwegian case in the previous chapter.

[19] Measurements at the German station in Spitsbergen were interrupted during the dark winter night because the observers had problems with lighting the instrument during the ascent of the weather balloon which meant that it could not be followed through the lens of the theodolite (C. Lüdecke personal communication). Measurements of surface temperatures were made throughout the year, thus contributing to the data that B.J. Birkeland later used as a basis for his finding that there was a rapid rise in average temperatures for the months of January and February during 1917–1920 (Birkeland 1930).

[20] Sorge (1933).

[21] Sverdrup (1926, 1933).

[22] Anon. (1914); See also Chap. 6.

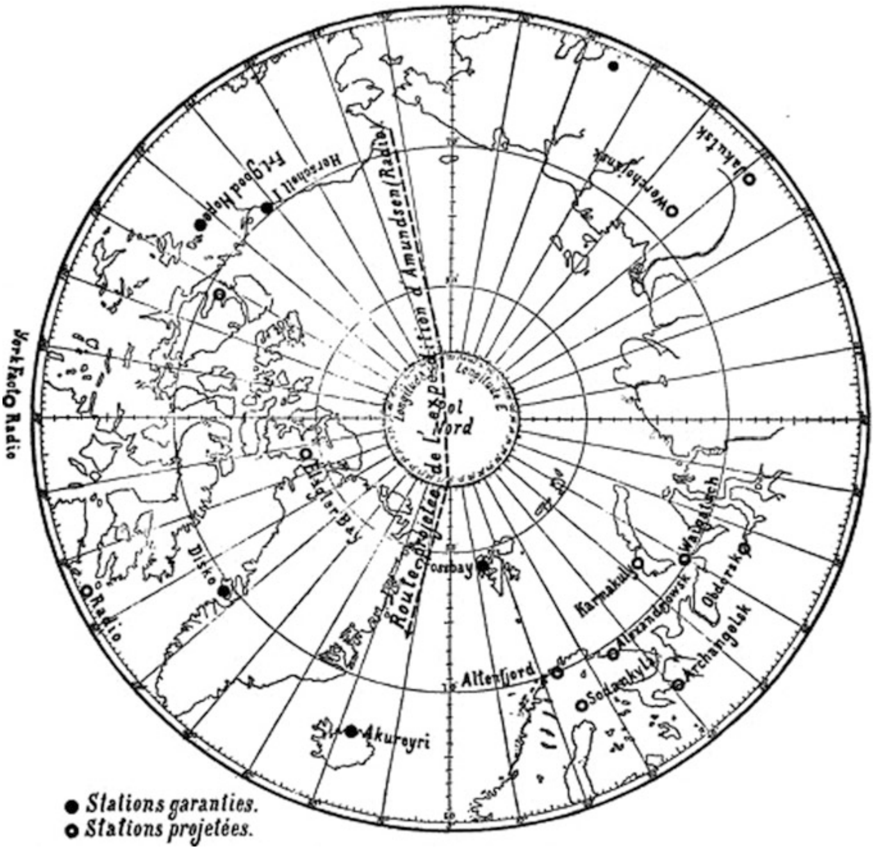


Fig. 8.1 Proposed route of Amundsen's Arctic expedition and location of stations that were meant to collaborate in aerological observations (Bul. Imp. Ac. Sci., St Petersburg, April 1, 1914)[23]

commission reflected the nations to be involved.[24] Noteworthy is that the Russians were apparently geared up to play an important role, with three fully-equipped primary stations, one of which on Novaya Zemlya and four secondary ones across its vast Arctic territories. Canada intended to equip four stations, the Danes were to take part on the west coast of Greenland and at Akureyri in Iceland, the Germans would use their observatory at Cross Bay (Krossfjorden), Spitsbergen, and it was hoped that the Scandinavians would participate with two Arctic observatories (Altenfjord,

---

[23] Reproduced from *Monthly Weather Review*, Vol. 42 (Issue 3 – March 1914), pp. 181–182. See http://docs.lib.noaa.gov/rescue/mwr/042/mwr-042-03-0181.pdf

[24] Members: A.I. Rykachev (president; he had once been an assistant to H. Wild and succeeded him as director of the Physical Observatory in St Petersburg), R. Amundsen (Norway), H. Hergesell (Germany), C. Ryder (Denmark), R. F. Stupart (Canada), B. Birkeland (Norway), Prince Boris Golitsyn (Director of the Russian Meteorological Service), A. de Quervain (Switzerland) and A. Wegener (secretary – Germany).

Alta and Sodankylä), while an American expedition in Greenland would also take part. As it turned out none of this materialized. The First World War turned attention to other uses of meteorology in the service of nationalist goals. The spirit of scientific internationalism was seriously eroded. Meteorologists were trained to analyse and issue battlefield weather maps; to take hourly measurements conducive to launching and defending against poison gas attacks; and to collect data on upper-air conditions, especially winds, to help calculate the trajectories of long-range artillery shells. By using pilot balloons with theodolite trackers and electrical timers, observers could track the winds needed to launch airships with their deadly bombs, while registration balloons provided meteorological data aloft.[25]

It should be added that prior to the First World War the International Meteorological Committee met every three years in friendly gatherings for social intercourse and the transaction of business. Broadly speaking, the difficulties of the members were in obtaining sufficient funds to enable them, in their respective services, to achieve the ends upon which they were agreed rather than in securing agreement on the desiderata for international exchange. After the war the situation changed as the IMO became more dynamic largely thanks to the achievements of meteorology in the war.[26]

During the First World War the Commission for Polar Meteorology was more or less dormant. In 1919, however, it was reconstituted and both at a preparatory meeting of the IMC (June) and again at the conference in Paris (October) the earlier plan to co-operate for a full year with the Amundsen venture (that in the meantime had finally got started once more in June 1918)[27] was again discussed and reaffirmed; at the Paris conference an International Polar Commission was established to lead the projected co-operation with Amundsen and a map of his projected route and the array of many attending observatories in the various countries for at least a year were updated.[28] In the end Amundsen never attained his objective and the plan to put in place a series of Arctic observation posts also appears to have come to nought, with

---

[25] Cf. Fleming and Seitchek (2009).

[26] Gold (1920).

[27] Amundsen had announced that his intention was to head into the Arctic basin once more to attempt a northerly polar drift by proceeding westward from Nome (Alaska) through the Bering Strait and drift with the ice fields across the Arctic Sea. Although he did not achieve his intended objective the *Maud* Expedition with Harald Ulrik Sverdrup as head of the scientific mission delivered many important scientific results obtained during the entire expedition (1918–1925) and published in the United States and Scandinavia. See Sverdrup 1922, 1926, 1933; Friedman 2004.

[28] See Geofysiske Kommission (1920) that gives details with an update of the plan and the map, both in English. This report includes papers by Theodor Hesselberg, Ole Andreas Krogness and Carl Størmer. It was the basis of a memo circulated by the Norwegian government to other governments to ask them to participate in the plan. To what extent the Versailles negotiations at the Paris Peace Conference 1919–1920 that led among other things to a Spitsbergen Treaty had some relevance is unclear; Article 5 of the Treaty recognized the utility of establishing an international meteorological station at Spitsbergen, although this was never realized, nor was the idea of regulating research in the region followed up until much later.

the exception of a geophysical observatory on Novaya Zemlya in 1923.[29] In 1921 the Commission for Polar Meteorology, finally, was united with the network commission to form the Commission for the Réseau Mondial and Polar Meteorology. It was this new joint committee, in consultation with the one on terrestrial magnetism and atmospheric electricity, which was tasked to review the proposal for a new polar year. The Réseau Mondial for its part, with its 450–475 land-based stations that generated vast amounts of data, continued to compile these into annual volumes published for each year from 1910 to 1934. Unfortunately, delays in publication meant that the handbooks did not appear until 5–7 years after the period the respective volumes covered. The final volume (for 1934) appeared in 1956. Nevertheless, this effort to produce a global climatological database, owing to the many difficulties entailed, prompted standardization of observation, measurement and recording techniques as well as codification. In the words of Sir Napier Shaw, who took over the leadership of the pertinent commission just before the First World War, the *réseau mondial* was the guiding principle of international co-operation between meteorological establishments of the world.[30] In retrospect, the *réseau* is now recognized as the predecessor of the World Meteorological Organization's (WMO) planetary meteorological observational infrastructure, the World Weather Watch (WWW) of the 1960s.[31] In this perspective, the second IPY may be seen as a temporary *effort to increase the density of Arctic observation points in an existing global observation net* and do something similar in the realm falling under the responsibility of an older commission of the IMO, the permanent Commission for Terrestrial Magnetism and Atmospheric Electricity that had been established in 1891.

8.3 Essential Tension Between Research and Monitoring

As Cornelia Lüdecke argues in Chap. 6 in this volume the forum that provided necessary impetus for the idea of a new IPY was the AEROARCTIC, the multinational non-governmental movement largely dominated by German, Russian and American actors. Although motivated by practical utilitarian interests, for some key persons in this network research was high on the agenda. Remember that it had an executive committee and various affiliated scientific experts in aerogeodesy, earth magnetism, atmospheric electricity, aerology and meteorology, radio-telegraphy and other fields.[32] The other non-governmental organization, the IUGG (since 1931 under the ICSU umbrella) was of course directly involved as a recognized partner in

---

[29] See Lüdecke, Chap. 6.

[30] Daniel (1973:175); Cannegieter (1963:183–184).

[31] Edwards (2004, 2006).

[32] See Lüdecke, Chap. 6. In 1929 membership was about 33% German, 20% Russian, 30% North American. The internal organization included 11 "commissions", i.e. geographical, aerial-geodetic, aerological–meteorological, equipment, biological, earth-magnetic, financial, radio-telegraphic, air-electrical, oceanographic and technical commissions.

organizing IPY-2.[33] Then there was the IMO network. It is important to remember that it was also a non-governmental organization, a status that had put limitations on its mode of operation. Its present-day successor, the World Meteorological Organization, by contrast is an intergovernmental organization, a position that in many respects gives it comparatively more official clout in an international arena. A major constraint for the IMO was that by virtue of its non-governmental status it only had a small budget. For participation in the polar year individual members had to lobby for funds in their individual countries, a difficult task given the emergence of an international economic crisis.

The status of the IMO was actually the subject of many debates, for example, at the fourth conference of directors in Utrecht 1923, at which some members argued that its non-governmental character was a handicap. Having only an advisory function, governments could ignore it. Opponents to the idea emphasized the importance of an autonomous position that provided for flexibility and warned against the formation of an international bureaucracy of civil servants that might be arbitrarily appointed or removed by national governments. In the end a compromise was achieved under which a *permanent secretariat* (with H.G. Cannegieter as secretary) was created and housed at de Bildt, the Netherlands and the provision was made that invitations to researchers to participate in major undertakings could be disseminated through national governments.

Another subject of debate was to what extent commissions under the IMO should be involved in scientific research rather than being restricted to coordinating observations, promoting standardization of techniques and instruments and publishing synoptic reports containing vast amounts of tabulated data. This had to do with its emphasis on the monitoring of geophysical parameters. By the time of the Utrecht conference, international scientific unions had begun to function again under the auspices of the IRC (International Research Council) later transformed to ICSU.[34] In view of this, the IMO decided upon a *division of labour* under which research was left as the purview of the international scientific unions, and that when needed collaboration might be developed with them. It was an arrangement that turned out to be very important for the planning and execution of the second IPY in which the IUGG, and particularly its two sections for, respectively, meteorology and terrestrial magnetism, played an important role, financially and scientifically. In other words, under the institutional circumstances at hand involving the IUGG, this added some much-needed funding to a costly global effort; in addition it enhanced the legitimacy of the effort by providing a broader and stronger scientific base.

A further aspect of importance has to do with the oft-cited ethos associated with research, i.e. ICSU's strong and clear affirmation of the spirit of scientific internationalism. As the successor of the International Research Council, an organization

---

[33] ICSU is today called the International Science Council. It is currently one of the oldest international non-governmental organizations in the world, arising out of the evolution of two earlier bodies known as the International Association of Academies (1899–1914) and the International Research Council (1919–1931).

[34] Greenaway (1996).

that was dissolved because of discrimination against scientists from certain countries, ICSU had a policy of non-discrimination and free communication inscribed on its banner. This approach is explicitly expressed in the Fifth Statute of its Constitution, a paragraph that has been revised and elaborated several times since 1931, but retains its original essence, and now reads as follows: “In pursuing its objectives in respect of the rights and responsibilities of scientists, ICSU, as an international non-governmental body shall observe and actively uphold the principle of the universality of science. This principle entails freedom of association and expression, access to data and information, and freedom of communication and movement in connection with international scientific activities without any discrimination on the basis of such factors as citizenship, religion, creed, political stance, ethnic origin, race, color, language, age or sex. ICSU shall recognize and respect the independence of the internal science policies of its National Scientific Members. ICSU shall not permit any of its activities to be disturbed by statements or actions of a political nature”.[35] Of course, this was an ideal that was not always lived up to in practice. During IPY-2, for example, open exchange both ways of information between the USSR and other countries was to some degree still impaired by political considerations as well as linguistic limitations on both sides.[36] It must be remembered that the USSR did not join ICSU until 1955.[37]

8.4 Logistics and Instrumentation

As already indicated, modes of transport and communication were much more advanced during IPY-2 compared to IPY-1. Vehicles driven by combustion engines, stronger and better seagoing vessels, aircraft and radios provided a basis for greater efficiency in logistics and made it easier to ensure synchronicity in monitoring and data collection. Simultaneous observation of aurora, for example, could now be coordinated via radio contact between two different sites quite far apart. Radio contact with institutions back home also helped reduce expeditioners’ feeling of isolation and provided a better safety network in case of accidents and other risks. New technologies also had an important bearing on instrumentation and measurement techniques.

The radio, for example, had become an important research tool in its own right. It opened up new vistas of inquiry, ionospheric studies, and facilitated more precise

---

[35] Noble 2003:3 – (http://www.iups.org/nl6/IUPSNewsletterApril03FINAL.pdf)

[36] Ibid. 5.; also see Lüdecke’s and Lajus’ account (Chap. 6) of some of the difficulties Soviet scientists experienced on account of Stalin’s political regime.

[37] An approach to the IUGG was blocked when the Soviet Academy secretary was killed in the Great Purge of the 1930s; otherwise in the period before the Second World War there was only a small, patchy Soviet presence in the IUPAC and the IAU. I thank Rip Bulkeley for pointing this out. US scientists attempted at first to keep the USSR and other “Iron curtain” country researchers out of the IGY exercise. This is corroborated by Mike Baker (personal communication from Mike Baker, former secretary of IGY at ICSU’s office in Paris).

records of coincidences between geomagnetic events and aurorae, a possible connection suggested by the fact that disturbances in radio receptivity occurred in both instances. Moreover, small transmitters sent up with balloons as radiosondes (first successfully deployed in 1931) were capable of sending back continuous reports of air pressure, temperature, wind velocities and humidity by radio signals to the launching site. This was an improvement over self-recording meteorographs that had to be retrieved after balloon flights and sometimes were lost.

The use of airplanes facilitated further the move from two to three dimensionalities in meteorology. A highlight in this respect was the effort of H.G. Cannegieter, a section head at the Royal Netherlands Meteorological Institute, in sending two Fokker D-VII aircraft to make aerological observations in the vicinity of Reykjavik (Iceland), making altogether 330 flights, most of them exceeding a height of 5 km.[38]

Another advance over the previous polar year was the self-recording magnetograph. Here la Cour, who was director of the Danish Meteorological Institute (DMI) in Copenhagen, was pivotal.[39] La Cour was a proficient instrument maker who designed, produced and sold precision magnetometers.[40] During the months preceding the IPY many special magnetic recording instruments were produced and about 100 autographic magnetometers were distributed to magnetic stations in different parts of the world.

La Cour's self-recording magnetometer had a relatively fast paper run speed (about 18 cm per hour). It improved the accuracy of determining and monitoring specific geomagnetic events by a factor of 12. Rapid fluctuations in geomagnetic fields could be studied in greater detail than before.[41] Greater accuracy also made it possible to distinguish local magnetic fluctuations from those that had a broader reach. The fact that la Cour had prepared foreign observers in the use of his instrument by prior training was another important factor for what could be achieved since it helped facilitate greater uniformity in techniques of observation, recording and storing of data.[42]

On the aurora borealis expeditions to Iceland and Finland in which la Cour had participated in his younger days the painter Harald Moltke was engaged to paint images of various configurations of northern lights.[43] Just before the start of IPY-2 a *Photograpic atlas of forms of aurorae* was published, useful for observers covering this part of the international programme. La Cour also was involved in that enterprise.

Developments in photographic techniques prior to 1900 had made it possible to determine the altitude and spatial orientation of aurorae by comparing plates of images of the same phenomena synchronously taken at two different sites, for

---

[38] Laursen (1982:218), Also see Chap. 7, L. Hacquebord, this volume.

[39] Bartels (1942).

[40] Lauridsen and Abrahamsen (1988), Stauning (2002).

[41] La Cour and Laursen (1930).

[42] DMI (1972:28–30).

[43] Stauning and Henriksen (2008).

example, 100 km apart. Thus a problem left over from IPY-1 was solved. In the interim before IPY-2 the technology had improved further. Sydney Chapman wrote a paper after IPY-2 in which he proposed a method for reducing paired plates more rapidly and effectively than before.[44] Spectroscopy had also become more sophisticated and was in some cases used to do comparative spectral analysis of northern lights. Considerable advances occurred during the 1920s, with controversy between Norwegian and Canadian experimental physicists regarding the origin of the dominant green spectral line of wavelength 5,577 Å that had been an enigma for over 50 years. Shortly after the riddle was resolved (1925 in Toronto) atomic theory was brought to bear on the question and very soon a quantum theoretical explanation emerged.[45]

8.5 Epistemology: A Combination of Inductivism and Hypothesis-Driven Research

Earlier in this chapter it was noted how there was a division of labour between the IMO and the IUGG and how these two organizations tended to represent different ideals of science. Inductivism was still strongly entrenched among those who saw data collection as a primary task. Thus this epistemology had a strong institutional base among those concerned with the Réseau Mondial, but also among geomagneticists there existed a conservative trend. Even la Cour, being himself a meticulous observer of geophysical phenomena, expressed exasperation at the backwardness of some of his colleagues, because of their inability to move with the times. After IPY-2 was over he complained about the poor quality of some of the data he received for archiving in Copenhagen. He had given explicit instructions when he sent out his magnetic measuring instruments, but not all observers had managed to make the necessary adjustments to avoid disturbances, a failure he ascribed to “des wohlbekannten Konservatismus der Magnetiker” [“the well-known conservatism of the earth magneticians”].[46] Another problem was the overwhelming volume of data collected. Capable analysts had to be engaged to work through it all, but this was difficult. In the archives now managed by the Danish National Archive in Copenhagen there are thick compendia of unprocessed handwritten raw data from Chile, Brazil, Egypt and a number of other countries that took a long time to process.

At the other end of the epistemological spectrum, apart from its vitally important support, the involvement of the IUGG also boosted the much-needed hypothesis-driven research component in a worldwide effort that otherwise tended to be dominated by empiricism.

---

[44] Chapman (1935).

[45] For this fascinating history see Kragh (2009).

[46] La Cour (1934b).

It is clear that new instruments facilitated better empirical studies, but they also made it possible to verify or falsify various hypotheses that guided theoretical studies and the construction of models. In the 1920s discussion of scientific method and the role of hypotheses (for example, multiple working hypotheses) entered the geosciences.[47] Theories and hypotheses existed and were important in several areas. In meteorology, the Bergen School led by Vilhelm Bjerknes introduced a fluid dynamic view of the atmosphere that revolutionized the field and led to improvements in weather forecasting. Using the notion of surfaces of discontinuity and perhaps influenced by the contemporary imagery of battlefronts in war, in 1919 they developed the theory of polar fronts and a three-dimensional model of evolving cyclones using concepts like air mass and the polar front.[48]

In the UK, Sir Napier Shaw, the long-time head of the Meteorological Office and president of the International Meteorological Committee 1907–1923, explicitly criticized the hypothetico-deductive method of a new generation of physicists as being unsuitable in meteorology. He found fault with Bjerknes' approach on a methodological point concerning the relationship between cause and effect.[49] In the laboratory, one can experiment with phenomena by consciously isolating and excluding the influence of particular factors, but in fieldwork dealing with the natural atmosphere at large this is not possible. There, he argued, it is "an arduous duty and a rather thankless one" to plod on, accumulate vast amounts of data on a worldwide scale by the inductive method and successively fill "gaps [that] are many and vexatious".[50] It requires the construction and coordination of continued observation over long periods within a single global network. In epistemological terms, then, the image evoked here is reminiscent of Francis Bacon's in *The New Atlantis* (1627), that of a grand machine for induction that – in this case one might say – distinctively characterizes meteorology. Or, in Shaw's own words: "[s]ome day we are going to have an international encyclopedia of meteorological information with actual working data for the whole world, the product of a complete *réseau mondial*; and the science is going to have its own inductive axioms, its own definitions, and its own analysis".[51]

The work of the Bergen School was also slow to gain acceptance in the United States where Bergen-trained Carl-Gustaf Rossby went against the conservative epistemological tide. He successfully applied the Bergen models in a study of North American weather maps in an effort to stimulate discussion and rethinking by practical example using data from over 180 meteorological stations in the United States.[52] In Britain Lewis Fry Richardson, inspired by Bjerknes' idea of rational forecasting, criticized traditional meteorologists and even articulated a vision of

---

[47] Chamberlin (1897), reprinted 1931, Davis (1922).

[48] Friedman (1982).

[49] Shaw (1924:421–422).

[50] Shaw (1924:418).

[51] Ibid.

[52] Rossby and Weightman (1926).

a Forecast Factory employing 64,000 computers (humans, not machines!). As an avowed pacifist he came out against placing meteorological services under the auspices of military forces during the First World War, a stance that hindered him from a mainstream career; it was only much later that his abilities and prescience have been celebrated.[53] By the late 1920s, the existence of rapid winds from west to east in the upper atmosphere, 10–15 km above the Earth, was a hot topic. Many publications arising from IPY-2 are on this topic.[54] Determining their more detailed structure and the process behind them in the meeting of warm and cold air masses as well as their being named "jet streams" came a decade later. Pilots flying back and forth between the UK and the United States during the Second World War then noticed how the eastward flight sometimes was much faster than the westward. Jet streams were the explanation.

In the late 1920s, also, large amounts of total ozone were found to exist in the atmosphere in the high latitudes, something Chapman tried to explain with a photochemical theory.[55] In addition, referring to the method developed by Edward Appleton in the UK,[56] he keenly advocated the use of the radio as a tool to explore the ionosphere.[57]

A layer that reflected radio waves was predicted around the turn of the century shortly after Marconi sent his first signals from Europe to Newfoundland. It became known as the Kennelly-Heaviside (also called the E-) layer after the two men who had independently postulated its existence. By the 1920s advances in radio techniques made it possible to test this hypothesis.[58] Appleton, in a series of experiments with radio signals, confirmed its existence in 1924 and he calculated its altitude to be around 60 km and upward above the Earth. In 1927, he detected a second (the F-) layer at about 230 km and upward that, still more exposed to ultraviolet solar radiation, reflected back shorter wavelengths in daytime as well as at night, and with greater strength than from the Heaviside or E-layer. These discoveries stimulated work on elaborating various theories about the variable electron densities, structure and other properties of the ionospheric layers that influenced the refraction and reflection of radio waves.[59]

During IPY-2, Appleton brought his equipment to Tromsø where he set up a sender and receiver 17 km apart to probe both E- and F-layers. Special days were allocated for four specific types of measurements, one on each occasion each month between August 1932 and August 1933. Soon after the start of the programme,

---

[53] Lynch 2008, a paper that includes a picture of a contemporary artistic image of the Forecast Factory.

[54] Laursen (1951).

[55] Chapman (1930).

[56] See Appleton (1934).

[57] Chapman (1934).

[58] Breit and Tuve (1926).

[59] Appleton was awarded the Nobel Prize (1947) – cf. Appleton 1947, Gilmor (1981).

he recorded an intense magnetic storm.[60] The purpose was to study radio wave propagation at high latitude, taking account of weak auroral phenomena and magnetic storms.[61] Afterwards the Norwegians purchased a slightly modified copy of Appleton's instrument, bringing it on air in 1935. Since then ionospheric soundings at Tromsø have continued and now span over 70 years.[62] Researchers at Sodankylä in northern Finland have also since IPY-2 provided a long-time series of ionospheric data. This series is very special because the analysis ("scaling") was performed by the same person for almost half a century thereby uniquely reducing susceptibility to personal error that often arises when a succession of different observers have done the work, or as in the case of Tromsø, the instrument and its precise location have been altered over time. In Canada, Harry Vestine led an IPY expedition to Meanook in northern Alberta where he began to obtain magnetic data from that aurora region, an operation that continues to this day. Vestine also reported the first North American sightings of noctilucent clouds.[63]

Lloyd Berkner, a radio engineer who had accompanied Richard Byrd on his first Antarctic expedition, set up ionospheric research at the Carnegie Institution in Washington DC. He used radio methods to study changes in the F- or Appleton-layer in low altitudes,[64] and wrote on how changes in ionization of the ionosphere might be studied during a coming solar eclipse.[65] Several investigators used IPY magnetic observations to test hypotheses on differences in how magnetic storms[66] might be propagated at night compared to daytime.[67] Julius Bartels was concerned with the influence of sunspot variations in relationship to observed earth magnetic properties.[68] Chapman was particularly interested in the effect of magnetic storms in the polar regions, so the advent of a new polar year was propitious. Already in the 1920s, he had used the magnetic data acquired in IPY-1 as a basis for his hypothesis on the flow of currents in the upper atmosphere, and then went on with W. Ferraro to construct magneto-ionospheric models to develop a theory to explain these current systems. They postulated plasma-like storms from the sun hitting the earth's magnetic field much like a shield and forming a cavity (with the earth in it) facing away from the direction of the sun.[69] Even though the theory was later falsified and eclipsed by the work of Hannes Alfvén it nevertheless had a significant bearing in discussions on ionospherics and what was later called plasma physics.

---

[60] Appleton (1932).

[61] Appleton and others (1937).

[62] Hall and Hansen (2003).

[63] Vestine (1934).

[64] Berkner and Wells (1934).

[65] Kirby and others (1934).

[66] Marrs (1932).

[67] Egedal (1934).

[68] Bartels (1932).

[69] Chapman and Ferraro (1931, 1933).

8.6 Results and la Cour's Quest to Ensure a Legacy

The president of the international commission for IPY-2, Dan Barfod la Cour, understood the point concerning the need to plan for a sustained legacy. His management skills and personal stamina were an important dimension that has to be considered when evaluating what was achieved. Despite difficult circumstances owing to the widespread economic crisis in the early 1930s, he nevertheless pressed on and did everything in his power to establish an archive especially of geomagnetic data, and ensured the production of a comprehensive scientific bibliography that was finally published in 1951.[70] He was probably also responsible for the idea of extending IPY-2; in the sub-Antarctic region it was extended to the end of February 1934 in hopes of obtaining further data.[71]

Laursen's (1951) bibliography indicates that 44 countries participated, 16 of them had national IPY committees while others counted intensified meteorological or geomagnetic observations and only contributed one or two publications. Some countries reopened old IPY stations and more established new ones. Of 45 magnetic observation posts, 30 of them were located north of 60° N. Compared to IPY-1, the number of stations in the equatorial zone and southern hemisphere also increased.[72] For the most part it was a matter of intensifying meteorological observations at already existing stations and additionally installing new magnetometers. Corby lists the following sites: Elisabethville (Lubumbashi), Tatuoca, Tamanrasset, Bangui, Mogadiscio, Magellanes (Punta Arenas) and Cape Town.[73] The extent of data coverage obtained in the Soviet Arctic has hitherto often been unappreciated because much of it did not find its way to Copenhagen.[74] On the other hand, in the West it is not unusual to find mention of a site set up in the Antarctic by Richard Byrd during his second Antarctic expedition even though it came too late even if one considers the fact that the second polar year in the south was extended to the end of February 1934. Much of the material that emanated from all these expeditions found its way to a central archive in Copenhagen, to a large extent thanks to la Cour's urging and letters to remind researchers to send published papers, memos and raw data to the depository at the Danish Meteorological Institute.[75] The intention was to have a number of analysts process the material and work it up for future

---

[70] See Laursen (1951).

[71] La Cour (1934a).

[72] Summerhayes (2008:325).

[73] Corby (1982:325).

[74] For the sake of the record, it is here worth noting in this context that the USSR for its part had 115 stations in the Arctic as well as 11 research vessels sent out in 1932 and 15 in 1933 – see Korotkevich (1982:233); only three sites figure in the archives referred to in the appendix below, so perhaps most of the Soviet stations must have been concerned with meteorology, but still this is a matter open for further historical investigation.

[75] The Archives of the Department of Terrestrial Magnetism of the Carnegie Institute of Washington (D.C.) contains copies of much of the magnetic data. See below – Appendix.

use. However, lack of funds and circumstances related to developments leading up to a new world war foiled la Cour's ambitious plan.

In 1933 he applied for a new grant from the Rockefeller Foundation for a follow-up programme but this failed and he feared that in the event no funds became available "the main goal for which so much work and money has been sacrificed should be dropped and left to an uncertain fate – which probably would mean that the greatest and most useful part of the work should never be done".[76] In a letter to Sir Henry Lyons, the general secretary of ICSU he intimated how, "the first part of the work, the organization and the observation has been carried out in spite of severe financial conditions, – and now the second part, namely the thorough treatment and discussion of the observations has to be organized and carried out in a manner not inferior to the good sacrifices of labour and expenses".[77] The following year he again approached the Rockefeller Foundation. In the field of terrestrial magnetism alone, he noted, magnetographs had made "110 miles of magnetic curves" and that the ultimate value of these depends "wholly to the extent to which these or parts of them can come into the hands of investigators".[78] In the end the Rockefeller Foundation did provide a new grant to be used towards ensuring the legacy of IPY-2, a task la Cour considered would take five years. Progress, however, was slow and then a new world war interrupted it. Since very little of the new Rockefeller grant had been used before the war, the IMC at its meeting in Paris 1946 decided the remainder was sufficient for setting up a special commission to produce a comprehensive bibliography and also to arrange for publication of Brazilian and Chilean magnetic data.[79] Both tasks were completed by 1951.[80] La Cour having died in 1942 it was the geomagnetist Viggo Laursen who supervised the collection of publications and other materials from various parts of the world for the central archive and finally compiled a bibliography covering publications, unpublished manuscripts, microfilms with magnetographic records and aurora observations.[81]

While IPY-1 had, apart from geophysical observations, also included other aspects of natural history such as geology, ethnography, botany and zoology, the scope of the official programme for IPY-2 was more strictly limited to geophysical dimensions.[82] In meteorology, the focus was on the broad study of the atmosphere in the polar regions, and the circulation of the air between these and air masses at lower latitudes, plus related studies of the upper atmosphere in hopes of gaining a better understanding of the "mechanisms" of the atmosphere as well as for immediate progress in weather forecasting. Pure local phenomena were only to

---

[76] La Cour (1933a).

[77] La Cour (1933b).

[78] La Cour (1934c).

[79] Fleming and Laursen (1949).

[80] Laursen (1982:222).

[81] Laursen (1951).

[82] Baker in Anon. (1982:194). The interview with F.W.G. Baker was with H.Taba of the WMO Secretariat. See also Baker (1982).

receive secondary consideration. Study of earth magnetism, atmospheric electricity and northern lights was also emphasized.[83]

Of course, there were some important exceptions to these guidelines. One was the extensive oceanographic and glaciological work undertaken by the USSR in which there were ideas of using a drifting ice-island as a platform for observations in the Arctic, a method actually realized in 1937. The others were ornithological studies from an ethological point of view and ethnographic work among Inuit people carried out by the future Nobel laureate Niko Tinbergen. Tinbergen joined a Dutch group of researchers to the earth magnetic observation station they set up at Tasiilaq (Ammassalik) in eastern Greenland.[84]

Lausen's bibliography contains just over 1,000 items listed under 48 countries or their affiliated colonies or provinces. More than one third of the items refer to general international reports, special campaigns and accounts of various expeditions, as well as unpublished material and microfilms. From other sources, we know that some interesting publications are missing (for example, Tinbergen's ornithological papers and his book (1934) on the Inuit).

In Table 8.1 the distribution by "country" is divided into four categories covering intervals of 1–10, 11–25, 26–50 and over 50 publications per country.

Table 8.1 Countries of origin of scientists that produced in IPY-2 publications clustered in terms of four intervals (based on a count of the items listed in Laursen 1951)

I	(> 50 publ.):	Britain and its colonies, France, Germany, the USA and the USSR.
II	(26–50):	Canada, Italy, Japan, The Netherlands, Norway, Switzerland.
III	(11–25):	Austria, Belgium, China, Denmark, Finland, India, Pakistan, Spain, Sweden, Portugal (plus Azores).
IV	(1–10):	Algeria, Australia, Brazil, Bulgaria, Chile, Columbia, Czechoslovakia, Egypt, Haiti, Hungary, Iceland, Indonesia, Latvia, Madagascar, Philippines. South Africa, Syria, Tunisia, Turkey, Yugoslavia.

In the second part of his bibliography Laursen reduces the 1,000 items to a core of 672 scientific papers and works that are then re-listed under the headings of various disciplines (Table 8.2).

Table 8.2 Scientific publications by discipline as listed in Laursen 1951

Geomagnetism	173	Atmospheric electricity	40
Aerology	102	Earth currents	26
Meteorology	95	Cosmic rays	18
Aurora	70	Hydrology	18
Radio electricity	59	Atmospheric ozone	9
Solar radiation	41	Other	21

---

[83] Laursen (1932).

[84] Tinbergen 1934, Hacquebord (1995:14) and in Chap. 7 in this volume, Buijs and van Zuylen 2008.

Of the 672 disciplinary items, the majority are in the field of geomagnetism, followed by aerology and meteorology. In the table "radio electricity" refers to ionospheric studies using radio transmitters and receivers as a research tool.

Inductivism and empiricism still marked the work of a vast majority of those working in the field making observations and meticulous tabulations of measurements regarding meteorological, geomagnetic and cosmic phenomena. In a few cases research practices in the field also entailed severe polar conditions that disrupted their schedules and caused breakdown of instruments.[85]

La Cour's foresight in making arrangements for a central geomagnetic database apparently influenced the architects of the next polar year, the IGY.[86] They made exacting provisions in several fields for international data depositories to be used for subsequent analysis.

Acknowledgement is made of helpful comments provided by Rip Bulkeley and Cornelia Lüdecke on a draft of this chapter.

Appendix: Carrnegie Institute of Washington, DC: Archive Material Gathered 1931–1936

The materials in this collection were created or collected before, during, and after the Second International Polar Year (1932–1933) between 1931 and 1936. The overview was put together by Joseph Neumann in January 2009 at the Department of Terrestrial Magnetism Archives.

Apart from the holdings from College-Fairbanks and Point Barrow not taken up here, there is a large collection of "global" materials. That part of the collection (below) gives an indication of the scope of IPY-2 magnetic data (by folder no. in Box 8).

Subseries B: Global Magnetic and Earth Current Registries, 1932–1936
Abinger, UK, 1932–1933 (prints and microfilm) 21
Agincourt, France, 1932–1933 (prints and microfilm) 22
Angmagssalik, Greenland, 1932–1934 (microfilm only)
Antipolo, Philippines, 1932–1933 (prints and microfilm) 23
Apia, Samoa, 1932–1933 (prints and microfilm) 24
Bear Island (Bjørnøya), Norway, 1932–1933 (prints and microfilm) 25
Cape Town, South Africa, 1932–1934 (prints and microfilm) 26
College-Fairbanks, the USA, 1932–1934 (prints and microfilm) 27
Dickson Island, the USSR, 1932–1933 (prints and microfilm) 28
Dombass, Norway, 1932–1933 (prints and microfilm) 29

---

[85] Olsson (1933), see also Tollner and others (1934).

[86] Details of the significance of IPY-2 for the IGY may be gleaned from various chapters in ICSU (1959).

Ebro-Tortosa, Spain, 1932–1933 (prints and microfilm) 30
Elisabethville (Lubumbashi), Belgian Congo, 1932–1933 (prints and microfilm) 31
Eskdalemuir, the UK, 1932–1933 (prints and microfilm) 32
Fernando Po (Bioko), Spanish Guinea, 1932–1933 (prints and microfilm) 33
Fort Rae, Canada, 1932–1933 (prints and microfilm) 34
Godhavn (Qegertarsuag), Greenland, 1932–1934 (prints and microfilm) 35
Helwan, Egypt, 1932–1933 (microfilm only)
Jakoutsk (Yakutsk), the USSR, 1933 (microfilm only)
Jan Mayen, Norway, 1932–1933 (prints and microfilm) 36
Julianehaab (Qaqortoq), Greenland, 1932–1934 (prints and microfilm) 37
Kajaani, Finland, 1932–1935 (microfilm only)
Kandalaksha, the USSR, 1932–1933 (prints and microfilm) 38
Lerwick, the UK, 1932–1933 (prints and microfilm) 39
Lövö, Sweden, 1932–1933 (prints and microfilm) 40
,Lycksele, Sweden 1932–1934 (microfilm only)
Matochkin Shar, the USSR, 1932–1933 (prints and microfilm) 41
Meanook, Canada, 1932–1933 (prints and microfilm) 42
Mogadiscio (Mogadishu), Italian Somaliland, 1932–1933 (prints and microfilm) 43
Nantes, France, 1932–1933 (microfilm only)
Orcades du Sud (South Orkney Islands), 1932–1933 (microfilm only)
Pays François Joseph (Franz Josef Land), the USSR, 1932–1933 (prints and microfilm) 44
Petsamö, Finland (now Pechengsky, Russia), 1932–1933 (prints and microfilm) 45
Reykjavik, Iceland, 1932–1933 (microfilm only)
Rude Skov (Copenhagen), Denmark, 1932–1934 (prints and microfilm) 46
San Miguel (Azores), Portugal, 1932–1933 (prints and microfilm) 47
Scoresbysund (Ittoqqortoormiit), Greenland, 1932–1933 (prints and microfilm) 48
Sitka, the USA, 1932–1933 (prints and microfilm) 49
Slutsk, the USSR, 1932–1936 (prints and microfilm) 50
Sodankylä, Finland, 1932–1936 (prints and microfilm) 51
Sveagruvan (Svalbard), Norway, 1932–1933 (prints and microfilm) 52
Tananarive (Antananarivo) Madagascar, 1932–1934 (microfilm only)
Teoloyucan, Mexico, 1932–1933 (microfilm only)
Thule, Greenland, 1932–1933 (prints and microfilm) 53
Toolangi, Australia, 1932–1933 (prints and microfilm) 54
Tromsø, Norway, 1932–1933 (prints and microfilm) 55
Unidentified Location, 1932–1933 (prints and microfilm) 56
Val-Joyeux, France, 1932–1933 (prints and microfilm) 57
Vuotso, Finland, 1935–1936 (microfilm only) 58

References

Anon. (Anonymous) 1914: International Meteorological Observations in the Arctic *Monthly Weather Review* 42(3): 181–182.

Anon. (Anonymous). 1982: An Interview with Dr F.W.G. Baker, Executive Secretary of ICSU. *WMO Bulletin* 31:187–196.

Appleton, E.V. 1932: *Letter to B.D. La Cour. 7 August 1932*. Copenhagen: Danish National Archive (Meteorologisk Institut Polarkommissionen box 4, letter 24).

Appleton, E.V. 1934: Radio Exploration of the Ionosphere. *nature* 133(3369): 793.

Appleton, E.V. 1947: The Ionosphere. Nobel Lecture, December 12, 1947. In: S. Lindqvist (ed) 1992. *Nobel Lectures in Physics 1910–1971*, pp 79–86. Stockholm: World Scientific Publishing Company.

Appleton, E.V., R. Naismith, and L.J. Ingram 1937: British Radio Observations During the Second International Polar Year 1932–1933. *Philosophical Transactions of the Royal Society* Series A 236(764): 191–259.

Bacon, F. 1627: *The New Atlantis*. 1905 Issue in *the Essays or Counsels Civil and Moral and the New Atlantis of Francis Lord Verulam* (*The English works of Francis Bacon*, vol. 1). London: Methuen (Methuen's Standard Library).

Baker, F.W.G. 1982: The First International Polar Year, 1882–1883. *Polar Record* 21(132): 275–285.

Baker, M. 1982: A Century of International Interdisciplinary Co-operation. *Interdisciplinary Science Reviews* 7(4): 270–282.

Barr, S. 2003: *Norway – A Consistent Polar Nation? Analysis of an Image Seen Through the History of the Norwegian Polar Institute.* Oslo: 2nd edition published by Fram Museum.

Bartels, J. 1932: Terrestrial-Magnetic Activity and its Relation to Solar Activity. *Geophysical Research* 37:1–52.

Bartels, J. 1942: Dan La Cour (Obituary). *Die Naturwissenschaften*, Jahrgang 30, Heft 43 (Oktober): 649–650.

Berkner, L.V., and H.W. Wells 1934: Report on the ionospheric investigations at the Huancayo magnetic observatory (Peru) during 1933. *Proceedings of the Institute of Radio Engineers* 22:1102–1123.

Birkeland, Kr 1908: *The Norwegian Aurora Polaris Expedition 1902–1903.* Vol I, *On the Cause of Magnetic Storms and the Origin of Terrestrial Magnetism.* Christiania: H. Aschehoug & Co.

Birkeland, B.J 1930: Temperaturvariationen auf Spitsbergen, *Meteorologische Zeitschrift* (Juni): 234–236.

Breit, G., and M.A. Tuve 1926: A Test of the Existence of a Conducting Layer. *Physical Review* 28:554.

Buijs, G., and P. van Zuylen 2008: *Jaap van Zuylen. A Dutchman in east Greenland 1932–1934*. Leiden: Digital Publications of the National Museum of Ethnology (URL: www.rmv.nl).

Cannegieter, H.G. 1963: *The History of the International Meteorological Organization 1872–1951, Annalen der Meteorologie, Nue Folge* 1.

Chamberlin, T.C. 1897: The Method of Multiple Working Hypotheses. *Journal of Geology* 5:837–848. (Reprinted 1931 in the *Journal of Geology* 39:155–165).

Chapman, S. 1930: A Theory of Upper Atmospheric Ozone. *Memoirs of the Royal Meteorological Society* 33(26):106–125.

Chapman, S., and V.C.A. Ferraro 1931: A New Theory of Magnetic Storms Part I. *Terrestrial Magnetism and Atmospheric Electricity* 36:171–186.

Chapman, S., and V.C.A. Ferraro 1933: A New Theory of Magnetic Storms. Part II *Terrestrial Magnetism and Atmospheric Electricity* 38:81–96.

Chapman, S. 1933: The Effects of a Solar Eclipse on the Earth's Magnetic Field. *Terrestrial Magnetism and Atmospheric Electricity* 38:175–183.

Chapman, S. 1934: Radio Exploration of the Ionosphere. *nature* 133(3372): 908.

Chapman, S. 1935: A Mechanical-Optical Method of Reduction of Pairs of Aurora Plates. *Terrestrial Magnetism and Atmospheric Electricity* 39:299–303.

Close, C., M.E. De Margerie, S. Chapman, G. Walker, H.R. Hill, J.K. Davis, D. Brunt, W. Goodenough, L.C.W. Bonacina, and G.C. Simpson 1929: Meteorology of the Polar Regions: Discussion. *The Geographical Journal* 74(3): 263–270.

Corby, G.A 1982: The First International Polar Year 1882/1883. *WMO Bulletin* 31:197–222.

Crewe, M.E 2002: *Meteorology and Aerial Navigation*. London: Royal Meteorological Society (Occasional Papers on meteorological history no. 4).

Daniel, H. 1973: *One Hundred Years of International Co-Operation in Meteorology*. Geneva: WMO (Report no. 345).

Davis, W.M. 1926: The Value of Outrageous Geological Hypotheses. *Science*, New series 63(1636): 463–468.

DMI (Danish Meteorological Institute) 1972: *Meteorologisk Institut gennem hundrede år 1872–1972*. Copenhagen: Danish Meteorological Institute.

Edwards, P.N. 2004: Beyond the Ivory Tower: "A Vast Machine": Standards as Social Technology. *Science* 304(5672): 827–828.

Edwards, P.N. 2006: Science, Technology, and Globalization. Meteorology as Infrastructural Globalism. *Osiris* 21:229–250.

Egedal, J. 1934: On the Propagation of Magnetic Storms. *Terrestrial Magnetism and Atmospheric Electricity* 39:321–323.

Ellsworth, L., and E.H. Smith 1932: Report of the Preliminary Results of the Aeroarctic Expedition with "Graf Zeppelin", 1931. *Geographical Review* 22(1): 61–82.

Fleming, J.A., and V. Laursen 1949: International Polar Year 1932–1933. Temporary Commission on Liquidation of Polar Year 1932–1933. *Science* 11(2856): 308–309.

Friedman, R.M. 1982: Constituting the Polar Front 1919–1920. *ISIS* 73(2): 343–362.

Friedman, R.M. 2004: Nansenism, In: *Norsk Polarhistorie*. Oslo: Gyldendal Norsk Forlag AS, 2 *(Vitenskapene)*: 107–174.

Geofysiske Kommission 1920: *Various Papers on the Projected Cooperation with Roald Amundsen's North Polar Expedition*. Kristiania. Oslo: Grondahl & Sons.

Gilmor, S. 1981: Wilhelm Alter, Edward Appelton, and the Magneto-Ionic Theory *Proceedings of the American Philosophical Society* 126(5): 395–440.

Gold, E. 1920: Aerial Navigation and Meteorology. *nature* 105:775–776 (19 August 1920).

Greenaway, F. 1996: *Science International. A History of the Council of Scientific Unions*. Cambridge: Cambridge University Press.

Hacquebord, L. 1995: *Nederlandse poolkringen. Hondertvijftig jaar Nederlands onderzoek in poolgebieden*. Groningen: Inaguerell rede Rijksuniversiteit Groningen.

Hall, C.M., and T.L. Hansen 2003:20th Century Operation of Tromsø iosonde. *Advances in Polar Upper Atmosphere Research* 17:155–166.

ICSU 1959: *Annals of the International Geophysical Year*. Vol. 1, London and New York: Pergamon Press.

International Polar Commission 1913: *Session of 1913*. In: G. LaCointe (ed) Brussels: Royal Academy of Sciences.

Kirby, S., L.V. Berkner, T. Gilliland, and K. Norton 1934: Radio Observations of the Bureau of Standards during the Solar Eclipse of Aug. 31, 1932. *Proceedings of the Institute of Radio Engineers* 22:247–264.

Korotkevich, E.S. 1982: The Polar Regions in World Geophysical Programmes. *WMO Bulletin* 31:231–234.

Kragh, H. 2009: The Spectrum of the Aurora Borealis: From Enigma to Laboratory Science, *Historical Studies in the Natural Sciences* 39(4): 377–417.

La Cour, D.B., and V. Laursen 1930: *Le variomètre de Copenhague*. Copenhagen: Danish Meteorological Institute (communication magnetiques no. 11).

La Cour, D.B. 1933a: Letter to J.A. Fleming (Carnegie Institution of Washington). 22 November 1933. Copenhagen: Danish National Archive (Meteorologisk Institut Polarkommissionen box 17, letter 2565).

La Cour, D.B. 1933b: Letter to Sir H. Lyons (Secretary General of the International Council of Scientific Unions). 29 December 1933. Copenhagen: Danish National Archive (Meteorologisk Institut Polarkommissionen box 17, letter 2582).

La Cour, D.B. 1934a: Letter to J. Valenzuela (Director of the Meteorological Office in Chile) 8 January 1934. Copenhagen: Danish National Archive (Meteorologisk Institut Polarkommissionen box 17, letter 2592).

La Cour, D.B. 1934b: Letter to Adolf Schmidt. 4 January 1934. Copenhagen: Danish National Archive (Meteorologisk Institut Polarkommissionen box 17, letter 2589).

La Cour, D.B. 1934c: Letter to W.E. Tisdale (Rockefeller Foundation). July 13 1934. Copenhagen: Danish National Archive (Meteorologisk Institut Polarkommissionen box 17, letter 2696).

Laktionov, A.1960: *Nordpolen. ur polarfärdernas historia*. Moskva: Förlaget för främmande språk.

Lauridsen, E.K., and N. Abrahamsen. 1998: The History of Astatic Magnet Systems and Suspensions. *Centaurus* 40(2): 135–169.

Laursen, V. 1932: Det internationale polaraar 1932–33. *Geografisk Tidskrift* 35:22–35.

Laursen, V. 1951: *Bibliography for the Second International Polar Year 1932–1933*. Copenhagen: Horsholm Bogtrykkeri.

Laursen, V. 1982: The Second International Polar Year (1932/33). *WMO Bulletin* 31:214–231.

Lynch, P. 2008: The Origins of Computer Weather Prediction and Climate Modelling, *Journal of Computational Physics* 227:3431–3444.

Lüdecke, C. 1995: *Die deutsche Polarforschung seit der Jahrhundertwende und der Einfluß Erich von Drygalskis*. PhD thesis, *Berichte zur Polarforschung* (Bremerhaven) 158, 340 pp.

Lüdecke, C. 2008: From the Bottom to the Stratosphere. Arctic Climate Features Seen from the First International Polar Year (1882–1883) until the end of World War II. In: S. Brönnimann, J. Luterbacher, T. Ewen, H.F. Diaz, R.S. Stolarski, and U. Neu (eds) *Climate Variability During the Past 100 Years,* pp 29–45. Berlin: Springer.

Marrs, H.B. 1932: Seasonal Variations in Magnetic Storms. *Physical Review* 39:504–514.

Noble, D. 2003: The Universality of Science: What Are Its Limits?, *IUPS Newsletter,* 8(April): 2–9.

Olsson, H. 1933: *Med svenskarna på Spitsbergen under polaråret 1932–1933*. Stockholm: Åhlén and Söner Förlag.

Seidenfaden, G. 1938: *Modern Arktisk forskning*. Stockholm: Åhlén and Söner förlag.

Simpson, G.C. 1929: Meteorology of the Polar Regions. *The Geographical Journal* 74(3): 258–262.

Shaw, N. 1924: World Weather: A Review. *Geographical Review* 14(3): 416–425.

Sorge, E. 1933: The Scientific Results of the Wegener Expedition to Greenland. *The Geographical Journal* 81(4): 333–344.

Stauning, P. 2002: *High Precision Magnetometers.* Copenhagen: Danish Meteorological Institute.

Stauning, P., and S. Henriksen. 2008: *Nordlysets maler. Harald Moltkes malerier på Meteorologisk Institut.* Copenhagen: Danish Meteorological Institute (technical report 08–08).

Summerhayes, C.P. 2008: International Collaboration in Antarctica: The International Polar Years, the International Geophysical Year, and the Scientific Committee on Antarctic Research. *Polar Record* 44(231): 321–334.

Sverdrup, H.U. 1922: Meteorology on Captain Amundsen's present Arctic expedition, *Monthly Weather Review* 50 (2): 74–75.

Svedrup, H.U. 1926: Scientific Work of the "Maud" Expedition, 1922–1925. *Smithsonian Report for 1926*, pp 219–233.

Sverdrup, H.U. 1933: *General Report of the Expedition. The Norwegian North Polar Expedition with the "Maud" 1918–1925, Scientific Results*. Vol. II, 331 pp Meteorology, Part I, Discussion, Geofysisk Institutt.

Tinbergen, N. 1934: *Eskimoland*. Rotterdam: D. van Sijn and Zonen.

Tollner, H., R. Kanitschreiber, and F. Kopf 1934: *Vierzehn Monate in der Arktis*. Wien-Innsbruch-München: Verlagsanstalt Tirolia.

Vestine, E.H. 1934: Noctiluscent Clouds. *Journal of the Royal Astronomical Society of Canada* 28:249–272, 303–317.

Chapter 9
Origins of the International Geophysical Year

Rip Bulkeley

The International Geophysical Year (IGY, now often referred to as IPY-3) was suggested as a Third Polar Year on the evening of Wednesday, 5 April 1950, at 1105 Meurilee Lane, Silver Spring, Maryland, USA (Fig. 9.1). (In 1946 the Geological Society of South Africa had put a similar proposal before the British Polar Committee, which turned it down.) The occasion was an informal dinner party at the home of upper atmosphere physicist James (1914–2006) and mathematician Abigail Halsey (1922–) Van Allen, and their guests were Sydney Chapman (1888–1970, visiting from Britain), Merle Tuve (1901–1982), Lloyd Berkner (1905–1967), Harry Vestine (1906–1968), Wallace Joyce (1907–1970) and Fred Singer (1924–).[1] All except Tuve, Vestine and Abigail Van Allen were working directly or indirectly for the US government at the time.

For some years Berkner claimed and was credited with the original suggestion. Later Chapman and Abigail Van Allen said they had also taken some part in it. It is not hard to imagine a conversation to which all three contributed, but that each would remember differently.

The founders of the IGY have cited only its scientific merits, perhaps out of an ideological commitment to the purity of basic science. But that aspect would have been just as attractive two years earlier or five years later.

Several factors probably influenced that historic after-dinner conversation. In the background, the return of peace to most advanced industrial societies was bringing about a revival of civilian technological optimism, as expressed by major trade fairs in several countries, by the Stockholm World's Fair of 1949, and by plans for the forthcoming Festival of Britain. In August 1948, in keeping with this mood, James Van Allen sent a proposal to the Assembly of the International Union of Geodesy and Geophysics in Oslo which daringly suggested the use of artificial earth satellites for scientific purposes.[2] At the same time, the shadow of a new global conflict,

---

R. Bulkeley (✉)
Exeter College, Oxford, UK
e-mail: rip@igy50.net

[1] The presence of Tuve, long suspected by the present author, has only recently been confirmed with resonable certainty (Van Allen, 1983).

[2] Van Allen (1950).

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_9,

Fig. 9.1 1105 Meurilee Lane in 2007, with a maple tree planted by James Van Allen © Rip Bulkeley

the Cold War, was growing. Its most dangerous episode so far, the 15-month-long Berlin Airlift, had ended only six months earlier. To support their armed forces in the Second World War, the Western allies had created extensive global forecasting networks for weather, tides, ocean currents and the vital radio communications which were governed by the state of the ionosphere (layers of charged particles in the upper atmosphere). Those networks would now be extended and improved for the Cold War.

Three recent or current developments closely concerned people at the dinner party. First, the Carnegie Institute of Washington's Department of Terrestrial Magnetism, at which five of them either were or had in the past been based, was currently playing a leading role in winding up the Second Polar Year of 1932–1933 (see Chap. 8). The notice announcing this arrangement had appeared in *Science*, one of the house journals of the American scientific community, a few months earlier.[3]

Second, the US Department of State, for which Berkner and Joyce had been working on a special consultative project for over a year,[4] had recently been trying to resolve the unsatisfactory political situation in Antarctica. Early in 1948 it began to canvass the idea of setting up some form of collective sovereignty over the polar continent, shared between the United States and the seven countries with existing territorial claims. This was intended to replace all national claims, some of which were in conflict with each other. None were recognized by the United States, which regarded itself as entitled to register its own claim or claims in the future, based on

---

[3] Fleming J.A. and Laursen, V. (1949:308–309).

[4] For all phases of Berkner's career referred to here, see: Needell (2000).

expeditions that had visited some of the areas claimed by others. In spite of negative responses to the first American approach from all the seven claimant countries, the Department of State renewed its proposal formally in August 1948.

Meanwhile, in July 1948, dismayed by those initial rejections, the Department of State commissioned a study by the National Academy of Sciences on "the nature and scope of scientific operations that are feasible in the Antarctic region", with explicit emphasis on international scientific cooperation.[5] An Academy committee, in which Berkner played a leading part, held meetings in July and September and sent in a formal, positively framed report in May 1949.

Also in July 1948, a Department of State official visited Santiago de Chile to discuss his government's new plan for Antarctica. As their meetings were drawing to a close the Chilean representative, Dr Julio Escudero Guzmán (1903–1984), handed his opposite number an unexpected counter-proposal. Instead of taking a diplomatic, legalistic approach to the problem of Antarctic rivalries, the Chilean government suggested there should first be a five-year period of jointly planned scientific cooperation in the region, during which all political action over territorial issues would be suspended.

Without abandoning their condominium policy, the Department of State gave the idea of a science-focussed political standstill in Antarctica a very positive reception. As they explored it with the claimant nations in the late 1940s and early 1950s, it turned out to be the only option that everyone could accept. That sufficed to keep it on the table while preparations for the IGY began. However, a renewal of low-level conflict frustrated diplomatic efforts during 1953. So when planning for the Antarctic portion of the IGY got under way in 1955, the meetings were either attended or closely monitored and supported by diplomats familiar with the Chilean idea. Although it is sometimes said that Escudero's proposal was superseded by the IGY, a more informed view might be that it was implemented by the IGY with help from government officials who knew exactly what they were doing.

A third consideration that probably influenced people at the Van Allens' dinner party was the current state of military-sponsored geophysics in the United States. For upper atmosphere physics and planetary geophysics in general, financial support from military agencies like the Office of Naval Research was essential. In turn, the Department of Defense had created an extensive structure for consulting civilian scientists, based on the Research and Development Board (RDB) whose first Executive Secretary, from 1946 to 1947, had been Lloyd Berkner. By the time of the dinner party, RDB committees were on record as to the vital importance for military operations, including the future deployment of ballistic missiles, of further geophysical research in many fields. They also stressed that this could only be achieved (a) in peacetime, and (b) through programmes of international scientific cooperation. However President Truman's drive for military budget reductions was now creating uncertainty for scientists working in such areas, including James Van Allen. The

---

[5] R. A. Lovett, Under Secretary of State, letter to A. N. Richards, president of the National Academy of Science, 9 July 1948: Archives of the National Academies of Science.

outbreak of the Korean War in June 1950 would begin to improve the fortunes of para-military geophysics, but back in April that could not have been predicted.

The proposal for a Third Polar Year also reflected changes in the intellectual and institutional structures of geophysics. On the intellectual side, scientists studying the upper atmosphere and solar-terrestrial interactions now thought of themselves as a new discipline, or group of disciplines, independent of established fields like meteorology. On the organizational side, the post-war geopolitical situation meant that the balance of leadership in geophysics was shifting away from Europe and towards the United States. The central axes of the first two Polar Years were European and meteorological; the axis of the IGY was solar-terrestrial and American, even down to its alignment with the US fiscal year.

During the next few months the Van Allens' dinner guests were able to spread the idea of a Third Polar Year at four important meetings. It was discussed in May 1950 at a secret review of upper atmosphere research at the US Navy's Inyokern testing range in California. In June it was probably mooted when Van Allen chaired and Chapman attended the Upper Atmosphere Rocket Research Panel in Boulder, Colorado. In July Berkner, Chapman and Vestine led further discussions at an international conference on ionospheric physics at Pennsylvania State College. From that meeting Berkner took the idea to the sessions of the Mixed Commission on the Ionosphere (MCI) at Brussels in September. The MCI, on which the international scientific unions for astronomy, geophysics and radio science were all represented, adopted the proposal, and from that point it was virtually unstoppable.

References

Archives of the National Academies of Science, Central Policy Files, 1946–1949, Committee on Antarctic Research: 1949; 1948/: R.A. Lovett, Under Secretary of State, letter to A. N. Richards, president of the National Academy of Science, 9 July 1948.

Fleming, J.A., and V. Laursen 1949: International Polar Year of 1932–1933. *Science* 110: 308–309.

Needell, A.A. 2000: *Science, Cold War and the American State: Lloyd V. Berkner and the Balance of Professional Ideals*. Washington, DC: Smithsonian Institution.

Van Allen, J.A. 1950: The Use of Rockets in Upper Atmospheric Research, in Transactions of Oslo Meeting, August 27–28, 1948. *IATME Bulletin* 13:531–536.

Van Allen J.A. 1983: Genesis of the International Geophysical Year. *EOS* 64: 977.

Chapter 10
The IPY-3: The International Geophysical Year (1957–1958)

Klaus Dodds, Irina Gan, Adrian Howkins

10.1 Geopolitics of the International Geophysical Year (1957–1958): The Case of Antarctica

Klaus Dodds

The International Geophysical Year (IGY) of 1957–1958 was an extraordinary achievement in the midst of the Cold War. Thousands of scientists from 65 countries were engaged in international collaboration for the purpose of expanding knowledge about the earth and outer space.[1] The United States and the Soviet Union, despite crises in Berlin, Hungary and Korea alongside mounting anxiety about atomic weapons testing, were nonetheless willing and able to contribute to a programme of research, which encapsulated inter alia the remote Antarctic continent.[2] While science and its associated practices of investigation and knowledge creation unquestionably enabled international co-operation, it would be wrong to conclude that the IGY was untouched by the prevailing Cold War zeitgeist. The US military and national security institutions such as the Pentagon and the Central Intelligence Agency were deeply interested and involved in providing resources, influencing research programmes and encouraging political leaders like President Eisenhower to conceive of scientific endeavour in terms of national prestige and geopolitical advantage.[3] The Antarctic and of course the Arctic were major recipients of the apparent largesse of the military–industrial–academic complex.[4]

The Antarctic was one of the more troublesome locations for a programme of global research that had been first discussed in April 1950.[5] While scientists such

---

K. Dodds (✉)
Politics and Environment Research Group, Royal Holloway, University of London, UK
e-mail: k.dodds@rhul.ac.uk

[1] Chapman (1959), Sullivan (1961), Wilson (1961).

[2] Beck (2010).

[3] Collis and Dodds (2008).

[4] Doel (2003) and Powell (2008).

[5] Korsmo (2007).

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_10,

as James Van Allen and Sydney Chapman needed no persuading as to the intrinsic academic value of the IGY (as it was later to be called – see Chap. 9), the polar continent and the Southern Ocean were embroiled in a series of territorial disputes and tensions, which threatened to plunge the Antarctic into its own "cold war". The worst affected part of the region was the Antarctic Peninsula with ongoing disputes between Argentina, Britain and Chile over ownership.[6] All three countries claimed the Peninsula and islands such as Deception and each had invested greatly in mapping, surveying and occupying this contested space. In 1948, an agreement was signed between the parties limiting the movements of naval vessels south of 60° S in an attempt to de-escalate the tension between the three states. In the context of Anglo-Argentine relations, the so-called Antarctic Problem was made worse by the fact that the Falkland Islands and South Georgia were also subject to legal dispute. Elsewhere, the United States, as the largest operator in the Antarctic via its naval personnel, had declared that it did not recognize the existing territorial claims made by Argentina, Australia, Chile, France, Norway, New Zealand and its closest Cold War ally, Britain. Successive American administrations reserved the right to press their own claim to the continent in the future, as did the Soviet Union also.

Territorial claims were only one element in the contested geopolitics of the Antarctic. Post-1945, speculation was becoming increasingly rife that the polar continent might be the source of strategic minerals such as uranium, coal and iron ore. In a nuclear age, the apparent promise of large supplies of uranium was exciting much interest in governments and media organizations around the world. Journalists in the northern and southern hemispheres wrote feverishly about the hidden potential of the Antarctic and speculated about the motives of the varied parties.[7] Cold War tensions merely added further impetus to this speculation and Australian journalists in particular were concerned that the Soviets might use the IGY as an excuse to create secret missile stations and submarine bases in Australian Antarctic Territory.[8] Much of this febrile reporting was reminiscent of earlier concerns about the intent and purpose of Nazi German interest in the Antarctic in the late 1930s and associated fantasies about secret bases and sinister plotting. The Antarctic's very size and poorly mapped topography allowed such fears to flourish and unquestionably influenced popular conceptions of the continent as mysterious, exciting and even a little disturbing.

Notwithstanding those pressures, co-operation and goodwill were never entirely absent from the Antarctic. Anglo-Argentine–Chilean relations in the Antarctic itself were often cordial in comparison to the diplomatic exchanges originating from London, Buenos Aires and Santiago, respectively.[9] Scientists had shown they could collaborate with one another and the Norwegian–British–Swedish expedition (NBS,

---

[6] Dodds (2002).

[7] Beck (1986).

[8] Beck (2010) and Dodds (1997).

[9] Howkins (2008).

1949–1951) was particularly significant in this regard.[10] The NBS carried out significant research with regard to sub-glacial Antarctica and helped pioneer the use of seismic techniques for the purpose of profiling the polar ice sheet. Five years later, the Trans Antarctic Expedition involving Britain, New Zealand, Australia and South Africa also demonstrated that it was possible to work with one another in the region, albeit in a context where good relations already prevailed.[11]

10.1.1 The IGY Antarctic Conference, Paris, 1955

The IGY was prepared in a series of international meetings between 1950 and 1957. One important milestone was the first IGY Antarctic Conference in July 1955 in Paris. This meeting achieved a number of distinct objectives. First, it agreed upon a plan on research station location, with the Soviets agreeing to establish a base at the Pole of Inaccessibility and the South Geometric Pole and the Americans to build one at the South Pole. The British delegation committed their resources to creating a new station at Halley Bay. This agreement was significant because it meant that there was overall agreement among the 12 parties working in the Antarctic for the duration of the IGY. The claimant states all, however, continued to locate their research activities within their respective territories. Second, freedom of scientific investigation was, on the basis of the first point, respected precisely because the Americans and Soviets were able to locate their IGY bases throughout the Antarctic.[12] For both superpowers, it reiterated their long-standing rejection of existing territorial claims and their determination to reserve their rights in the aftermath of the IGY.[13] Third, and again closely related to the earlier points, the claimant states were also given some guarantees that their territorial claims would remain unaffected by the IGY and the associated freedom of others to conduct research throughout the Antarctic region.

The understandings reached in Paris were, however, also regarded with some suspicion by claimant states. Argentina and Chile were most concerned about their rights as territorial claimants in the Antarctic Peninsula and remained disturbed by the proposed American IGY scientific programme and its extensiveness. Australia was deeply preoccupied with the Soviet planned research projects and their decision to create those bases in the Australian Antarctic Territory. They even tried to persuade the American administration to register their formal concerns with the Soviets about their intentions and whether those bases would remain occupied and functional in the aftermath of the IGY. While the claimant states, including Britain, would eventually agree to co-operate with potential adversaries for a special period of international scientific co-operation, they were less clear about the period directly

---

[10] Naylor et al. (2008).

[11] Dodds (2008).

[12] Collis and Stevens (2007).

[13] Toma (1956).

following the ending of the IGY. In essence, the Paris meeting and its successors enabled the IGY planning to proceed, but it could not resolve the underlying tensions in Antarctica over territorial claims and possible resource exploitation. For the moment all 12 parties would simply have to put to one side their concerns and enter into the public spirit of the IGY – an apolitical venture designed to increase human knowledge about the Antarctic, outer space and other geographical regions such as the ocean floors.

10.1.2 The IGY and Antarctica

Despite the fears of Australians and Argentines about the intentions of others, the Antarctic dimension of the IGY passed off without conflict. Some remarkable achievements were recorded and included the traverses carried out by the American programme across the Antarctic ice sheet. In January 1957, Charles Bentley and colleagues set out from Little America Station and travelled over Marie Byrd Land towards their ultimate destination of Byrd Station. Bentley was one of the principal contributors to knowledge about ice thickness and the sub-glacial characteristics of Antarctica. Working in conjunction with British, French and Soviet counterparts, his endeavours helped to create a whole new series of maps of the Antarctic.[14] At Halley Bay, the British engaged in an intensive programme of radio astronomy and research into southern aurora. Appropriately enough, the British party had to take down the Union Jack flag because it interfered with scientific readings being taken from the roof of the research station.

During the IGY two competing visions of the Antarctic co-existed uneasily. On the one hand, the polar continent was a geopolitically divided space filled with territorial and counter-territorial claims. On the other hand, the knowledge created by the IGY emphasized a geophysical view of the Antarctic, which inevitably focused on how systems and processes were inter-connected with one another. The Antarctic ice sheet, for instance, clearly demanded a holistic view and not one artificially divided into Australian, British, Norwegian and Argentine sectors. The challenge for the 12 IGY parties was abundantly clear – how to reconcile those geopolitical and geophysical representations of the Antarctic?

10.1.3 The Road to Washington

The answer to that predicament was to be supplied at a conference hosted by the American government in October 1959.[15] After a series of preparatory meetings during and after the IGY, the 12 parties came to Washington DC in order to reconcile science and geopolitics with one another. It took six weeks of intense negotiations,

---

[14] Dodds (2010) and Naylor et al. (2008).

[15] Dodds (2008).

notwithstanding a hatful of preliminary meetings in 1958–1959. The outcome was the Antarctic Treaty, which was signed on 1 December 1959 and, notwithstanding some resistance within the domestic arenas Argentina and Chile, eventually entered into force in July 1961. In essence, the signatories committed themselves to international scientific co-operation and to pursue peaceful activities – the IGY in Antarctica had shown, at the very least, that it was not a chimera (see Chap. 11, Berguño). The Antarctic became the world's first nuclear-free zone and military activities were banned in the region. The claimant states agreed that their claims would be effectively suspended for the duration of the Treaty.[16] The contested geopolitics of the polar continent was not resolved, but it was settled in a manner that prevented further outbreaks of tension and possible violence. No mean achievement in the midst of the Cold War.[17]

10.2 Argentina and Chile

Adrian Howkins

Argentina and Chile approached the Antarctic section of the International Geophysical Year (IGY) with political considerations at the forefront of their thinking. Both countries made territorial claims to the Peninsula region of Antarctic, and since the late 1930s they had been involved in an active sovereignty dispute with Great Britain.[18] The governments in Buenos Aires and Santiago worried that the IGY's freedom of scientific investigation would undermine their claims to exclusive political sovereignty. They also feared that they might fall behind their rivals as scientific research increasingly became the main currency of Antarctic politics. In common with the other "Western" powers involved in Antarctica, Argentina and Chile were suspicious of Soviet intentions, believing that they might establish permanent military bases in the southern continent, in close proximity to the southern tip of South America. As a result of these various apprehensions, Argentina and Chile approached the IGY with less enthusiasm than some of the other participants. And yet, despite their somewhat reluctant collaboration, both South American countries conducted research programmes that contributed substantially to the scientific work of the IGY.

At the IGY Antarctic Planning meeting in Paris in July 1955, representatives from Argentina and Chile successfully argued in favour of a "Gentleman's

---

A. Howkins (✉)
Colorado State University, USA
e-mail: Adrian.Howkins@colostate.edu

[16] Rothwell (2010).

[17] Beck (1986).

[18] Dodds (2002).

Agreement" in which the participants agreed that the scientific work of the IGY would in no way affect the question of sovereignty in Antarctica.[19] This agreement offered some insurance against the possibility that "scientific freedom" would be used to erode Argentine and Chilean territorial claims. The two South American countries opposed the location of any new foreign bases in the sectors that they claimed as their own. Argentina in particular argued that the location of British and North American bases on the coast of the Weddell Sea in close proximity to its Base Belgrano was unnecessary, and would merely replicate the scientific research already being conducted. In this particular argument Argentina was unsuccessful: both Britain and the United States constructed bases in the Weddell Sea region. But in general the two South American countries managed to keep foreign countries out of the Peninsula region, and they were particularly relieved that the Soviet Union did not establish any bases there. In terms of their own IGY Antarctica programmes, Argentina and Chile limited themselves almost exclusively to research within their own Antarctic claims.

Domestic political considerations, as much as international politics, shaped the actual scientific contributions of Argentina and Chile to the IGY. In Argentina, the overthrow of President Perón in September 1955 threw the country's Antarctic programme into chaos on the eve of the IGY. Under President Perón, Argentina had become the world's leading Antarctic power in the first half of the 1950s.[20] The purchase of an icebreaker, the *San Martín*, and the construction of *Base Belgrano* on the coast of the Weddell Sea attested to Perón's ambition to "saturate" Antarctica with Argentine bases. The military coup that toppled Perón destroyed Argentina's leading position. At Base Belgrano, Hernán Pujato (1904–2003), Perón's right-hand man in Antarctic policy, survived for a short while as a curious vestige of Peronism. But the new military government refused to supply him with the materials necessary to continue his scientific investigations.[21]

All eight of Argentina's permanent stations participated in some way in the IGY research, as did several research ships and temporary scientific bases.[22] Research was conducted in all ten areas of the IGY's Antarctic programme: meteorology, geomagnetism, the aurora, the ionosphere, glaciology, seismology, oceanography, tides, gravity and biology. Under the new leadership of Panzarini, the Antarctic Institute represented Argentina in IGY planning conferences and participated in the formation of SCAR.[23] Between 1955 and 1959 the Argentine Antarctic Institute published 47 scientific "contributions".[24] The Argentine scientific effort culminated in 1959 when a geophysical congress was held in Buenos Aires. The world's leading geophysicists, many of them on their way home from Antarctica, met in the

---

[19] Pinochet de la Barra (1994).

[20] Genest (1998).

[21] Rigoz (2002).

[22] Instituto Antártico Argentino (1960).

[23] Comerci (1979).

[24] Dirección Nacional del Antártico (1983).

Argentine capital to discuss the early results of the IGY.[25] Argentina continued to play a significant role in Antarctic science, although it no longer occupied the leading position.

In relative terms, Chile was the poorest country that participated in the Antarctic section of the IGY. Politicians and officials in Santiago realized that they did not have the money to compete scientifically with their territorial rivals in Antarctica, and some questioned participation in a "race for bases" that Chile could not win. In May 1955, the Chilean Antarctic Commission debated whether Chile should even participate in the IGY at all.[26] The fact that the country did decide to participate had much to do with the strength of geopolitical feeling in the country. Led by General Ramón Cañas Montalva (1896–1962), geopolitical theorists argued that the retention of Chilean sovereignty in Antarctica was imperative for the country's survival. Chilean sovereignty, they considered, was best protected by participating in the IGY, rather than remaining on the outside. The Chilean government appointed General Cañas to be president of Chile's IGY Planning Committee. Chilean IGY research therefore took place in the wider context of what Cañas like to call the "New Science of Geopolitics".

Chile's contribution to the IGY was very similar to that of Argentina: auroral observations with an "all sky camera", meteorology reports sent to the Weather Central, glaciology, oceanography, gravitational studies, seismology and participation in the various "World Days".[27] Just like Argentina and all the other claimant nations, the Chileans did not conduct any significant research outside the region they claimed for themselves. Despite the geopolitical context in which the scientific work took place, it was generally carried out by scientists with more traditionally "scientific" agendas. The Chileans even constructed a new base, especially for scientific research, which they named Base Risopatrón, after one of the originators of the idea of an "American Antarctic". Unfortunately for the Chilean IGY programme, this base burned down in March 1958, severely hampering Chilean scientific efforts. Just as Escudero and others had feared, the Chilean contribution to the IGY was, in relative terms, much less than most of the other countries with political interests in the region. In the new era of Big Science in Antarctica, the Chileans were being forced to compete on a playing field that was far from level.

The participation of Argentina and Chile in the IGY helped to legitimize this research endeavour as a genuinely international project. The goodwill of the IGY in turn helped to lay the foundations for the signing of the Antarctic Treaty less than a year after the end of the IGY. If the two South American countries had remained on the outside of the IGY and hostile to its activities, it is likely that the scientific results of the project would have been compromised, and the goodwill less pronounced. As it was, Argentine and Chilean participation in the IGY brought the two countries

---

[25] Pyne (2003:345).

[26] Comisión Antártica Chilena (1955).

[27] *Hydrographical Bulletin* 1957–1963 contains full details of the Chilean contribution.

onto the inside of the growing international Antarctic community, and in so doing they collaborated in the successful creation of the Antarctic Treaty System.

10.3 Assault on the Interior – Establishing the IGY Soviet Antarctic Inner-Continental Stations

Irina Gan

10.3.1 Introduction

By the time the Soviet Union expressed its intention to participate in the International Geophysical Year (IGY) in 1954, it had already unambiguously outlined its historic, economic and political interest in the South Polar Region. When the United States had previously proposed an international condominium for the Antarctic which excluded the USSR, the latter had countered by issuing a Memorandum which stated that "the Soviet Government cannot recognize as lawful any decision on the Antarctic regime taken without its participation".[28] The scope of the IGY programmes presented an ideal opportunity for the USSR government to actively demonstrate its interest in the Antarctic by instigating ambitious and challenging research plans for its national programme.

This chapter examines the pioneering "assault on the interior" of the Antarctic continent by the first three Soviet Composite Antarctic Expeditions (CAE) in their attempts to establish stations in the unexplored and most inaccessible areas of the icy continent: the South Geomagnetic Pole and the Pole of Inaccessibility (Fig. 10.1). The setbacks and obstacles encountered by these expeditions promoted the development of new technology and techniques which were applied in the hitherto unknown conditions.

The foray into the Antarctic interior was planned as a gradual, step-by-step progress, whereby each incursion would secure a firm foothold from which to move forwards to the next. This approach is reflected in the naming of the stations: *Pionerskaya*, the first interior station, was named for the "Pionery" (Pioneers), the Communist Children's Organization; the second intermediate station, *Komsomolskaya* was named for the "Komsomol", the Communist Youth League, and the station planned for the Pole of Inaccessibility was *Sovetskaya*, named for the revolutionary Soviets (councils) which were made up of full-fledged adult Communist Party members.

I. Gan (✉)
Institute of Antarctic & Southern Ocean Studies, University of Tasmania, Australia
e-mail: igan@postoffice.utas.edu.au

[28] Soviet Memorandum:209.

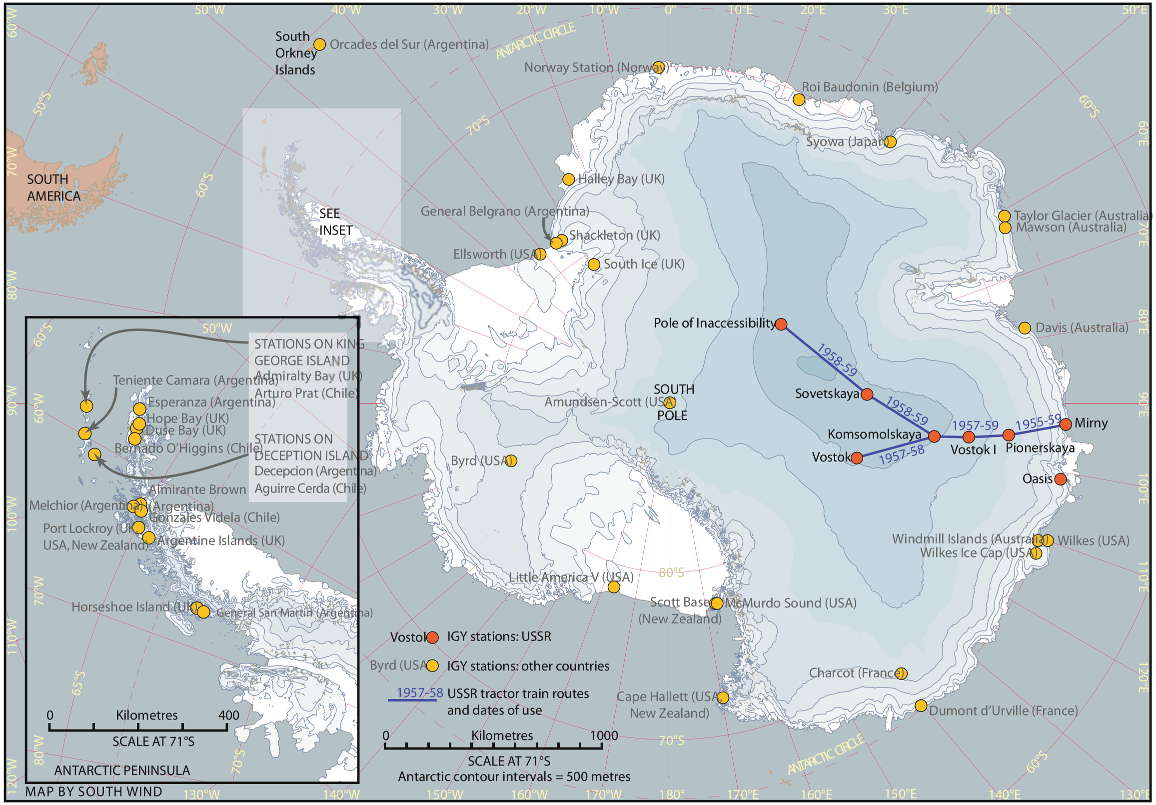


Fig. 10.1 Map of Antarctica: Soviet IGY stations (Adapted from "Map of Antarctic research during the IGY 1956–1959". Moscow: Ministry of the Merchant Fleet of the USSR, 1959)

10.3.2 Preparations

A decree of the USSR Council of Ministers on 13 July 1955 established the Soviet Composite Antarctic Expedition, which was to consist of two parts: a continental expedition and a marine expedition. The first was to operate on the icy continent year round, whereas the second was to conduct research using expedition ships in coastal Antarctic waters and in the open sea. Scientists, aviators, mariners and other support personnel who had wide experience of working in the Arctic were assigned to the Antarctic IGY effort.[29]

The Academy of Sciences of the USSR was instrumental in formulating research programmes, while logistic support was to be provided by the Northern Sea Directorate, a department of the Merchant Fleet Ministry responsible for Arctic research. The leaders selected for the First (1955–1957), Second (1956–1958) and Third (1957–1959) Soviet CAE were oceanographer Mikhail Somov (1908–1973) (Fig. 10.2), geographers Aleksei Tryoshnikov (1914–1991) (Fig. 10.3) and Evgeniy Tolstikov (1913–1987) (Fig. 10.4). Each had previously headed the Soviet Arctic *Severniy Polus* (North Pole) drifting stations SP2, SP3 and SP4, respectively.

Two of the USSR's most up-to-date icebreakers, the *Ob* and *Lena*, and a support vessel, *Refrigerator 7*, were fitted out for the First CAE. Its complement of 429

Fig. 10.2 M. Somov. Photo from the personal collection of L. Savatyugin

---

[29] Bulkeley (2008) and Gan (2009a).

Fig. 10.3 A. Tryoshnikov. Photo from the personal collection of L. Savatyugin

Fig. 10.4 E. Tolstikov. Photo from the personal collection of L. Savatyugin

personnel and crew[30] was to make preparations for the requirements of the Soviet IGY commitment, including building a coastal base *Mirny* (66°33′ S, 93°01′ E), which was opened on 13 February 1956, the eve of the Twentieth Congress of the Communist Party of the Soviet Union. An additional aim of the expedition was to

---

[30] RGAE (1957). *Nesmeyanov and Bakayev*

select sites for the inner-continental polar stations *Vostok* at the South Geomagnetic Pole and *Sovetskaya* at the Pole of Inaccessibility. The first long-range exploratory tractor-sledge foray into the interior of the continent resulted in the establishment on 27 May 1956 of the research station *Pionerskaya* (69°44′ S, 95°31′ E, alt 2,700 m) at a site located 375 km from the coastal base. Another station, *Oazis* (66°16′ S, 100°45′ E), was established on 15 October 1956, 360 km to the east of *Mirny* in the Bunger Hills on an ice-free part of the coast.[31]

From his base at *Mirny*, the expedition leader M. Somov had already undertaken reconnaissance flights to the South Geomagnetic Pole and towards the Pole of Inaccessibility.[32] His observations indicated that the projected aim of building inner-continental scientific observatories by hauling all necessary building material, fuel and equipment over the treacherous icy dome in deep snow at altitudes of 3,400–4,000 m on tractor-sledges would test his men and equipment to the limit. The distance to be covered from *Mirny* was 1,410 km to the South Geomagnetic Pole, located at an altitude of 3,488 m and 2,100 km to the Pole of Inaccessibility, located at an altitude of 3,719 m.[33]

10.3.3 The Attempts

The onerous task of actually building the stations at the South Geomagnetic Pole and at the Pole of Inaccessibility, as well as the intermediate base station *Komsomolskaya*, was left to the 625-man Second CAE led by A. Tryoshnikov. After arriving at *Mirny*, he had a tractor-sledge train outfitted and made ready to venture out to establish a foothold in preparation for the assault on the two poles. A team of ten men with three tractors hauling six sledges containing scientific equipment and huts set out on 14 February 1957 along the crevasse and sastrugi-covered terrain to *Pionerskaya* and on towards the proposed site of *Komsomolskaya* (Fig. 10.5).[34]

The rugged terrain and frigid conditions took their toll on fuel consumption. On 7 March, after travelling about 850 km and having reached an altitude of 3,500 m, the traverse had almost run out of fuel by the time it reached the proposed site for *Komsomolskaya* station. The expeditioners prepared to winter at the site, expecting supplementary fuel and supplies to be delivered by aircraft from *Mirny*. However, this did not prove feasible when the approaching polar night sent temperatures plummeting to –70°C, making further aviation extremely dangerous: “all metal and rubber aircraft parts became as brittle as glass”, wrote Tryoshnikov.[35] Fearing for the safety of his personnel, he ordered the leader of the traverse, V. Pelevin, to evacuate

---

[31] Collis, C (2007), Gan (2009b, c), and Gan, In Press.

[32] Belov (1960:84).

[33] Lukin et al. (2006:436–437).

[34] Nudelman (1966:58); Savatygin and Preobrazhenskaya:53.

[35] Tryoshnikov (1959:215).

Fig. 10.5 The traverse at Mirny. Photo by V. Lebedev. Australian Antarctic Division © Commonwealth of Australia

his men and mothball the station until spring. The last three evacuees managed to take off in a plane filled with just enough fuel to reach *Pionerskaya* on 24 March, when the temperature reached –65°C.[36]

Two weeks later, on 28 February, a second traverse consisting of 18 men led by V. Averianov left *Mirny*.[37] The five tractors, towing two sledges each, followed the same route as the first, but this mission was to establish *Vostok*, the station planned for the South Geomagnetic Pole. Being late autumn, the environmental conditions became increasingly more difficult: temperatures below –50°C led to mechanical failure as the tractors sank into the loose, powdery snow. After covering a distance of 620 km, the traverse faltered and ground to a halt on 18 March.[38]

News of these difficulties raised concerns at the Northern Sea Directorate operational headquarters about the ability of the expedition to achieve its objectives. Averianov was urged to push further, to at least 650 km, and open a temporary intermediate station on the Antarctic plateau.[39] The traverse laboriously pressed on for another 15 km, but the altitude of 3,252 m and the harsh early winter conditions were obstacles impossible to overcome. With the tractor-train unable to continue, Tryoshnikov made the decision for the 635 km mark to become the site of the *Vostok*

---

[36] Tryoshnikov (1959:216).

[37] Tryoshnikov (1960:189), Savatyugin and Preobrazhenskaya (2008:55).

[38] Tryoshnikov (1960:172).

[39] Tolstikov (1980:19).

1 station (72°09′ S, 96°36′ E), which was officially opened on 12 April 1957.[40] The eight men who were left to man the station and conduct research over winter suffered severely from altitude sickness, temperatures of –70°C and frostbite.

The Northern Sea Directorate was convinced that the evacuation of *Komsomolskaya* (74°06′ S, 97°30′ E), mechanical failures, unexpected excessive fuel consumption and the severe conditions at *Vostok 1* posed a threat to the success of the Soviet IGY programme.[41] Plans for building bases on the South Geomagnetic Pole and Pole of Inaccessibility were in danger of collapse and immediate action was required to ward off this threat. The knowledge gained by the expeditions during their time in the Antarctic led the deputy director of the directorate, E. Tolstikov, to conclude that the response to the threat of failure lay in utilizing specially designed technical support and a more rigorous health screening of personnel. He made the decision to assume the leadership of the Third CAE himself, with the objective of handpicking his men and organizing the development and construction of specialized equipment. Orders were placed for a new solid fuel for heating,[42] turbo-equipped aircraft,[43] more powerful tractors, sledges, navigational aids and protective clothing suited to inner-continental Antarctic reality. Tolstikov also suggested that *Sovetskaya* station be built not on the Pole of Inaccessibility as initially planned, but as an intermediate half-way station within range of a Li 2 aircraft flying out of *Komsomolskaya* station.[44] Reaching the Pole of Inaccessibility and building a station there would be the last hurdle.

10.3.4 Partial Success

Meanwhile, Tryoshnikov was determined that the Second CAE achieve as much of its programme as possible. He attributed the delay in setting out for the interior to the late arrival of his expedition at *Mirny* and attempted to make up for lost time by thorough planning for the coming summer season during the winter hiatus. He resumed his assault on the Antarctic interior on 8 October by leading a traverse from *Mirny* to *Vostok 1* and on to the mothballed *Komsomolskaya* station, which he manned and opened on 6 November.[45] The traverse continued towards the South Geomagnetic Pole for 280 km, where an intermediate supply depot was established. It then turned back to *Komsomolskaya,* which it reached on 17 November. After reviewing plans and co-coordinating actions, the crew went on to *Vostok 1* to assist in transporting the huts and supplies to the South Geomagnetic Pole. On 20 November they arrived at *Vostok 1* and began excavations to extricate the temporary station, which had been

---

[40] Lukin et al. (2006:436).

[41] Tolstikov (1980:18).

[42] RGAE (1958). Tolstikov

[43] Nudelman (1966:32).

[44] Tolstikov (1980:20, 42).

[45] Tryoshnikov (1959:220).

Fig. 10.6 *Vostok* station. Photo by V. Averianov. Photo from the personal collection of L. Savatyugin

buried under the winter drifts, from its blanket of snow.[46] Work was completed by 1 December, when the augmented traverse was able to set forth and cover the distance of 775 km to the South Geomagnetic Pole in 15 days. The next day, on 16 December, *Vostok* station (78°28′ S, 106°48′ E), was officially opened on the South Geomagnetic Pole (Fig. 10.6). Against great odds, Tryoshnikov had overcome the previous setbacks and showed that the Soviet IGY plans were attainable and now seemed to be within reach.

10.3.5 The Last Hurdle

It was now up to Tolstikov and the Third CAE (1957–1959) to continue the battle of man and machine against the hostile elements to secure another foothold and establish a station on the most inaccessible site of the Antarctic continent. It was fortunate that this expedition had consolidated and built on the knowledge acquired by the first two expeditions, since the conditions that it encountered were perhaps even more difficult than those faced by its predecessors.[47]

A traverse left *Mirny* on 26 December 1957 for *Komsomolskaya* and then across the Antarctic plateau, which was named "Plateau Sovetskoye" (Soviet Plateau)[48] towards its final goal, the Pole of Inaccessibility. However, 700 km short of its destination, the progress of the tractor-sledges was impeded by deep, soft snow and the approaching winter. It was decided that this location, rather than the Pole of Inaccessibility, would become the site for *Sovetskaya* station. *Sovetskaya* (78°23′ S,

---

[46] Tryoshnikov (1960:180).

[47] Gan (2009c).

[48] Tolstikov (1980:126).

Fig. 10.7 Traverse returns to *Mirny* after building *Sovetskaya* station. Photo by V. Lebedev. Australian Antarctic Division © Commonwealth of Australia

87°32′ E) was built in six days and officially opened on 16 February 1958. A wintering party was left at the station, while the remainder of the traverse returned to *Mirny* (Fig. 10.7). The following spring, on 23 October 1958, a traverse set out from *Mirny* towards the interior. At *Komsomolskaya*, it split into two, with one party continuing on in the direction of *Vostok* and the other headed for the Pole of Inaccessibility, which it managed to reach in less than two months. On 14 December 1958, in the closing days of the IGY, the Soviet CAE finally achieved its aim: a base for episodic research was set up on the Pole of Inaccessibility (82°07′ S, 55°02′ E) and was operational until 26 December 1958. This base became known as the *Pole of Inaccessibility* (Fig. 10.8).

By establishing its network of inner-continental stations (*Pionerskaya, Vostok 1, Komsomolskaya, Vostok, Sovetskaya* and *Pole of Inaccessibility*), the Soviet Union

Fig. 10.8 *Pole of Inaccessibility* station. Photo by V. Babarykin. Australian Antarctic Division © Commonwealth of Australia

had more than fulfilled its commitment to the International Geophysical Year of 1957–1958. The country welcomed the expeditioners back as heroes and the media extolled their exploits and determination. Other nations participating in the IGY acknowledged the status of Soviet science and technology, which had been globally showcased and recognized. Soviet national prestige had been enhanced. The USSR had demonstrated that it was seriously interested in the South Polar Region and had earned the right to participate in the formation of any proposed international regime for the Antarctic.[49]

References

Beck, P. 1986: *The International Politics of Antarctica.* London: Croom Helm.

Beck, P. 2010: Fifty Years on: Putting the Antarctic into the History Books. *Polar Record* 46: 2–4.

Belov, M. 1960: Isstoriya otkrytiya i issledovaniya (History of Discovery and Exploration) In: E. Tolstikov (ed) *Atlas Antarktiki Tom II (Antarctic Atlas Vol II),* pp 35–97. Leningrad: Hydrometeoizdat.

Bulkeley, R. (2008), Aspects of the Soviet IGY, Russ. J. Earth Sci., 10, ES1003, doi:10.2205/2007ES000249. See: http://elpub.wdcb.ru/journals/rjes/doi/2007ES000249.html

Chapman, S. 1961: *IGY: Year of Discovery.* Ann Arbor, MI: University of Michigan Press.

Collis, C. 2007: Mawson and Mirny Stations: The Spatiality of the Australian Antarctic Territory, 1956–1961. *Australian Geography* 38(2): 215–231

Collis, C., and K. Dodds (2008) Assault on the Unknown: The Historical and Political Geographies of the International Geophysical Year 1957–1958. *Journal of Historical Geography* 34: 555–573.

Collis C., and Q. Stevens 2007: Cold Colonies: Antarctic Spatialities at Mawson and McMurdo stations. *Cultural Geographies* 14: 234–254.

Comerci, S.M. 1979: La ciencia argentina en el Antártico: El Instituto Antártico Argentino, Buenos Aires.

Comisión Chilena Antártica, Reunión de la Comisión Chilena Antártica, 27 May, 1955. RR.EE., Departamento de Limites: Comisión Chilena Antártica, 1945–1956. 1958.

Dirección Nacional del Antártico 1983: Instituto Antártico Argentino Contribuciones Cienı́ficas Autores – Titulos – Resumenes Nos. 1 al 304 Años 1959 al 1983, Buenos Aires.

Dodds, K. 1997: *Geopolitics in Antarctica.* Chichester: Wiley.

Dodds, K. 2002: *Pink Ice: Britain and the South Atlantic Empire.* London: I B Tauris.

Dodds, K. 2008: The Great Game: Britain and the 1959 Antarctic Treaty. *Contemporary British History* 22: 43–66

Dodds, K. 2010: Assault on the Unknown: Geopolitics, Antarctic Science and the International Geophysical Year (1957–1958) In: S. Naylor, and J. Ryan (eds) *New Spaces of Exploration: Geographies of Discovery in the 20th Century,* pp 148–172. London: I B Tauris.

Doel, R. 2003: Constituting the Post-War Earth Sciences: The Military's Influence on the Environmental Sciences in the USA After 1945. *Social Studies in Science* 33: 635–666.

Gan, I, in Press, Towards the great unknown: the Soviets prepare for their thrust into the Antarctic interior. Paper prepared for the 3rd SCAR workshop on the history of Antarctic research entitled National and transnational agendas in Antarctic Research from the 1950s and beyond, Columbus, OH: Byrd Polar Research Center, 25–26 October 2007. In Press in Byrd Polar Research Centre, Columbus, OH, USA

---

[49] Gan (2009c, 2010).

Gan, I, 2009a: The Soviet preparation for the IGY Antarctic Program and the Australian response: politics and science. Paper prepared for the 2nd SCAR workshop on the history of Antarctic research entitled Multidimensional exploration of Antarctica around the 1950s, Ministry of Foreign Affairs of Chile, Santiago, Chile, 21–22 September 2006. *Boletín Antartico Chileno,* pp 60–70. 2nd SCAR Workshop on the History of Antarctic Research.

Gan, I, 2009b: The Reluctant Hosts: Soviet Antarctic Expedition Ships Visit Australia and New Zealand in 1956. *Polar Record 45*(232): 37–50.

Gan, I, 2009c: Will the Russians Abandon *Mirny* to the Penguins After 1959. . . or Will They Stay? *Polar Record* 45(233): 167–175.

Gan, I. 2010: Soviet Antarctic Plans After the IGY: Changes in Policy. *Polar Record,* doi: 10.1017/S0032247.409008456

Genest, E. 1998: Pujato y la Antártida Argentina en la Década del Cincuenta. Buenos Aires.

Howkins, A. 2008: Reluctant Collaborators: Argentina and Chile in Antarctica during the International Geophysical Year 1957–1958. *Journal of Historical Geography* 34: 596–617.

Hydrographical Bulletin 1957–1963 (Chile), (Anuario Hidrografico de la Marina de Chile, Valparaíso, Chile) Vol.41.

Instituto Antártico Argentino 1960: Report to SCAR on Antarctic Scientific Activities During the International Geophysical Year, 1957–1958. Buenos Aires.

Korsmo, F. 2007: The Genesis of the International Geophysical Year. *Physics Today* July: 38–43.

Lukin, V., N. Kornilov, and N. Dmitriev 2006: *Sovetskiye i Rossiiskiye Antarkticheskiye expeditsii v tsifrah i faktah (1995–2005) (Soviet and Russian Antarctic Expeditions – Facts and Figures [1995 – 2005]).* St Petersburg: AARI.

Naylor, S., K. Dean, and M. Siegert 2008: The IGY and the Ice Sheet: Surveying Antarctica. *Journal of Historical Geography* 34: 574–595.

Nudelman, A. 1966: *Soviet Antarctic Expeditions 1955–1969. Translated from Russian by N. Kaner.* Jerusalem: Israel Program for Scientific Translations.

Pinochet de la Barra, O. 1994: Medio Siglo de Recuerdos Antárticas Memorias. Editorial Universitaria: Santiago, Chile.

Powell, R. 2008: Science, Sovereignty and Nation: Canada and the Legacy of the International Geophysical Year 1957–1958. *Journal of Historical Geography* 34: 618–638.

Pyne, S. 2003: *The Ice*. London: Weidenfeld & Nicolson.

RGAE 1957: 3 June, *Nesmeyanov and Bakayev*. *Kratkiye itogi raboty kontinentalnoi chasti kompleksnoi Antarkticheskoi expeditsii AN SSSR 1955–1957 (A Brief Summary of the Results of the Continental Component of the CAE of the Academy of Sciences of the USSR 1955–1957)*, f 9570, op 2, ed hr 2589.

RGAE 1958: 25 July, *Tolstikov. Losevu*, *V institut Goryuchih iskopaemyh (Tolstikov. To the Institute of Fossil Fuels)*, f 9570, op 2, ed hr 2595.

Rigoz, S. 2002: Hernán Pujato: el conquistador del desierto blanco. Buenos Aires.

Rothwell, D. 2010: Sovereignty and the Antarctic Treaty. *Polar Record* 46: 17–20.

Savatyugin, L., and M. Preobrazhenskaya. 2008: *Polus holoda* (The Pole of Cold), 450 p. AARI: St Petersburg.

Soviet Memorandum of 7 June 1950 on the participation of the Soviet Union in any international settlement concerning Antarctica. In: W. Bush, 1982 (ed) *Antarctica and International Law. A Collection of inter-state and National Documents*, vol. 3, pp 208–209. London: Ocean Publications.

Sullivan, W. 1961: *Assault on the Unknown*. New York: McGraw-Hill.

Tolstikov, E. 1980: *Na polyusah Antarktidy (On the Poles of Antarctica)*, 160 p. Leningrad: Hydrometeoizdat.

Toma, A. 1956: Soviet Attitude Towards the Acquisition of Territory in the Antarctic. *American Journal of International Law* 50: 611–626.

Tryoshnikov, A. 1959: Na ledyanom kontinente (On the icy continent) In: E. Burkhanov (ed) *Na samoi Yuzhnoi Zemle (On the Far South Land),* pp 208–231. Moscow: Geografizdat

Tryoshnikov, A. (ed) 1960: *Vtoraya kontinentalnaya expeditsiya 1956–1958. Obshcheye opisaniye (2nd Continental Expedition 1956–1958. General Description),* 206 p. Leningrad: Morskoi transport.

Wilson, J. 1961: *IGY: Year of the New Moons.* London: Michael Joseph.

Further Reading: Selected List of Publications in English

Gvozdetsky, N. 1974: *Soviet Geographical Exploration and Discoveries,* 344 p. Moscow: Progress.

Lebedev, V. 1959: *Antarctica* (Translated from Russian), 259 p. Moscow: Foreign Language Publishing House.

Sullivan, W. 1957: *Quest for a Continent,* 373 p. London: Secker and Warburg.

Sullivan, W. 1961: *Assault on the Unknown. The International Geophysical Year*, 461 p. New York: McGraw-Hill Book Company.

Chapter 11
The Achievements of the IGY

Jorge Berguño, Aant Elzinga

11.1 IGY Research

Aant Elzinga

The IGY was a vast undertaking that took place from 1 July to the end of December 1958. It was orchestrated by the International Council of Scientific Unions (ICSU), an independent federation of international scientific unions. Co-sponsor was the World Meteorological Organisation (WMO) established in 1951 as an intergovernmental organization within the United Nations framework.[1] A Special Committee (*Comité de l'Année Géophysique*, CSAGI) was formed to act as the governing body for all IGY activities. Care was taken to ensure that CSAGI would remain non-nationalistic, apolitical, and geared towards a scientific agenda. The emphasis was on synchronic global measurements. Nevertheless, planning was in its fourth year before the USSR joined, reflecting the east–west disparity originating in the United States' policy of containment according to which the original intention in the West had been to keep the Soviets out of Antarctica. As it turned out the Cold War became a veritable incubator for science, causing an upswing for several branches of geoscience on both sides of the iron curtain between east and west.

Polar research had a dual function of both military and civilian importance. Given the charged geopolitical circumstances in the Arctic, it was obviously difficult for

---

A. Elzinga (✉)
Department of Philosophy, Linguistics and Theory of Science, University of Gothenburg, Sweden
e-mail: aant.elzinga@theorysc.gu.se

This text was originally prepared as a chapter for the present volume. Before its appearance here it became part of a paper (Elzinga 2009) presented at the 4th SCAR Action Group for History of Antarctic Science workshop in St Petersburg 2008. The longer paper compares salient characteristics and findings across all four polar years.

[1] WMO succeeded the earlier International Meteorological Committee (IMO), a non-governmental organization that was involved in orchestrating both IPY-1 and IPY-2. For a review at the time of the background, see the first volume Annals of IGY (ICSU 1959) which also contains chapters (assembled by Mike Baker at ICSU) written by IGY scientists who had also participated in IPY-2 (1932/1933). See also Chapters 9 and 10 in this volume.

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_11,

scientists to develop working relations and a free flow of information in that region.[2] Fortuitously, the same geopolitical conditions brought the Antarctic to the fore as an arena for intense scientific activities.

11.1.1 Scope of the IGY

Special scientific and technical panels were set up to cover the following geophysical fields: auroras, airglow, cosmic rays, geomagnetism, glaciology, gravity, ionosphere physics, longitude and latitude determinations, meteorology, oceanography, rocket exploration of the upper atmosphere, seismology and solar activity. Incidental to the official programme some researchers also did work in geology, biology and human physiology. Major foci for research were outer space, the ionosphere, the Earth's magnetosphere, the cryosphere (mostly polar regions), the oceans and the Earth's crust. Telling is the fact that about 200 rockets were used to launch earth-orbiting satellites, therewith marking the dawn of the space age. The Soviet Sputnik early October 1957 was only the first and most famous event in a competition between the two superpowers, the United States and the USSR.[3] Another first was the US atomic-powered submarine *Nautilus*' crossing of the Arctic under the ice early 1958. It went from the Bering Strait to Iceland via the pole in four days. The following year the US submarine *Skate* surfaced through the ice at the North Pole. These events give an indication of an underlying military interest that can also be traced, for example, in some of the glaciological exploits on Greenland during the IGY (see below). In Antarctica, on the other hand, superpower politics was more deeply sublimated into science as the United States and the USSR competed to outdo each other. The US feat of putting a research station at the geographic South Pole was matched by the Soviet placement of a station at the Pole of Inaccessibility furthest away from all coasts. Simultaneously, an armada of research vessels from many different countries plied the oceans to map the circulation of currents, take water temperatures at various depths, probe seabeds while taking bottom cores and making rock dredges, etc.

In all, 67 countries (almost 2/3 of the world's countries at the time) participated in the various activities to a total cost of about 1 billion US dollars. The bulk of the resources went to the logistics of establishing, serving and operating scientific observation posts, about 2,500 all around the globe (including vessels at sea). Antarctica proved to be the most cost-intensive owing to its distance, harsh climate and difficult access. The United States, for example, spent 8 dollars on logistics for each research dollar to mount a major effort there.[4] The other big player, the USSR trailed halfway

---

[2] Hamblin (2000:300–301).

[3] Soviet atomic bomb tests were also made in October 1957, over Novaya Zemlya.

[4] The US costs in Antarctica amounted to about 200 million dollars to set up and operate seven stations, one at the geographic South Pole.

behind, while medium-sized countries like France, the UK and Australia invested less but got out more scientific payoff per dollar.[5]

11.1.2 The Antarctic Focus

Estimates of the total number of persons involved worldwide in IGY networks usually land on the figure 60,000, whereof 10,000 were scientists. In the Arctic more than 300 stations were established by 14 northern and other nations interested in that region as well as its continuation into the North Atlantic. Antarctic and Sub-Antarctic islands counted in the order of 68 stations mainly manned by personnel from the 12 nations that had research programmes there (see Table 11.1).

During the austral summer about 5,000 persons were on active duty, a figure that fell to just over 900 in the Antarctic winter. Table 11.1 indicates how the United States and the USSR were the biggest participants. The United States feat of putting a research station at the geographic South Pole was matched by the Soviet placement of a station at the Pole of Inaccessibility.[6] The research vessels came in addition.

Table 11.1 Numbers of IGY stations (and affiliation) in the Antarctic

	Continental and peninsular	Sub-Antarctic islands
Argentina	3	5
Australia	2	1
Belgium	1	0
Chile	2	2
France	2	1
Japan	1	0
New Zealand	1	1
Norway	1	0
South Africa	0	3
UK	9	6
USA	7	0
USA/NZ	1	0
USSR	7	0
Total	*37*	*19*

Estimates of the number of stations vary, the table is based on a similar one in J.T. Wilson 1961; see also Walton (1987:55). For the names of stations see Summerhayes (2008)

---

[5] A high-level British research station manned by members of the Royal Society was mounted on an ice shelf that rose and fell with the tide of the Weddell Sea (Halley Bay).

[6] Petrov (1957) and Bulkeley (2008).

11.1.3 New Technologies, Instruments and Scientific Avenues

The following are some highlights in the annals of IGY research. For the first time World Data Centres were created to assemble data in all branches of geophysics, records some of which are still used today, for example, in global climate change research.

The first US satellites into space in 1958 (*Explorer 1* and *3*) were fitted with Geiger counters and able to discover the radiation belts around the earth, later named after James van Allen. Systematic visual studies of aurora in the north and south as well as recordings by all-sky aurora cameras in various locations including Antarctica led to the finding that aurora occur in the same hour in both hemispheres at conjugate points (locations in opposite hemispheres where a specific line of magnetic force intersects the Earth's surface). It was also found that the polar ionosphere retains considerable ionization through the dark period of the winter. Investigations on the whistler mode of Very Low Frequency (VLF) propagation between hemispheres, clearly following the earth's magnetic lines, opened a research agenda for studying the Earth's distinct magnetic field and the distribution of ionization at a considerable distance from the planet. Auroral particle precipitation into the Earth's ionosphere affects properties of radio signals around the globe, so all this research was very important for improving radio communications and hence militarily significant during the Cold War. Stimulated by the construction of the DEW line that was finished in 1958 (see below) the US Air Force boosted radio physics at several universities in the United States, Canada, Denmark, Sweden and some other countries.

One of the more sensational events in Antarctica was the over-the-ice-traverse by the British scientist Vivian Fuchs' party (on the Commonwealth Trans-Antarctic Expedition) from the Weddell Sea via the South Pole to McMurdo Sound on the Ross Sea. Fuchs was assisted by Edmund Hilary (of Mt Everest fame) who had laid depots on the Pole-to-Ross Sea leg and met up with Fuchs at the pole. During the traverse seismological soundings were made to determine the depth of the ice-cap. Seismology and gravity measurements were also undertaken during a series of separate traverses by US, Soviet, French and Australian scientists. Three American traverses concentrated on the area between the Weddell Sea, Marie Byrd Land and the Ross Sea. Soviet traverses went across East Antarctic, from the Indian Ocean inland 1,400 km to Vostok, a Russian station near the geomagnetic South Pole (reached for the first time in 1957), and later from Vostok to the American South Pole station and back. Traverses also went to the Pole of Inaccessibility (see Chap. 10, I. Gan).

Such traverses supplied completely new information on the profiles of ice-sheet thickness, the configuration of underlying bedrock surfaces and gravitometric data. Earlier the ice thickness was held to range from 600 to 1,600 m. Now scientists discovered thicknesses of over 4,000 m and an average ice-sheet thickness of over 2,000 m. Even if such findings were later revised they nevertheless led to radical recalculation of the total ice volume over Antarctica. Supplemented by aerial surveys and reconnaissance the traverses also gave data that led to better maps of the Antarctic interior, recording new features like mountain ranges and ice-free "oases" additional to those known before. They also added credence to the concept that three quarters of Antarctica is continental in character and not just a string of Sub-Antarctic islands. Connected to the continent is an archipelago under the ice of the Antarctic Peninsula. It was found that the hypothetical channel between the Ross and Weddell seas (the Ross-Weddell Graben) does not exist, although it was surmised that a sub-glacial channel probably looped back under Marie Byrd Land into the Bellingshausen Sea. Thanks to incidental geological work a much clearer picture emerged also of what then were perceived to be potentially exploitable mineral resources like coal deposits, uranium and other minerals in a number of mountain outcrops. Uranium finds in particular made newspaper headlines and spurred speculations across the world.

Research during the IGY also provided evidence favourable to the long-disputed hypothesis of continental drift and the theory of plate tectonics, forming our present-day understanding of the origin of the Earth's oceans and continents. Monitoring of earthquakes combined with gravity measurements (Belgian, French, Soviet, UK, US in the Antarctic) provided data that helped confirm the existence of Gondwanaland in a geological past. As one leading geologist put it later, "because of its central positioning in the assembly, Antarctica must clearly play an important role in determining the reality and history of Gondwanaland".[7] Oceanographic work and seismic crustal studies (the United States and Argentina) around the Falkland Islands/Malvinas and southward provided further insight into the character of the submerged Scotia Arc extension of the Andes. It should be noted, however, that gravity measurements around the globe were made on different standards and not tied together in a unified network.

Analysis of perturbations of IGY satellite orbits indicated that the degree of polar flattening of the Earth was less than previously estimated, and that there was a geoidal bulge upward in the Arctic polar area and a depressed region in the Antarctic. Consequently, the Earth's shape does not conform to that of an ideal rotating fluid body. Such findings spurred later research on more precise determination of gravitational anomalies.

11.1.4 Atmospheric and Cryospheric Processes

Globally, meteorological data led to a more distinct delineation of the Earth's stratosphere and its difference from the atmosphere. Total radiation and energy budget calculations improved, and so did the ability to produce weather forecasts, including for the first time also for parts of Antarctica. Meteorologists were able to reveal important features of the thermal structure and circulation of the atmosphere over the Antarctic continent and nearby oceans. Over the Antarctic, reversals in stratospheric winds from summer easterly to winter westerly were found to be very regular and to move southward and downward from 40 km at high latitudes. Distinctive too, it was found, that whereas local atmospheric vortices tend to pass

---

[7] Craddock (1982:3).

in and out of Antarctica, there is a single large vortex centred on the polar plateau and surrounded by a circumpolar "jet stream". The air at the centre of the vortex becomes steadily colder and sinks, generating drainage (katabatic) winds that move over glaciers towards the continental periphery, sometimes with fierce brief localized blizzards. Further understanding was thus gained of the katabatic airflow that is one of the most prominent meteorological features in Antarctica.

It was furthermore suggested that the continental existence of Greenland and Antarctic icecaps is due to their being "protected" by the oceans, in the absence of which lower albedo and hence higher heat "consumption" would exist. An important series of charts from the IGY came from the international Antarctic Weather Central at *Little America V* to which all nations sent regular data sets. This was an early first step on the road to a better understanding of the Antarctic atmosphere, its various trends and its place in world weather. An unexpected finding was that the lowest temperatures are not found at the geographic South Pole but at positions on the plateau where elevations above sea level are higher than the 2,800 m recorded at the pole.

Glaciological research in Antarctica was initially meant to supply knowledge of the physical properties of ice-sheets with an eye to their influence on the atmospheric environment and climatic conditions. Overall the Antarctic ice-sheet was estimated to cover seven times the area of the Greenland ice-cap, and about the same size as the Laurentide Ice Sheet that covered a large part of Canada and the United States 95,000–20,000 years before present day. As already noted, radical new estimates were made of the ice volume in Antarctica and consequently on the Earth's surface as a whole. Experiments were made with radio waves to measure the ice thickness of ice shelves, a technique that later led to ground-penetrating radar widely used in aerial surveys over vast areas of Antarctica from the 1970s onward. The IGY made possible for the first time a coordinated international plan to study Antarctic glaciology. Experience was gained for the first time of deep-core drilling down to 300 m in the Ross Sea Ice Shelf and in the inland ice largely due to US and Soviet efforts, respectively, a prelude to later ice-coring projects now so important in climatology.

It should be noted that the Cold War setting of the IGY was a significant driver of snow and ice studies that contributed to gaining knowledge from ice-cores – ultimately, in our day, making ice speak on the question of global climate change.

In Greenland the US Army's Polar Research and Development Centre, established 1949, had been very active in connection with the establishment of the Thule airbase in 1951 on a meridian midway between New York and Moscow, as an operations base and refuelling point for long-range bombers potentially directed at the Soviet Union. In the United States a decision was taken in 1955 to construct a Distant Early Warning (DEW) line of polar region radar stations stretching from Alaska over northern Canada and Greenland to Iceland. It was meant to detect incoming Soviet bombers and give early warning for interceptive action. The DEW line was completed a month after IGY had begun. In Greenland there were four radar stations called *Dye 1, Dye 2, Dye 3* and *Dye 4*. *Dye 3* later became an important ice-core drilling site. During this period a US military research station was also constructed, *Camp Century*, located 220 km east of Thule. It was also a product of the American concern about a possible Soviet attack and the need to develop knowledge about the harsh climate and physical properties of snow and firn (compressed snow) for military purposes. *Camp Century* comprised a little subsurface ice village of 32 buildings including laboratories dug into the firn, driven year round from 1958 until 1966. In summer its population was 250 men. Heat and power came from a nuclear reactor also located under the firn. In 1957 the Danish government struck a secret agreement with Washington to allow nuclear weapons to be installed in Greenland. Pilot drilling trials to recover ice-cores of 305 m in 1956 and 411 m in 1957 were probably linked to a plan to create a 4,000-km network of tunnels 10 m below the Greenland icecap surface to hide 600 middle-distance rockets with nuclear warheads on a line from Narsasuaq in the south to Thule in the north. This was the top secret *Iceworm* project that never materialized. It only came to light in 1997 when the Danish Foreign Affairs Policy Institute published a report citing documentary evidence of the intentions.[8] This was the context in which the Snow, Ice and Permafrost Establishment (SIPRE) of the US Army Corps of Engineers (later in 1961 renamed Cold regions Research and Engineering Laboratory – CRREL)[9] pioneered important developments in ice-coring technology, leading to the first drilling of a core down to bedrock in 1966, and GISP (Greenland Ice Sheet Project) much later. Equally important was the cooperation that developed with Danish and Swiss scientists, leading to O18 isotope analysis of air trapped in ice-cores to calculate paleoclimatological records of variations in atmospheric temperatures so central to present-day climatology.[10] A lasting effect of the Cold War of course was that many young scientists through SIPRE were trained and drawn into glaciology for the IGY.

11.1.5 The World’s Oceans

In oceanography, many countries participated in mapping seasonal changes in ocean masses caused by redistribution of water within the oceans and between sea and land. Major operations also explored the bottom contours of the north and south Pacific, the Indian Ocean and the Atlantic, and ocean circulation on all parts of the globe. A typical oceanographic expedition included two ships working together, traversing over several million km^2 and using a variety of instruments and techniques, such as echo soundings, drawing up bottom cores of sediments, rock dredging, bottom photography, gravity meters, magnetometers, heat probes, seismic refractors, etc. Some missions were secret since they were involved in assessing radiation in the atmosphere and geochemical effects in ocean waters worldwide in connection with US atomic tests in the Pacific and the USSR tests in the Arctic. One such example was the US ocean-going vessel *Vema* acquired in 1954 by the Lamont Geological Observatory of Columbia University, an institution that received a lot

---

[8] Dansk Udenrigspolitisk Institut (1997:319 ff.) and Lolck (2004:92 ff.).

[9] Langway (2008).

[10] Dansgaard (2004) and Elzinga (in press).

of its funding from the US Atomic Energy Commission (AEC).[11] In 1958 the US Navy sponsored initiatives in underwater sound transmissions and target tracking to develop an ocean surveillance system, an analogue of the DEW line on land. Contemporaneously, US and Soviet submarine exercises led to a lot of valuable data about ice conditions and bottom topography that have only been declassified since the mid-1990s.

In the Arctic regions the International Council for Exploration of the Seas (ICES, established 1902 in Copenhagen) coordinated a major programme called the Atlantic Polar Front Survey. It covered a vast area from Novaya Zemlya up to Svalbard and over to the Grand Banks of Newfoundland. In all 26 research vessels and seven weather-ships from nine different countries (Canada, Denmark, Germany, Iceland, The Netherlands, Norway, Sweden, the UK and the USSR) collected data on currents, convection and reversal of deep water off Greenland and the flow of cold heavier water into the deep North Atlantic. A prediction of a southward flowing westerly boundary current below 2000 m was partly verified, and a conclusion was that earlier ideas about the general circulation of the North Atlantic would have to be revised. Information about equatorial undercurrents obtained by other expeditions (e.g. from the Woods Hole Oceanographic Institution to the Indian Ocean) also brought new information, adding to new and perplexing questions that were only answerable much later (e.g. the El Niño phenomenon). Inventories of plankton and patterns of fish were also made, along with studies of the variability of air temperatures and atmospheric precipitation along the Polar Front. Conductivity salinometers were only just becoming available in 1958, so that the overwhelming majority of salinity results were determined by titration. Careful studies of density–salinity relationships and temperature gradients along various levels down into deep waters, however, enabled determination of continuous profiles. A large volume of materials was drafted into final form at Kiel and Bergen under the guidance of the ICES Working Group, emanating in a new hydrographic atlas and a comprehensive bathymetric map based on echo soundings.[12]

Another aspect of research in Arctic waters relates to the drifting ice islands, of which the United States and the USSR both had two during the IGY. Soviet scientists had experience of operating such stations since 1937 and continued until 1991. Driven by wind and currents these stations meandered in a gyre in Arctic waters, in one case as far as 6,400 km. Daily depth soundings were made, ocean bottom sediments collected, the Earth's magnetic field measured, ice movements and temperatures of various kinds recorded. The stations *North Pole 6* and *North Pole 7* during the IGY were only two in a series during the entire 54-year period Soviet scientists worked from drifting ice island platforms with supplies regularly brought in by airplanes that could land on them. A long record of physical properties of the Arctic Ocean, but also radiosonde observations in the upper air, was transcribed by hand in tables still archived in St Petersburg. In recent years the radiosonde data series have been put into digital form accessible in a world data bank since they

---

[11] Doel (2003).

[12] Dietrich (1969) and Chapman (1959).

are valuable in present-day research on global climate change. American scientists collected similar data from the two drifting ice islands, called *Alpha* and *Beta*, that they occupied in 1957and 1958.

In the Antarctic region the Soviets dominated in oceanography. This was because they had two research vessels '*Ob* and *Lena*' with excellent ice-forcing capabilities and adequately staffed to operate continuously in the Antarctic. The United States and other countries lacked comparable vessels, although recognition must be made of the aforementioned *Vema* that made a valuable cruise in the Southern Ocean in 1958 and 1959. Otherwise efforts were largely limited to strikes of "opportunity" or incidental projects as supply vessels and passing ships collected diverse data when they could, contributing data on Antarctic surface water, circumpolar water below the surface layer and on Antarctic bottom water. Sorties around the American *Ellsworth* station on the Filchner Ice Shelf on the inland edge of the Weddell Sea ice and from the Argentine *Belgrano* station nearby also provided further data, as did the Japanese on the sea-route to and from *Syowa* station in the Indian Ocean sector. However, all this was insufficient for an attempt to explain the Antarctic Convergence.[13] A close network of cooperating oceanographic stations to study the fine structure of the Antarctic convergence was lacking. The Russians, guided by broad oceanographic problems and building on H.V. Sverdrup and other's classical work of 1942 and earlier, and using a more systematic database, succeeded in finding a justification for the theory that the southern circumpolar water can be considered as an independent Southern Ocean.

11.1.6 Incidental Biological Studies

Most Antarctic expeditions made marine collections incidental to their main purposes, e.g. in connection with chemical and oceanographic surveys on the US Navy icebreakers operating during the IGY. Therefore, despite the large number of expeditions, the collections from areas around the Antarctic continent for the most part were haphazard and relatively small. An exception was the work of Soviet scientists. As the research vessel *Ob* also had extensive collecting and laboratory facilities for marine biological research, the Soviets were able to undertake the most intensive programme of all nations in the study of Antarctic fishes, collecting specimens from two meridian sections across the Indian Ocean and from the Antarctic and sub-Antarctic. Fish collections were obtained by mid-water tow nets, trawling at 1,000–3,000-m depths, hook and line fishing along the Antarctic coast, and examination of seal stomachs. Many rare species were recorded, including new "white blooded" ones. Soviet scientists also brought back 600 ornithological collections

---

[13] Wexler (1959).

representative of 11 species of birds. Scientists from several countries made inventories of fauna on Antarctica and sub-Antarctic islands. Otherwise ornithological collections and studies were few and far between. An exception was the work of an American scientist who was able to organize a skua investigation involving eight nations and 18 Antarctic stations.[14] Studies of penguins and snow petrels were carried out at various stations, but more sporadically.

11.1.7 Concluding Remark

From the foregoing review of some of the accomplishments during the IGY it is clear that research was epistemologically more diverse and problem-oriented than in IPY-2 while theoretical foundations had grown immensely.[15] IGY started as a trend in which even Antarctic geology "became less historical and descriptive and more explanatory".[16] Many new hypotheses were developed and in some cases confirmed and many questions emerged regarding various geophysical dimensions of the Earth. The focus had shifted to a more process-oriented approach with attempts to construct models of atmospheric and oceanic circulation processes. Ionospheric and cosmic studies, apart from benefiting from more advanced probing techniques, had also gained a more solid theoretical footing with sophisticated mathematical models of the magnetosphere and solar winds. At the same time, empirical work of data collection and monitoring continued and provided benchmarks for model construction. Further, developments in computer-aided methods of numerical analysis, with the move from analogical to digitalized simulation models, helped to open up many new avenues for future research.

11.2 The International Geophysical Year (IGY) and the Antarctic Treaty – The Interface of Science and Law

Jorge Berguño

11.2.1 Overview

The peculiar relationship between the International Geophysical Year and the Antarctic Treaty is seldom understood in all its implications. At the start of the

---

J. Berguño (✉)
Instituto Antártico Chileno, Ministry of Foreign Affairs, Santiago, Chile
e-mail: jberguno@inach.cl

[14] Eklund (1959).

[15] See further Elzinga (2009); cf. Elzinga (1993).

[16] Fogg (1992:260).

IGY there was a more profound understanding of the political and legal implications of this extraordinary experiment in international cooperation,[17] but the more recent literature in the fields of political science and law has focused almost exclusively on the further development of the Antarctic Treaty System. Relations linking the Antarctic Treaty to the International Geophysical Year (IGY) cannot be satisfactorily assessed through a chronological series of related events or by merely comparing both processes and their respective feedback. Interdisciplinary approaches to the subject should include: a State practice becoming customary international law and developed further multi-laterally; the influence exercised by the participants in both processes in developing strategies advancing their common goal, and the weight of the tradition of International Polar Years. The sequence of the process starts by probing the assets accumulated by the states active in Antarctica before the IGY, examines the use of those assets in the promotion of the objectives of the IGY and ends with the institutionalization of IGY cooperation under the umbrella of the Antarctic Treaty.

Some authors in the field of international law have endeavoured to determine how customary rules are maintained and changed through the customary process and the function that political power, the interests of state actors and other factors such as the role of ideas or active minorities play in the consolidation of customary international law. Contemporary international relations theory underlines the role of epistemic communities and the part played by principled ideas in the construction of international agreements. The concept of epistemic communities was derived from Hedley Bull who referred to “the diplomatic culture – the common stock of ideas and values shared by the official representatives of states” in his treatise on *The Anarchical Society*.[18] In the context of Antarctic negotiations, this core group or epistemic community was not restricted to official representatives of states but encompassed the “professional group of scientists, diplomats, lawyers and environmentalists which concerns itself full time with Antarctic matters” and represents “the practical, human level of integration”.[19] A critical stage for the integration of the scientific and the legal–political elements arose during the “Antarctic Conferences” of the IGY held in Paris on 6–10 July 1955, on 8–14 September in Brussels, on 30 July–4 August 1956 and on 13–15 June 1957 in Paris (Fig. 11.1).

Antarctic affairs also provided an entirely new arena for the potentially pivotal role of principled ideas and the construction of a special regime for Antarctic science. International regimes include “principles, norms, rules, and decision-making procedures around which actor expectations converge in a given issue-area”.[20] Regimes and attitudes are inextricably linked, as their point of departure arises from human behaviour being codified by formal or informal rules or codes of conduct.

---

[17] Baldwin (1964:78–81).

[18] Bull (1977:316).

[19] Watts (1992:85–86).

[20] Krasner (1982:2).

Fig. 11.1 Oscar Pinochet de la Barra, an Antarctic specialist and one of the Chilean delegates to the Antarctic conferences – here in Antarctica (Chilean Antarctic Institute (INACH))

Both regimes and institutions help to secure adherence to rules by formulating, communicating, administering, enforcing, interpreting, legitimating and adapting them to the issue area to which they relate. In the search for a regime for Antarctic Science, the path leads to the requirement for a more permanent set of institutions and legal prescriptions that the IGY mechanisms could only outline, but their enforcement remained beyond their reach. The threshold into the Antarctic Treaty System had to be crossed.

11.2.2 Antarctica before the IGY

In order better to understand the rather diffuse relationship between the IGY and the Antarctic Treaty, it is important to recall a practice of States active in Antarctica codifying a peculiar accommodation to the rivalries which divided those nations. Offer of facilities for scientific research in Antarctica made by the relevant claimant State would always be followed by a subsequent exchange of notes when, more often than not, the validity of the claim was questioned by the state undertaking such scientific activity, and the territorial claimant protested when the activities undertaken were perceived as a threat to its asserted rights. The second expedition by Admiral Byrd, announced in 1933, was offered by the New Zealand authorities "any facilities within their power either in this Dominion or in the Ross Dependency". The uneasiness created by the subsequent issue of special American postage stamps and the swearing in of two members of the Byrd expedition as postal officials by the US Post Master General happily ended with New Zealand noting that the American official was proposing to cancel the specially stamped letters on board ship rather than at the Little America station in Antarctica and in those circumstances, "His

Majesty's Government in New Zealand have no objection to the proposed visit of Mr. Anderson. . ..."[21]

The same routine took place, over and over again, with Antarctic expeditions considered foreign visits by the territorial claimant and supposedly tolerated only as a purely scientific ventures. During this decade (1929–1939) disagreements on territorial claims led to negotiations and arrangements, some of which finally appeared to close the ends of the Antarctic chart with the single exception of the overlapping claims in the region of the Antarctic Peninsula. Such optimistic assessment discounted the fact that the US opposed all claims and the USSR, after challenging Norwegian sovereignty on Bouvet Island in 1939, would take a similar stand.

During the following decade (1939–1949), Antarctic expeditions increased in numbers, nationalities and areas being covered by their explorations. Ritual protests coupled with the offer of facilities for scientific research continued. The problem was not solved, only shelved, by this "agreement to disagree" since the implication was, for the claimant, that scientific activity could never become a full or even inchoate title to sovereignty, and it was also obvious that any new claimant desiring to enhance its claim with proof of recent activity would wish to resort precisely to those scientific and logistic activities that were denied juridical effect.

Recognition of the value of scientific endeavour and balance of power considerations combined to create in Antarctica a rare but fragile atmosphere of peaceful coexistence. The "Pax Antarctica" prevailed through the exchange of specially invited observers and some cooperative arrangements significantly contributed to defuse tensions. The "Agreement for a British–American Weddell Coast Party"[22] between the American explorer Finn Ronne and Major Pierce-Butler of the Falkland Islands Dependencies Survey was a practical arrangement made on the spot by the leaders of two national expeditions. A joint statement by the Argentine Foreign Minister Atilio Bramuglia and the British Foreign Secretary Aneurin Bevin,[23] announcing the restriction to levels of normal logistic support of naval activity south of 60ºS during the 1948–1949 Antarctic season, adhered by Chile, supported by the United States and ratified in successive declarations could well be considered a source of international obligations and a precedent to article I of the Antarctic Treaty.

11.2.3 The IGY Scientific Revolution

The first contribution made by the IGY to the forthcoming Antarctic Treaty framework was a "gentleman's agreement" that scientific stations and expeditions would not constitute a precedent or modify existing relations among states active in Antarctica. Resolution I, adopted at the First Antarctic Conference, pursuant to a

---

[21] Templeton (2000:66).

[22] Bertrand (1971:528–529).

[23] Foreign Relations (1948:vol. 1, Part 2, 962 ff.).

statement by its chairman Georges Laclavere, stressed that its objectives were purely scientific. Resolution II recommended that stations be adequately distributed all over Antarctica in order to allow the best possible study of the geophysical phenomena which were the objects of the IGY. A statement by the Argentine and Chilean delegates interpreted the recommendations for the coordination of existing and new bases as "temporary measures" calculated to achieve the best results of the IGY and adopted in the "interests of scientific development", without prejudice to the "existing status" in the Antarctic regarding the participating countries.[24] While no disagreement was expressed with this interpretation, in-depth analysis of the global nature and the permanent scientific interests reflected in the Resolutions of the four Antarctic Conferences demonstrate that they were not "temporary measures" and rather reflected the need for more elaborate institutions in order to adequately ensure the "interests of scientific development".

National reports, Resolution 7 (ECV) of the World Meteorological Organization (WMO and the reports of the International Geodesic and Geophysical Union (IGGU) combined to provide criteria and guidance for the performance of the IGY programme:

- grant absolute priority to problems of a global nature
- avoid by all means dispersion of efforts or resources
- focus on problems which can be solved within a definite period (i.e. one year)
- eliminate any observation programme which object is not clearly spelled out
- observation programmes must be functional to the general programmes decided upon.

These rules clearly defined the content and limitations of what was to be considered and recommended as valuable scientific research during the IGY and illuminate the meaning of article II in the Antarctic Treaty.

The final location of stations required all the negotiating skills of chairman Laclavere to strike a balance between American and Soviet presences, respectively assigned to the South Pole and the Pole of Inaccessibility, and also decide on the South Magnetic Pole (Resolutions V & VII). Geographic distribution maximized comparative advantages for stations assigned to Ross Island, Princess Astrid Coast, Knox Coast and Vahsel Bay and others in the Weddell Sea (Resolutions III, IV, VI and VII), but could not prevent security, political and logistic considerations influencing the final decision. Resolution VIII aims at the coordination of groups of neighbouring stations. The IGY also built on the pre-existing Antarctic practices concerning vital activities such as communications, weather forecasting, search and rescue, to develop a larger measure of international administration for the Antarctic Continent.[25]

---

[24] Auburn (1982:89).

[25] Whiteman (1963:1242).

Resolutions XII–XV on logistic support, XVI–XXIV on radio communications, XXV on technical exchanges on the establishment of new stations and XXVI on training of personnel amplified the horizons of Antarctic cooperation. Resolution XLIV noted the deliberations of the Argentine, Chilean and British delegations and approved their results concerning the location of their respective stations in the region of the Antarctic Peninsula.

The establishment of a meteorological unit designated as Antarctic Weather Central (AWC) (Resolutions IX and XI) was supplemented by coordination measures, including assistance and encouragement to the Southern Hemisphere countries to perform meteorological surveys of the Southern Ocean. The AWC and the World Weather Watch in Melbourne helped better to understand how the Antarctic meteorological system behaved. Personnel from different stations served tours at AWC, contributing to a climate of solidarity promoted by the IGY.

The IGY developed and carried forward an already existent Antarctic status quo, sustained by an extended practice, mostly pragmatic but occasionally formalized in agreements, which had nevertheless failed to crystallize into a formal international convention or agreement. However, the IGY input was decisive on one count: the solution of one of the most crucial areas of the protracted “Antarctic dispute”: the kind of scientific organization most appropriate for the conduct of cooperative scientific activity in Antarctica. A “Global Plan for Antarctic Scientific Research”, tightly managed by an Antarctic Commission proposed by the United States, and a “High Authority” with a centralized system of scientific planning advocated by the UK, countered by a less powerful “Consultative Committee” suggested by Chile, had all been rejected. When the United States decided to opt out of all conversations and convene by itself an Antarctic Conference, its gamble was based on the unquestionable success of the IGY.

The course of the IGY demonstrated in tangible terms that binding undertakings and concerted action in substantial scientific programmes and projects, as well as the location of stations, the deployment of logistic support and the undertaking to share scientific results of ongoing research, could be accomplished without transferring all the authority to a single scientific body. This long-standing practice of the IPYs also contained inherent weaknesses. Up to the time of the IGY any attempt to organize polar research had been short-lived. Polar organizations were established for some specific objective and hence were self-liquidating.[26] On the recommendation of the Fourth Antarctic Conference (1957), the Executive Board of ICSU set up an ad hoc committee to examine the merits of further general scientific investigations in Antarctica which would be regarded as being inspired by the interest aroused by the activities of the IGY, and not as an extension of the IGY. In 1958 ICSU established the Special (later Scientific) Committee for Antarctic Research (SCAR) whose first meeting outlined a plan for further scientific exploration of Antarctica.[27]

---

[26] Rowley (1966:284).

[27] Fifield (1987:26).

11.2.4 The Treaty Regime and Science

The US invitation to attend an international conference, addressed to all countries participating in the IGY with Antarctic programmes, introduced the subject with a direct reference to the "splendid example of international cooperation" provided by the IGY, to its imminent conclusion at the end of 1958 and the need to ensure its continuation, to overcome political rivalries and build up friendly collaboration in Antarctica. Three basic pillars would suffice to reach these ends: (a) freedom of scientific research and "continuation" of the international scientific cooperation under the IGY; (b) an international agreement that would ensure that Antarctica be used only for peaceful purposes; (c) any other peaceful objective not inconsistent with the UN Charter. The thrust of the non-prejudicial clause originating in the "gentleman's agreement" was also mentioned. All the replies agreed with the above-mentioned principles and the references to the IGY.

The Preamble to the Treaty states that "a firm foundation for the continuation and development of such cooperation on the basis of freedom of scientific investigation in Antarctica as applied during the International Geophysical Year accords with the interests of science and humanity".

Article II states: "Freedom of scientific investigation in Antarctica and cooperation towards that end, as applied during the International Geophysical Year, shall continue, subject to the provisions of the present Treaty." The draft article coming from the Preparatory Meeting defined freedom of scientific research solely as "subject to the provisions of the Treaty". Argentina had objected to that draft and to any extensive interpretation of "freedom of scientific investigation", and the Plenary of the Antarctic Conference approved the present wording proposed by South Africa.[28] The meaning of "as applied" must be found in the guiding principles of the IGY programme: priority to problems of global importance, avoiding duplication or dispersion of efforts or resources, focus on observations within fixed periods, subordination to general programmes, all amounting to an international division of scientific effort.

Article II also qualifies freedom of scientific research as "subject to the provisions of the Treaty" and a certain restraint in the exercise of freedom of scientific investigation arises from the application of article III which conditions the exchange of information on plans for scientific programmes and scientific personnel by the words "to the greatest extent feasible and practicable". The wording and the means for this exchange are in line with IGY practice. But the exchange under the Treaty also results in a definite obligation: "scientific observations and results from Antarctica *shall be exchanged and made freely available*". While this requirement goes beyond the IGY rules, it joins the tradition of International Polar Years in whose context the following statement was made in 1880: "Scientific knowledge of lasting value can result from coordinated and cooperative studies undertaken

---

[28] Templeton (2000:229).

according to an agreed plan, with the results of the observations *freely shared without discrimination*."[29]

Article IV translated into legal language the 1955 IGY "Gentleman's Agreement". The concept originates in the status quo proposal drafted in 1948 by Professor Julio Escudero, but the elaborate present language is mostly the contribution of the French jurist André Gros, at the time Legal Adviser to the Quai d'Orsay.

Article V establishes Antarctica as a nuclear-free zone with a reservation concerning possible conclusion of future binding agreements on the peaceful use of nuclear energy. Parties adopted Recommendation VIII-12 (1975) to the end that no one disposes of or stores radioactive waste in the Antarctic Treaty Area; Recommendations VI-5 and VI-6 prevent the uncontrolled use of radio-isotopes, environmental harm or damage to subsequent investigations.

Article VI would seem to restrict scientific activity to the zone of application of the Treaty, the area below 60ºS, chosen by a clear majority against the USSR's preference for the Antarctic Convergence. SCAR had already, in February 1958, prepared the first plan for the exploration of Antarctica in the years following the IGY, in whose context its members agreed that the "Antarctic" shall be bounded by the Antarctic Convergence, the "Polar Front" between latitudes 40º and 60ºS, where cold northward-moving surface water from Antarctica meets the warmer southward-moving water from the temperate regions. SCAR also included in its studies some sub-Antarctic islands to the north of the Antarctic Convergence. The Protocol to the Antarctic Treaty for the Protection of the Environment (1991) also applies within the Antarctic Treaty Area, but references to adjacent areas (article 6.3) and the Antarctic Environment followed by "its dependent and associate ecosystems" enlarge the geographic scope. The complexities of article VI, the inclusion of "ice shelves" and mention of "high seas" rights give rise to different legal interpretations which should not restrict the scope or freedom of scientific research in the Southern Ocean crucial to the understanding of global change in Antarctica.

The remaining Antarctic Treaty articles have no direct relationship to the status of scientific research, except that scientists are subject to their national jurisdiction under article VIII. The key article IX defined the procedure to be followed for the furtherance of the principles and objectives of the Treaty, including the facilitation of scientific research and international scientific cooperation in Antarctica, but did not resolve the issue of which type of scientific organization would be sponsored by the Treaty Consultative Parties. In 1948, Thomas Huxley had unsuccessfully advocated an International Scientific Institute hosted by UNESCO; during the Preparatory Meeting in 1958, Chile had advanced the idea of a Scientific Institute managed by the Parties. While the Antarctic Treaty does not mention SCAR by name, its Preamble acknowledges "the substantial contributions to scientific knowledge resulting from international co-operation in scientific investigation in Antarctica". The final decision made in favour of SCAR, the most realistic and wise choice, was

---

[29] Kimball (1987:3).

also the best reflection of the vitality of the legacy inherited from the International Geophysical Year.

References and Further Reading

Archdale, H.E. 1957: Legality in Antarctica. *Australian Outlook,* September: 10–16.

Astuto, U. 1990: Origine e sviluppo del sistema antártico. *Comunita Internazionale* 5(1): 68–82.

Auburn, F.M. 1982: *Antarctic Law and Politics,* 361 p. London: C. Hurst.

Baker, F.W.G. 1964: The First International Polar Year. *Polar Record* 21(132): 275–285.

Baldwin, G.B. 1964: The Dependence of Science on Law and Government – the International Geophysical Year – A Case Study. *Wisconsin Law Review*: 78: 109.

Barrie, G. 1975: The Antarctic Treaty: Example of Law and Sociological Infrastructure. *Comparative and International Law Journal of South Africa* 8: 212–224.

Battaglini, G. 1971: *La Condizione dellÁntartide nel Diritto Internazionale,* 295 p. Padova: CEDAM.

Beck, P.J. 1985: *Preparatory Meetings for the Antarctic Treaty 1958–1959. Polar Record* 22(135): 653–664.

Beck, P.J. 1986: *The International Politics of Antarctica,* 182 p. London: Croom Helm.

Berguño, J. 1991: *Manual de Teoría y Práctica del Sistema Antártico*. Vol. I, Segunda Parte. La Ciencia Antártica, Santiago: Primera Edición.

Bertrand, K.J. 1971: *Americans in Antarctica 1775–1948,* 554 p. New York: American Geographical Society. Special Publication No. 39.

Bulkeley, R. 2008: Aspects of the Soviet IGY. *Russian Journal of Earth Sciences* 10(ES 1003 online): 1–17.

Bull, H. 1977: *The Anarchical Society. A Study of Order in World Politics,* 370 pp. New York: Columbia University Press.

Bush, W.M. 1991: *Antarctica and International Law: A Collection Of Inter-State And National Documents,* 4 vol. Dobbs Ferry, New York: Oceana Publications.

Butler, S.O. 1977: Owning Antarctica: Cooperation and Jurisdiction at the South Pole. *Journal of International Affairs* 32: 34–51.

Byers, M. 1999: *Custom, Power, and the Power of Rules. International Relations and Customary International Law*, 250 pp. Cambridge: Cambridge University Press.

Calflish, L. 1992: The Interaction of Science and Politics in the Field of International Relations: the Case of Antarctica. *Polar Record* 28(165): 159–164.

Chapman, S. 1959: *The IGY. The Year of Discovery*. Ann Arbor, MI: Michigan University Press.

Craddock, C. 1982: Antarctica and Gondwanaland. In: C. Craddock (ed) *Antarctic Geoscience,* pp 3–13. Madison, WI: The University of Wisconsin Press (IUGS series B 4).

Crary, A.P. 1962: The Antarctic. *Scientific American Reprint* 857(IX):11.

Daniel, J. 1949: Conflict of Sovereignty in the Antarctic. *British Yearbook of World Affairs* L V 3: 241–255.

Dansgaard, W. 2004: *Frozen Annals. Greenland Ice Cap Research.* Copenhagen: Niels Bohr Institute for Astronomy, Physics and Geophysics at Copenhagen University.

Dansk Udenrigspolitisk Institut 1997: *Grønland under den kolde krig. Dansk og amerikansk sikkerhedspolitik 1945–1968,* 2 vol. Copenhagen: Danish Institute for the Study of International Relations.

Dietrich, D. (ed) 1969: *Atlas of the Hydrography of Northern Atlantic Ocean Based on the Polar Front Survey of the International Geophysical Year, Winter and Summer 1958.* Carlottensund Slot: ICES Publication.

Doel, R. 2003. Constituting the Postwar Environmental Sciences: The Military Influence on the Environmental Sciences in the USA after 1945. *Social Studies of Science* 35(5): 635–666.

Eklund, C.R. 1959: *Life History and Distribution of the South Polar Skua*. University of Maryland: Doctoral dissertation.

Elzinga, A. (ed) 1993: *Changing Trends in Antarctic Research.* Dordrecht: Kluwer.

Elzinga, A. 2009: Through the Lens of the Polar Years: Changing Characteristics of Polar Research in Historical Perspective. *Polar Record* 45(235): 313–336 (a paper presented at the SCAR Open Science Conference in St. Petersburg 2008).

Elzinga, A. in press: A History of Ice Core Drilling and Science with some Early Roots in the Cold War – from Camp Century to EPICA. Columbus, OH: Ohio State University, Byrd Polar Research Center (paper presented at the *3rd SCAR action group workshop on the history of Antarctic science*, Byrd Polar Research Center, 25–26 October 2007).

Essen, A. 1960: Le problème político-juridique de lÁntarctique et le Traité de Washington", *Annales de Droit et de Sciences Politiques* 20(3): 227–236.

Fifield, R. 1987: *International Research in the Antarctic,* 146 p. Oxford: Published for the Scientific Committee on Antarctic Research (SCAR) and the ICSU Press by Oxford University Press.

Fogg, G.E. 1992: *A history of Antarctic science*. Cambridge: Cambridge University Press.

Foreign Relations of the United States 1948: vol. 1, Part 2, 962 ff. US Department of State, Office of the Historian.

Gajardo, E. 1977: Historia Diplomática del Tratado Antártico y la participación chilena en su elaboración. *Revista de Difusión INACH,* 10: 40–64.

Goldstein, J., and Keohane, R.O. (eds) *Ideas and Foreign Policy. Beliefs, Institutions, and Political Change,* 308 p. Ithaca, NY: Cornell University Press.

Guillaume, G. 1991: Le statut de lÁntarctique: reflexions sur quelques problèmes récents". In: *Humanité et droit international,* pp 171–177. Paris: Pedone.

Guyer, R. 1973: The Antarctic System. *Hague Recueil,* 139: 149–225.

Hamblin, J.D. 2000: Science in Isolation: American Marine Geophysics Research 1950–1968. *Physics in Perspective* 2(3): 293–312.

Hanessian, J. 1960: The Antarctic Treaty 1959. *International and Comparative Law Quarterly* 8: 436–449.

Hayton, R.D. 1959: *National Interests in Antarctica. An Annotated Bibliography,* 137 p. Washington: U.S. Government Printing Office.

ICSU 1959: *International Council of Scientific Unions. 1959. Annals of the International Geophysical Year.* Vol. 1, New York: Pergamon Press.

Jones, H.S. 1959: The Inception and Development of the International Geophysical Year. *1 Annals of the IGY,* pp 383–393, New York: Pergamon Press.

Kimball, L.A. 1987: *Future Directions for the Management of Antarctic Science,* 41 p. Racine, WI: The Johnson Foundation.

Krasner, S.D. (ed) 1983: *International Regimes,* 372 p. London: Cornell University Press.

Langway, C.C. Jr 2008: *The History of Early Polar Ice Cores.* Hannover, NH: US Army Engineering Research and Development center of Cold Regions Research and Engineering (ERDC/CRREL) (TR 08-1).

Lauterpacht, E. 1977: Gentleman's Agreements. In: W. Flume, H.J. Hahn, G. Kegel, and K.R. Simmonds (eds) *International Law and Economic Order*, München, Beck, pp 381–396.

Law, P. 1968: Antarctica-Nature's Unique Scientific Laboratory 16. *Australian Natural History Series* 4: 102

Leeper, R.A. 1948: Note of the British Ambassador in Buenos Aires, Sir R.A. Leeper, dated 17.12.1947 to Dr. A. Bramuglia, Minister for Foreign Affairs and Worship of Argentina. *Polar Record* 5(229–231).

Lewis, R.S., and Smith, P.M. 1973: *Frozen Future. A Prophetic Report from Antarctica.* New York: Quadrangle Press.

Lolck, M. 2006: *Klima, kold krig og iskerner*. Aarhus: Aarhus University Press.

Memorias del Ministerio de Relaciones Exteriores, 1948–1959. Santiago, Chile, Library of the Ministry of Foreign Affairs.

National Academy of Sciences – National Research Council 1961a: *Science in Antarctica. Part I The Life Sciences in Antarctica*. Washington: NAS/NRC Publication No. 839

National Academy of Sciences – National Research Council 1961b: *Science in Antarctica. Part II The Physical Sciences.* Washington: NAS/NRC Publication No. 878.

Nicolet, M. (ed) 1959: The International Geophysical Year Meetings. *2A Annals of the International Geophysical Year,* Vol. IIA, UK, Permagon Press, pp 176–177.

Petrov, V. 1957: Soviet Participation in the Geophysical Year. *Professional Geographer* 9(3): 7–10.

Pinochet de la Barra, O. 1991: *Reminiscences of the 1959 Antarctic Treaty Conference. Speech on the 30th anniversary of the entry into force of the Antarctic Treaty*. Bonn: ATCM.

Robin, G.Q. 1962: The Ice of Antarctica. *Scientific American Reprint*. 562: 2–16.

Rowley, G.W. 1966: International Scientific Relations in the Arctic. In: R. St. J. Macdonald (ed) *The Arctic Frontier,* pp 279–292. Toronto: Canadian Institute of Arctic Affairs.

Sullivan, W. 1959: The International Geophysical Year. *International Conciliation* 521: 116–126.

Sullivan, W. 1961: *Assault on the Unknown. The International Geophysical Year.* London: Houghton & Stoughton Ltd.

Summerhayes, C.P. 2008: International Collaboration in Antarctica: the International Polar Year, and the Scientific Committee on Antarctic Research. *Polar Record* 44(231): 321–334.

Templeton, M. 2000: *A Wise Adventure. New Zealand and Antarctica 1920–1960,* 328 p. Wellington: Victoria University Press.

Walton, D.W.H. 1987: *Antarctic Science*. Cambridge: University Press.

Watts, A. 1992: *International Law and the Antarctic Treaty System*, 469 pp. Cambridge: Grotius.

Wexler, H., 1959: The Antarctic Convergence – or Divergence? In: B. Bolin (ed) *Rossby Memorial Volume. The Atmosphere and Sea in Motion,* pp 107–120. New York: Rockefeller Institute Press.

Whiteman, M. (ed) 1973: *Digest of International Law,* 13 vols. Washington, DC: US Government Printing Office.

Wilson, J.T. 1961: *IGY. The Year of Many Moons.* New York: Alfred Knopf.

Chapter 12
Side-Effects and Traces of the Early IPYs

Susan Barr and Rip Bulkeley

Like many other human enterprises, the Polar Years left their mark in spheres that lay outside their primary purpose. Some of the IPY-1 stations in remote locations are now of great archaeological interest. As the first "mass participation" Polar Year, the IGY was the subject of several works of literature and the other arts, though only in a few countries. And a small number of people, some of them scientists but the majority in supporting roles, were seriously injured or lost their lives while taking part in a Polar Year.

The General Reports of the IPY expeditions contain a wealth of data of both historic and general interest. The compilation by William Barr of detailed accounts of the IPY-1 reports presented in English is an excellent introduction to these late nineteenth-century polar expeditions.[1] The IPYs 2 and 3/IGY became more complicated and more difficult to present in such a manner. Hopefully, this volume goes a little way towards filling in some of the gaps.

12.1 Archaeological Remains

12.1.1 IPY-1

IPY-1 was an operation for exclusive groups which were sent to remote areas in order to establish bases primarily for one year of dedicated observations and measurements. At the end of the programme, the bases were evacuated. This has left a wealth of archaeological and empirical data which is both a source of information for historians today and a focus of interest for tourists and other visitors to the

---

S. Barr (✉)
Directorate for Cultural Heritage, PO Box 8196 Dep., No-0034 Oslo, Norway
e-mail: susan.barr@ra.no

R. Bulkeley (✉)
Exeter College, Oxford, UK
e-mail: rip@igy50.net

[1] Barr (2008).

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_12,

sites. Unhappily, the remains have also been a mine of souvenirs for visitors who have not appreciated the significance of such sites remaining untouched from human interference and open to degeneration only from the unavoidable forces of nature.[2]

The main stations for the 10 participating countries were:

Denmark: Godthaab, Greenland
Finland: Sodankylä
France: Cape Horn, Tierra del Fuego
Germany: Kingua Fjord, Baffin Island and South Georgia
The Netherlands: Kara Sea
Norway: Bossekop + Kautokeino
Russia: Sagastyr, Siberia and Karmakuly, Novaya Zemlya
Sweden: Kapp Thordsen, Svalbard
UK/Canada: Fort Rae, Great Slave Lake
USA: Point Barrow and Lady Franklin Bay, Ellesmere.

Several of the IPY-1 expeditions stayed in buildings or at settlements that already existed for various reasons (missions, trading posts, local settlements). These were the expeditions from:

Denmark: The group stayed at the Godthaab settlement in Greenland which is now the main city of Nuuk. They erected four prefabricated buildings near to the settlement. No remains of the station are left today, but a statue of the Norwegian missionary Hans Egede (1686–1758) marks the top of the small station hill.[3]

Great Britain: The group stayed at the Hudson's Bay Company trading post at Fort Rae and used existing log huts.

Norway: The group stayed in a farmhouse at the settlement of Bossekop. Sophus Tromholt in Kautokeino stayed in the house of the local police authority.

Finland: The group stayed in the village of Sodankylä. Four small wooden buildings were erected for the observatories. An auxiliary station at Kultala adapted existing buildings belonging to a government survey station.

USA – Point Barrow: The group erected a station building near the Eskimo settlement at Barrow, Alaska. The hut, minus the second-storey "tower", is still standing today, but in a rather sorry and anonymous state. It is not in use and not protected by law in any way (Fig. 12.1).

In addition the Dutch IPY expedition was stuck on their ship in the ice of the Kara Sea and did not establish a station on land.

---

[2] Among others, the International Council on Monuments and Sites (ICOMOS)' special committee on polar heritage (IPHC) attempts to address the challenge of documentation and preservation of historic polar sites in an international perspective. See www.polarheritage.com and Barr and Chaplin (2008).

[3] For illustrations of Arctic stations, see: http://www.arctic.noaa.gov/aro/ipy-1/Frontpage.htm. For a short-illustrated information about the Greenlandic IPY stations, see *Greenland Collector* (stamps) at: http://www.stamps.gl/NR/rdonlyres/CF979115-A986-411A-AD77-DC2FC484B1E9/0/Collector_UK_web.pdf

Fig. 12.1 Point Barrow IPY station in 2007. Photo Susan Barr

The specially erected land stations from IPY-1 met the following fate:

Austria-Hungary on Jan Mayen: The buildings of the Österreichische Polarstation JM, today known as *Østerrikeren* [The Austrian], were left in 1883 in perfect condition with a large amount of equipment and provisions to be used by any following expeditions. These were mostly overwintering fox trappers. In 1917 or 1918 Count Wilczek transferred the ownership of the buildings to Denmark in thanks for their recognition of his polar research. Denmark never used the buildings, but claimed the ownership when Jan Mayen formally became a part of the Kingdom of Norway in 1930. However, by the end of the nineteenth century the buildings were already rather derelict, and they were only repaired sufficiently for the various wintering hunters to use. Denmark gave up its claim to *Østerrikeren* in 1933, recognizing that it was too derelict to be repaired. During the Second World War the Norwegian garrison stationed on Jan Mayen used the timbers from *Østerrikeren* to build anti-aircraft positions and canon platforms. Today little more than the foundations of the polar station are left, and the seaward end of these has already disappeared due to rapidly increasing erosion of the shore area. The remains are protected according to the Cultural Heritage regulations for Jan Mayen.

The grave of sailor Viscovich-Sturla from the ship *Pola*, which transported the IPY expedition to and from Jan Mayen, still remains near to *Østerrikeren*. The original massive driftwood cross lies at the head of the grave, while a new cross was erected in 1983. The grave is also protected (Fig. 12.2).[4]

France – Bahia Orange, Tierra del Fuego: The prefabricated huts were donated to Thomas Bridges at the mission station in Ushuaia by the French commander

---

[4] Barr (2003:55–57).

Fig. 12.2 Remains of Østerrikeren can be seen at the foot of the far slope, with the cross on the far right. Wave erosion is gradually destroying the site from the left. Photo Susan Barr (2006)

Martial, but left in situ. Bridges had to go there and dismantle the buildings for further use. He did this at some point, but no original building from the French station seems to exist either in Ushuaia or in Harnberton. It seems that Bridges must have used the materials to build other houses as is known from other cases.[5] A brick pillar from one of the observatories (see photo in Chap. 3, France) and a heap of building stones now mark the site (Fig. 12.3).

Fig. 12.3 Remains at the site of the Bahia Orange station. Photo Denis Chevallay

---

[5] Pers.com. Dec. (2009) Alfredo Prieto, CEHA Instituto de la Patagonia, Chile.

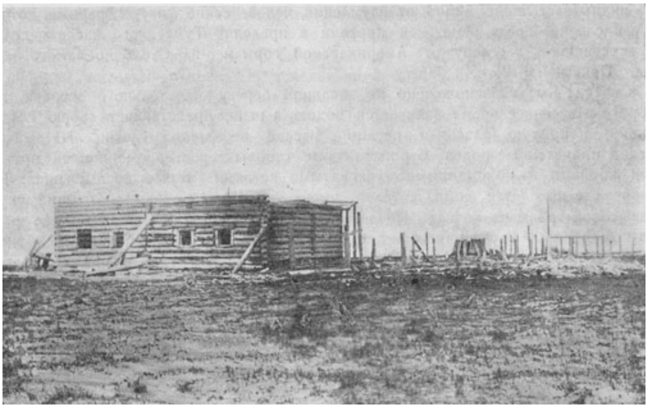


Fig. 12.4 Sagastyr 1921: Ruins of the Sagastyr station, 1921. From Evgenov NI (1929) Materialy ekspedicii k ust'yam rek Leny I Oleneka pod nachal'stvom F.A. Matisena v 1920 g. IN.I. Evgenova v 1921 g. Akademiya nauk SSSR I Gidrograficheskoe upravlenie. Trudy Komissii po izucheniyu Yakutskoi ASSR, 3(1): 72

Russia: Sagastyr, Lena Delta and Malye Karmakuly, Novaya Zemlja: Sagastyr: A report from c. seven years ago stated that only a 2-m high wooden monument showing the date of the station foundation marked the site (Fig. 12.4).[6]

Malye Karmakuly: According to a survey report by the Russian Research Institute for Cultural and Natural Heritage,[7] the station area was in use for meteorological observations from 1896 and the buildings existing in 1942 were destroyed by the German navy. New buildings were erected after the war.

Sweden at Kapp Thordsen, Svalbard: The Swedish IPY-1 station at Kapp Thordsen, Svalbard, today known as *Svenskhuset* [the Swedish House], is the only one of the large nineteenth-century buildings in Svalbard which still stands and is the second oldest of all standing buildings in Svalbard. It is protected according to the Environmental Law for Svalbard. Today only the house itself and the small observatory hut on top of the hill behind still stand, while remains of the various other small buildings belonging to the IPY station can be distinguished. The first major restoration of the house, involving the repair of two walls and the roof, was carried out in 1982. Since then further repairs have been carried out as necessary and the building has high priority on the list of cultural monuments in Svalbard. It is not in use today and is more or less empty inside (Fig. 12.5).

Germany: Kingua Fjord, Baffin Island and South Georgia: At the IPY-1 station site at Kingua Fjord the concrete blocks and pillars for instruments can still be seen, as can the rough stone building for the astronomical observations and an outline of the foundations of the main hut. Others of the stone pillars have been removed to other sites and new uses in the larger district area.[8]

---

[6] Personal communication from Pavel Filin.

[7] Mazurov et al. (1996:33).

[8] Barr (2008:106).

Fig. 12.5 Svenskhuset after restoration work in 1982. Photo Susan Barr

Fig. 12.6 Remains of the iron Transit of Venus observatory cupola. Photo Bob Headland

The station at Moltke Harbour, Royal Bay, South Georgia, was reported in 1931 to be in ruins.[9] There are still remains to be seen, such as floor materials and granite instrument mountings, as well as the iron transit of Venus cupola (Fig. 12.6), scattered artefacts such as cast-iron stoves, glass and earthenware bottles. These are recognized as part of the island's heritage.[10]

USA: Lady Franklin Bay, Ellesmere Island, Canada: Fort Conger, Lady Franklin Bay, was evacuated on 9 August 1883 and left in good condition with the remaining

---

[9] Headland (1986:60).

[10] South Georgia (2006:28–29).

Fig. 12.7 Remains of Starvation Camp on Pim Island. Photo Susan Barr (2003)

coal and provisions stored inside the cabin for any later users. Nature and visitors have since broken the buildings down, but the site is easily recognizable today with its generous scattering of broken remains of artefacts in wood, glass, metal and pottery. It has been designated a Canadian National Historic Site.[11]

Pim Island, where Greely's expedition ended in starvation, still shows the remains of the stone-walled hut where the tragedy took place. It is reported that many artefacts have been removed by visitors over the years (Fig. 12.7).[12]

12.1.2 Examples of IPY-2 Stations

The Austrian expedition to Jan Mayen did not use the derelict buildings from IPY-1, but lived in the reserve station at the Norwegian radio and meteorological station on the other side of the island. They were only three men this time and they impinged little on the Norwegian station. The Norwegian station, including the reserve hut, was destroyed early in the Second World War when Jan Mayen was evacuated after the German occupation of Norway. The Norwegian garrison which took over the island from March 1941 used the station area for patrols and anti-aircraft installations.[13] The site is today protected according to the Cultural Heritage regulations for Jan Mayen and foundations and scattered remains can be seen (Fig. 12.8).

The French at Scoresbysund in Greenland: As related in Chap. 7 – France, the main building of the French IPY-2 station was donated to the Danish Crown and

---

[11] Kobalenko (2002:127–28).

[12] Pers.com. from Jerry Kobalenko.

[13] Barr (2003).

Fig. 12.8 The site of the Norwegian meteorological station and Austrian IPY-2 station, both destroyed in 1940. Photo Susan Barr

was used as the local hospital until it burned down 25 years later. In connection with IPY-4, the buildings of the French IPY-2 station were commemorated on the Greenlandic DKK 10.50 stamp in October 2008.[14]

The Soviet Union in Pamir, Tajikistan: The Fedchenko Glacier in the Central Asian Pamir range of central Tajikistan[15] is, at 70 km, the world's largest glacier found outside the polar regions. It was discovered in 1878 and named for the nineteenth century Russian explorer A.P. Fedchenko who, however, was not the discoverer. Its middle and upper reaches were first explored in 1928 as part of the Soviet–German Alai-Pamir Expedition. Over the years the glacier has been the site of several meteorological stations, one being built for IPY-2 at 4,169 m,[16] possibly as a result of the 1928 expedition. This station seems to have been in use until 1994, although not continuously, and the building still exists.[17]

Sweden on Nordenskiöldfjellet, Svalbard: The Swedish IPY-2 station in Svalbard was situated on the hilltop Nordenskiöldfjellet by the main settlement of Longyearbyen and was really just a cabin for the three men. The cabin is automatically protected according to the Environmental Law for Svalbard and was considerably restored and upgraded by the Governor of Svalbard in 1994. It is currently used by the local Red Cross as a shelter and depot and is also regularly used by visitors who climb to the hilltop.

---

[14] Thing (2008).

[15] Information from http://www.britannica.com/EBchecked/topic/203322/Fedchenko-Glacier, accessed January (2010).

[16] According to Soviet IGY reports.

[17] Information from Christoph Mayer via C. Lüdecke

12.1.3 IPY-3/IGY

Many of the IGY polar stations have been continuously occupied since they were built, or were so for many years. That means that their sites do not easily provide "snapshot" views of the past, even when archaeologists can gain access to them. Several IGY Antarctic stations have been replaced by later structures, while the originals either became buried under tons of compacted snow or drifted out to sea on tabular icebergs. None of the IGY buildings at the US McMurdo Station has survived, for example, and although their plans may have been archived it is unlikely that physical traces of them remain. However, at New Zealand's nearby Scott Base the first IGY hut, erected in 1956, is almost unique among Polar Year stations because it has been preserved both externally and, to a large extent, internally. It acts as a museum and still houses scientific and communications equipment from the IGY and the related Trans-Antarctic Expedition.[18]

Antarctica also holds other interesting archaeological relics from the IGY, such as the rock-cut tombs of Soviet participants on Buromskii Island near Mirnyi Station (Fig. 12.9)[19] or the well-preserved wreck of an Auster aircraft belonging to the Belgian expedition, which crashed near the Belgica Mountains in December 1958.

In the northern hemisphere Poland's station at Hornsund, Svalbard was erected in 1957 and not used after the IGY until 1978. Since then it has been considerably upgraded and is today a modern research station. The Swedish station at Kinnvika, also in Svalbard, was erected in 1957 and consisted of 11 buildings scattered over a

Fig. 12.9 The Russian cemetery on Buromskii Island – Courtesy of the Arctic and Antarctic Research Institute, St Petersburg

---

[18] White, S. (2002).

[19] Report of the Russian Federation.

Fig. 12.10 The Kinnvika IGY station today. Photo Susan Barr

flat, stony area in the northeast of Svalbard (Fig. 12.10). It was used until 1959 and then left empty and a few of the buildings have only been sporadically used since. The station has been used as a base for research projects (mainly glaciological) during IPY-4. The 10 remaining buildings now belong to the Norwegian state and were protected by law in 2009 as an intact example of a complete research station from that era (Fig. 12.11). In Pamir, in central Asia, the Soviet Union established two more stations for the IGY at the Fedchenko Glacier, one at 4,880 m, the second highest IGY station in the world after Chacaltaya in Bolivia, and the other at 3,000 m at the glacier foot. These were almost certainly not intended to be permanent.

Fig. 12.11 The main Kinnvika building today. Photo Susan Barr

(See photo of Fedchenko hut in Chap. 1.) Since 2003 an automatic weather station has been operated on the glacier by Swiss scientists.[20]

12.2 Original Scientific Data and Instrumentation as Historical Artefacts

Throughout the history of the first three Polar Years, there has been a certain under-use of the historical data that was collected at such expense. There is often a seemingly insurmountable gap between the collection of raw data and the production of scientific knowledge until finally the original data comes to be regarded more as an historical paper artefact than as a scientific basis for further studies. Many of the measurements and observations collected by the Polar Years remain scientifically useful today. However, since the digital revolution has transformed the communication and storage of scientific data, the physical media in which they previously were stored, from handwritten log-books to photographic microfiches, have themselves become historically significant artefacts. In many parts of the world rooms full of such material are now ripe for examination by social scientists rather than earth scientists.

The obvious case here is IPY-2, because of world conditions between 1932 and 1945 (see also Chap. 8 – Elzinga). In 1951, Laursen's final IPY-2 bibliography contained many entries which referred to copies or even originals of primary data held in Copenhagen.[21] When the IGY was proposed some influential voices pointed out that their institutions were still awash with unused data from IPY-2 – notably Sir David Brunt (1886–1965), Vice-President of the Royal Society and Merle Tuve (1901–1982), Director of the Carnegie Institution of Washington's Department of Terrestrial Magnetism. But this problem was not confined to IPY-2. For example, the meteorological observations from the British IPY-1 expedition to Fort Rae were never used either. This might not seem surprising when one reads about the rough treatment which their instruments received on the way from the railhead!

The instruments used during the Polar Years have naturally a higher historical interest the older they are, but with the rapid strides in scientific development from one IPY to the next, the instrumentation from each Year is an important material source for the history of science and technology. Instruments and other equipment from the first three IPYs are to be found in museums and institutions around the world, and in addition many polar veterans or their descendants also retain items of personal equipment such as kitbags, clothing, etc. The conservation of IGY instruments like the Danjon astrolabe, the Dobson ozone meter, the Simpson cosmic ray counter, the auroral all-sky camera, the Markowitz lunar camera and artefacts belonging to the early satellite programmes has been the responsibility of parent

---

[20] Information from C. Lüdecke.

[21] Laursen (1951).

organizations such as the Danish Meteorological Institute, the Washington Naval Observatory, the Geophysics Institute in Alaska, the University of Saskatchewan, the Observatoire de Paris, etc., also of polar organizations and of national museums. Perhaps the single most important instrumental advance related to the IGY was achieved some time before it, namely, the ionosonde, which was still very experimental and unreliable for IPY-2 but was perfected well before IGY.

12.3 Creative Reflections

Polar expeditions have long been associated with two forms of artistic activity, the graphic recording of their experiences by officially appointed painters and photographers or other participants, and the literary work of expedition members that appeared in the home-made magazines sometimes produced at overwintering stations. Both were present in IPY-1 and IPY-2. But the IGY added something new to this aspect of the Polar Years.

After the Second World War science acquired a more prominent position in public affairs than ever before. This development was accompanied by official efforts in the field now known as "the public understanding of science". The first such topic to be addressed worldwide, in the late 1940s, was the military and peaceful significance of atomic energy. The second was the International Geophysical Year. Popular guides to the IGY, some intended for school students, were published by the IGY committees of the United States, Britain and Japan. Others were produced by science writers in those countries and also in the Soviet Union, France, East and West Germany and elsewhere. There was extensive coverage in the popular press, and especially in the popular scientific press, including such periodicals as *Discovery, Science News-Letter* and *Ciel et Terre*. Posters, documentary films and postage stamps were also used to spread the word. The dominant topics in this material were the first artificial earth satellites and the expeditions to Antarctica.

For the cultural historian, however, the more or less official public-relations output of the IGY is less striking than the diverse artistic creations that were spontaneously generated in response. There were several (rather disappointing) poems. There was an American comic novel and a British thriller. There were two or three comic strips and at least two contemporary jazz tributes. Serious visual artists seldom responded to the IGY in general, but the 1950s saw an upsurge in both private and public "space art" in the United States and the Soviet Union, though usually without much reference to the role of the IGY in launching the space age.

The IGY has also inspired several retrospective works of art, the most famous of which is Donald Fagen's song "I.G.Y.", which was an ironic take on the technological optimism of his youth written 25 years after the event. This group also includes Homer Hickam's memoir *Rocket Boys* and Koreyoshi Kurahara's film *Antarctica*.

12.4 To Give all for Science

When the Norwegian scientist Fridtjof Nansen recruited men to join him on the revolutionary drift in the polar ship *Fram* across the Arctic Ocean, starting in 1893, he informed them that they could expect to be absent from home for from three to five years. It was impossible to estimate a more exact time period. The ship was provisioned for five years, and it was expected that additional fresh meat would be obtained from the Arctic fauna. The 13 men left behind them eight wives and 27 children.[22] Nansen thus took the responsibility for a minimum of 35 direct dependants on an expedition that General Greely described with the words "Arctic exploration is sufficiently credited with rashness and danger in its legitimate and sanctioned methods, without bearing the burden of Dr. Nansen's illogical scheme of self-destruction."[23] Greely's own *legitimate and sanctioned* IPY expedition 1881–1884 had seen the deaths by privation and starvation of 19 of the 25 participants during the expedition which lasted three years (see Chap. 3 – USA). Nansen's expedition lasted also for three years and the men returned in the best of health.

Do these two examples prove anything regarding the risks and fortunes of polar expeditions? According to Lisbert Lewander: "As for polar exploration, polar history is laden with more or less thoughtful risk and crisis management regardless of the existence and/or content of previous planning for risks and uncertainties."[24] Certainly, one large difference between the two above-mentioned expeditions is the fact that the Norwegian expedition was from the very start planned to be completely self-contained. There would be no re-provisioning underway, no contact with the outside world through pre-arranged depots or otherwise, and absolutely no hope of any rescue expedition as there would be no clue about where to start a search. Greely's expedition, on the other hand, had very explicit instructions drawn up by superiors who would have no actual contact with the conditions in the field and no way of modifying the instructions in the light of developments during the expected two-year period. Both expeditions shared the common factor of the vagaries of the high Arctic ice and climate conditions and Nansen's also had incidents that could have gone terribly wrong. So added to the self-sufficiency and ability to steer the course of the expedition oneself was also an element of luck that always will follow expeditions that push borders and challenge the elements, right up to the present day. The often-quoted words by South Pole explorer Roald Amundsen can be borne in mind: "Victory awaits he who has prepared himself. They call it luck. Defeat is a certainty for he who has neglected to take the necessary measures in time. They call that bad luck."[25]

---

[22] Barr, Susan (1996).

[23] Quoted in Barr (1996:27).

[24] Lewander, Lisbert: (2009:18).

[25] "Seier venter den som har alt i orden. Hell kalles det. Nederlag er en absolutt følge for den som har forsømt å ta de nødvendige forholdsregler i tide. Uhell kalles det." A slightly bitter reflection on the different fates of Amundsen's own and of Scott's expeditions to the South Pole in 1911–1912.

Fieldwork in the earth sciences has often taken people to dangerous locations, such as mountain peaks or volcanoes, and the Polar Years were no exception. There are no figures for the incidence of disabling injuries, but the numbers affected were similar to or perhaps slightly higher than the number of fatalities, about which some information can be given.

As is described in Chap. 3, while some of the IPY-1 expeditions had a relatively comfortable year in established communities, some even with telegraph stations providing daily contact with the home base, others ventured into the desolate Arctic wastes and suffered great hardships. A total of 21 men died on the IPY-1 expeditions (19 Americans, one Russian who died from cold exposure while trying to get sent home and a sailor on the Austro-Hungarian transport ship, who perhaps cannot be counted in the expedition deaths). The 19 Americans were members of the 25-strong United States Expedition to Lady Franklin Bay in the Canadian Arctic. They died of starvation and hypothermia after their relief ship failed to reach them. The disaster caused a sensation when evidence of cannibalism was discovered on some of the corpses. But it is perhaps more significant for the history of IPY-1 that this expedition was the only one which pursued not only the scientific goals of the Polar Year but also purely geographical targets, such as beating the previous record for the furthest north latitude. Such targets were thought to be important for national prestige, but they had nothing to do with the international programme and placed the expedition in greater danger than simply maintaining a scientific station would have done. The deaths were, however, not directly related to this extra expedition.

Despite its compact and well-organized archive in Copenhagen, IPY-2 remains the least studied of the Polar Years. Its expeditions and special stations in “extreme” locations were still quite few in number – no more than 20. Fifty years after IPY-1 such regions were better known; the expeditions had better equipment, including radio communications; and none of them valued glory above safety. The president of the IPY-2 commission, Dan La Cour, made no reference to deaths when thanking the IPY-2 observers in 1934.[26] However, a few participants did make the ultimate sacrifice for scientific knowledge. The schooner *Albatross*, of the Soviet Hydrological Institute, was wrecked in October 1932 on its way from Dickson to Archangelsk, resulting in the deaths of expedition leader Vladimir Yakovlevich Nikitinskii and two unnamed companions.[27] Two other people died in the huge (c. 300 person) Soviet research effort for IPY-2 in the Pamir Mountains in Tajikistan, including the Fedchenko Glacier. One was a secretary called Maslovskii, who died in an avalanche, and the other was a mountaineering leader, Aleksei Timofeevich Germogenov, who died suddenly after a night in the saddle during a training exercise, at the age of only 23 (Fig. 12.12).

---

[26] Annals of the IGY (1959:227).

[27] Sources are V. Vasnetsov: *Under Persey’s starry flag*, Leningrad, Gidromet (1974) and a more detailed account in the article “Autographs on maps” by S.V. Popov on the Polyarnaya Pochta Syevodnya website.

Fig. 12.12 Fedchenko trek. From "Soviet IGY Bulletin"

About 200,000 people took part in the IGY on a full-time basis, whether as scientists or as support staff, from cooks to pilots. As described in this volume, the programme included a major effort in Antarctica, the interior of which was little better known in the 1950s than the Arctic had been in the 1880s. In polar regions care was usually taken to provide medical staff and equipment at isolated IGY stations. Nevertheless, during the five years that were spent on putting in new stations in Antarctica and elsewhere, and then carrying out the observations of the IGY and its one-year extension, the International Geophysical Cooperation of 1959, over 100 people died either in accidents or from conditions which may have been aggravated by the person's lack of access to the full range of medical facilities while on an expedition. The number is approximate, and is almost certainly a slight underestimate, because little is known about the experiences of IGY participants in many of the 98 countries or colonial territories which contributed to the programme.

A particularly tragic case was the loss of the Argentine rescue-tug *Guaraní* with 38 crew members on 15 October 1958, while supporting a successful emergency flight to deliver medical supplies to Melchior Station in the Palmer Archipelago, near the Antarctic Peninsula (Fig. 12.13). In 2008 the 50th anniversary of the event was commemorated with ceremonies in Ushuaia and the Beagle Channel. Of the remaining c. 10% so far recorded, two persons died in accidents outside the polar or mountainous regions, one was suicide, and six died from causes not yet uncovered.

The figure of 100 or more deaths should be seen in historical context. For example, 11 people, including Soviet glaciologist Aleksandr Gaudis, died in an air crash on 10 August 1959, while on 11 October 1956 an American military transport plane disappeared over the Atlantic with a loss of 59 lives.

Nearly all IGY-related deaths (over 90%) took place in polar or mountainous regions, though not quite all of those were certainly caused by local conditions.

Fig. 12.13 The Guaraní in Lapataia Bay, c 1958 – taken by Conscript Harvey Howard Bonin, who left the ship the day before she was lost. Courtesy of the Museo Maritimo de Ushuaia

For example, one was a suicide. The distribution of fatalities by age and nationality appears to be related to (a) the numbers taking part and (b) the use of air transport and the amount of effort given to surface traverses in Antarctica. Different expeditions varied widely in such matters.

For the IPY-4 it can be imagined that loss of life would be considered an unacceptable risk and a terrible defeat for the organizers. A scientist who participated as a young man in the IGY for "the romance and adventure" came more recently to the recognition that "What I didn't know then was that adventures in Antarctica only happen when someone makes a mistake."[28] At the same time, however, he writes that: "The Cold War was at its height, and the [US] Navy and participating researchers accepted risks that would not be tolerated today. The U.S. Antarctic air squadron VX-6 had an accident rate eight times that of U.S. Naval aviation in other parts of the world at that time. Because of these risks . . . [we were] given a 25% hazardous duty pay differential for the period we were in Antarctica."[29]

12.5 The Wider Heritage

The second half of the twentieth century saw a rapid increase in many societies in awareness of our planet, the Earth, as a huge and complex system of intermeshing physical and biological processes which itself interacts with an external cosmic environment, and within which human beings participate both as agents and

---

[28] Behrendt (2007:81).

[29] Behrendt (2007:83).

as subjects of physical change and of ecological constraints. The pictures of Earth suspended in space that were taken by the Apollo 8 mission, while orbiting the Moon in December 1968, are often thought to have triggered or accelerated that cultural change.[30] Perhaps so. But for more than 2,000 years before that thousands of earth scientists and their assistants worked to establish our scientific understanding and cultural conception of the planet as a whole. They have continued to do so up to the present time, with the recent Polar Year of 2007–2008 and other research programmes.

In other words, when people saw those images from Apollo 8 they already knew what they were looking at and, to some extent at least, why it mattered. Most of us will never be earth scientists, but before we could begin to care for our planet, we needed to get some idea of what it is and how it works. As this book has shown, the Polar Years have done a great deal for science. But if humanity and human culture survive the next 2,000 years, perhaps the greatest achievement of the Polar Years will turn out to be what they did, in the nick of time, for all of us.

References

Annals of the International Geophysical Year 1959, vol.1, International Council of Scientific Unions, London/New York: Pergamon.

Barr, S. 1996: *Fram mot Nordpolen* [Fram Towards the North Pole]. Oslo: Schibsteds forlag.

Barr, S. 2003: Jan Mayen. Øyas historie gjennom 1500 år [The Island's History Through 1500 Years]. Oslo. 2nd edition published by author.

Barr, S., and Chaplin, P. (eds) 2008: *Historical Polar Bases – Preservation and Management. ICOMOS Monuments and Sites XVII*. Oslo: IPHC.

Barr, W. 2008: *The Expeditions of the First International Polar Year 1882–83*. Canada: The Arctic Institute of North America, Calgary.

Behrendt, J.C. 2007: The U.S. Antarctic Oversnow Research Program. In: Lüdecke, C. (ed.) 2007: Steps of Foundation of Instutionalised Antarctic Research. Proceedings of the 1st Workshop on the History of Antarctic Research, Munich 2–3 June 2005. Berichte zur Polar-und Meeresforschung, Alfred Wegener Institute of Polar and Marine Research, Bremerhaven, No. 560. http://epic.awi.de/Publications/Lde2007b.pdf. Accessed December 2009.

Beltramino, J.C.M. 1965: Mortalidad en Antártida desde fines del Siglo XIX. New York.

Berthon, S., and Robinson, A. 1991: *The Shape of the World*. Chicago: Rand McNally.

Guttridge, L.F. 2000: *Ghosts of Cape Sabine*. New York: Putnam's.

Headland, R. 1986: *The Island of South Georgia*. Cambridge: Cambridge University Press.

Hickam, H.H. 1998: *Rocket Boys*. New York: Delacorte Press.

Kelly, W. 1958: *G.O. Fizzickle Pogo*. New York: Simon and Schuster.

Kobalenko, J. 2002: *The Horizontal Everest*. New York: Extreme Journeys on Ellesmere Island Soho Press Inc.

Laursen, V. 1951. *Bibliography for the second International Polar Year 1932–33*. Copenhagen: Horsholm Bogtrykkeri.

Lewander, L. 2009: The Logic of Risk Assessment in the Planning for the IGY. In: Multidimensional exploration of Antarctica around the 1950s. 2nd SCAR Workshop on the History of Antarctic Research, Boletín ANTÁRTICO Chileno, Lüdecke C.

---

[30] Berthon and Robinson (1991).

(ed) Instituto Antártico Chileno: Punta Arenas, 18–26 and http://www.inach.cl/InachWebNeo/Controls/Neochannels/Neo_CH6231/deploy/boletin%20historico.pdf

Mazurov, Yu.L., and V.P. Stolyarov 1996: *Novaya Zemlya, Natural and cultural heritage. History of Discoveries. Russian Research Institute for Cultural and Natural Heritage*. Moscow: Polar Research Foundation .

Report of the Russian Federation on implementing the provisions of the Protocol on Environmental Protection to the Antarctic Treaty 2005–2006, n.d., available at: http://www.aari.aq/raedocs/environment/environment_2005–2006_en.pdf. Accessed January 2010.

South Georgia 2006: Plan for Progress. Managing the Environment 2006–2010. GSGSSI, Stanley.

Sullivan, W. 1961: *Assault on the Unknown: The International Geophysical Year*. New York: McGraw-Hill.

Thing, H. 2008: Crumbs from the history of IPY. In: Polar Focus: IPY in the field. Danish Polar Center.

White, S. 2002: Images of Antarctica: Scott Base. At: http://www.sethwhite.org/scott%20base.htm

Chapter 13
International Meteorological and Magnetic Co-operations in Polar Regions

Cornelia Lüdecke

(I) 1st International Polar Year (1882–1883) in the Arctic

Hourly meteorological and magnetic measurements from 1 August 1882 until 1 September 1883 (13 months).
Magnetic term days with hourly observations on the 1st and 15th each month (exception 2nd instead of 1st January 1883) with intensified measurements each 5 minutes over the period of 24 hours starting at 1 August 1882 at midnight Göttingen Time.
Magnetic term hours with measurements each 20 s over the period of 1 hour during term days starting on 1 August 1882 at 12 noon and continued on the next term day starting an hour later (1 p.m.–2 p.m.), so they would cover each hour of a day during the year.

(IIa) International meteorological and magnetic co-operation (1901–1903) of Antarctic expeditions as well as navy and merchant ships sailing south of 30°S

(The observing period had been expanded until 1904)
Hourly meteorological observations starting at 12.00 noon Greenwich Time from 1 October 1901 until 31 March 1903 (18 months).
Magnetic term days with hourly observations were defined on the 1st and 15th of each month from 1 February 1902 until 15 February 1903. Magnetic term hours with intensified measurements starting at the same day from 0 a.m. to 1 a.m. and continued on the next term day starting an hour later lasting from 1 a.m. to 2 a.m., according to IPY-1.

(IIb) "Norwegian Aurora Polaris Expedition" (1902–1903) in the Arctic

Simultaneous measurements according to the instructions of the magnetic co-operation of the four Arctic stations (Iceland, Finland, Spitsbergen, Novaya Zemlya)

C. Lüdecke (✉)
Institute of History of Science, Mathematics and Technology, University of Hamburg, Germany
e-mail: C.Luedecke@lrz.uni-muenchen.de

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_13,

(III) 2nd International Polar Year (1932–1933) in the Arctic

Simultaneous meteorological and magnetic measurements from 1 August 1932 until 31 August 1933 (13 months).
Investigation of the upper atmosphere with aerological methods including radiosondes and aircraft ascents.
Collection of meteorological data from ships sailing on the southern hemisphere.
Simultaneous observations of aurora using time signals from radio transmission.
Investigation of the ionosphere with radio waves.
Investigation of radiation from the sun and air electricity.

(IV) International Geophysical Year (1957–1958) with focus on Antarctica later called 3rd International Polar Year (1957–1958)

Continued for a year until 31 December 1959 (then called: International Geophysical Co-operation).
Co-ordinated meteorological and magnetic measurements from 1 July 1957 until 31 December 1958 (18 months).
10-day interval for special meteorological measurements.
3 world days per month for intensified measurements.
Main fields of research: meteorology, earth magnetics, glaciology, investigation of the ionosphere, cosmic rays, sun activity and aurora.
Additional oceanographic, seismic and gravimetric investigations as well as medical and biological projects.
First mission of satellites.

(V) 4th International Polar Year (2007–2008) in both polar regions

Co-ordinated measurements from 1 March 2007 until 1 March 2009 (24 months) (Originally planned only for 2007–2008).
Traditional knowledge of the local people is included for the first time.

Chapter 14
Why Do We Have a 4th IPY?

Dave Carlson

The visionaries and advocates of four different “international years” – the electronic Geophysical Year (eGY), the International Heliophysical Year (IHY), the International Polar Year (IPY) and the International Year of Planet Earth (IYPE) – all recognized the approach of 2007 and 2008 as an opportunity to commemorate the International Geophysical Year after the passage of 50 years. All four “Years” also sought to invigorate, advance and promote their areas of science through internationally coordinated research and outreach activities during 2007 and 2008. Representatives of the four programmes crafted a Celimontana Declaration (September 2005) avowing to cooperate among the programmes, implement activities in areas of mutual interest and communicate effectively to scientists, governments and the public.

The IPY-4, officially the IPY 2007–2008, elicited a surge of scientific and public interest indicative of the urgent need for an IPY in 2007 and 2008 regardless of anniversaries.[1] With news of sea ice retreat, ice-sheet collapse and threats to polar species almost constantly in the media headlines, the public and the science community could well have asked “why not” if an IPY did not occur at this point in time. If the commemoration of IGY suggested the timing, the increasing evidence of rapid change in the polar regions determined the need.

The IPY Framework Document, produced by the ICSU IPY 2007–2008 Planning Group (see list below) and adopted as a basis for collaboration with WMO in October 2004,[2] laid out the bipolar rationale for this IPY:

D. Carlson (✉)
IPY International Programme Office, c/o British Antarctic Survey, High Cross, Madingley Road, Cambridge CB3 OET, UK
e-mail: ipy.djc@gmail.com

[1] Of 1,231 expressions of interest, only 36 mention IGY. Of those, 8 relate to history, 5 to ice sheet traverses, and 4 to space, all as expected to recall IGY. 4 others relate to recruitment of a new generation of scientists – again one would expect them to recall IGY. Very few countries referred to IGY in their call for IPY proposals. Perhaps Norway, but not Canada or the United States. Scientific urgency, and possibility of funding, motivated most researchers!

[2] Rapley and Bell (2004).

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs)*,
From Pole to Pole, DOI 10.1007/978-3-642-12402-0_14,

- Why International?
  - Polar processes extend across national boundaries.
  - The science challenge exceeds the capabilities of any one nation.
  - An internationally coordinated approach maximizes cost effectiveness and the use of finite resources and assets.
  - The new knowledge and understanding generated by IPY 2007–2008 will be of worldwide relevance.

- Why Polar?
  - Polar regions are active, highly connected components of the planet.
  - Significant changes are occurring in the polar regions.
  - Polar regions hold unique information on the past behaviour of the Earth System.
  - Polar regions (especially the Arctic) are of growing economic and geopolitical importance.
  - The harsh conditions and remoteness of the polar regions have hampered scientific inquiry compared to mid- and low-latitudes.
  - There is a need to re-establish and enhance operational observing systems in the polar regions.
  - The polar regions offer a unique vantage point for a wide variety of terrestrial and cosmic phenomena.

- Why a “Year”? (What constitutes a Polar “Year” becomes a minor but constant confusion in this IPY – see below:
  - An intensive, coordinated burst of effort will accelerate advances in knowledge and understanding.
  - A defined-period polar “snapshot” will provide a crucial benchmark for detecting and understanding change in comparison with past and future data sets.
  - An (extended) year provides an opportunity for observations in both polar regions throughout the seasonal cycle.

- Why 2007–2008?
  - The anniversaries of past IPYs and the IGY set a firm deadline.
  - There is a pressing need to capture contemporary information on change.
  - The timescale for preparations allows advances in technology and logistics to be exploited to address new issues and to access new areas.

At the nominal end of this IPY-4, celebrated in Geneva in February 2009, the IPY Joint Committee (jointly appointed and supported by ICSU and WMO to succeed the ICSU Planning Group), in its “State of Polar Research” summary document, offered a short but broad list of research topics with continuing (or increased!)

polar and global urgency. The exploration and discovery during the IPY "two" years reiterated and emphasized the urgency that motivated the original planning group.

IPY Planning Group	IPY Joint Committee
C Rapley, UK, co-chair	I Allison, AUS, co-chair
R Bell, USA, co-chair	M Beland, Can, co-chair
I Allison	K Alverson
R Bindschadler	R Bell
G Casassa	P Cutler
S Chown	K Danell
G Duhaime	E Fanta
V Kotlyakov	E Fahrbach
M Kuhn	G Hovelsrud
O Orheim	V Kotlyakov
P Pandey	I Krupnik
H Petersen	J Lopez-Martinez
H Schalke	T Mohr
W Janoschek	D Qin
E Sarukhanian	V Rachold
Z Zhang	C Rapley
	E Sarukhanian
	C Summerhayes
	T Yamanouchi

14.1 Scientific Plan of IPY 2007–2008

The IPY Planning Group worked from four basic goals:

- Make major advances in polar knowledge and understanding;
- Leave a legacy of new or enhanced observational systems, facilities and infrastructure;
- Inspire a new generation of polar scientists and engineers;
- Elicit keen interest and participation from polar residents, schoolchildren, the general public and decision-makers worldwide.

The Science Plan expressed in the same Framework document[3] laid out scientific themes (below), an early conception of new observational systems, and the outlines of an IPY data management plan, covering in general terms the first two goals. It also presented an education, outreach and communication plan to cover the latter two goals and a timetable for soliciting and processing Expressions of Intent and for the subsequent development of IPY Full Proposals. In practice, the scientific interest

---

[3] Rapley and Bell (2004).

in IPY, measured by numbers of Expressions of Interest (finally, more than 1200), Full Proposals (more then 400) and eventual IPY Projects (170 in science, 58 in education and outreach and one integrated data services Project), far exceeded the expectations of the Planning Group and required substantial adjustments in process and scheduling.

14.2 Initial Ideas and Expressions of Interest

Unlike many science programmes that proceed from initial goals through detailed science plans to more-detailed implementation planning and documentation, and contrary to much-used processes whereby big (expensive) science projects expend substantial initial effort to define critical data targets and outputs, this IPY took the unusual and adventurous step of building the science programme from the spontaneous ideas of hundreds of groups of existing and aspiring polar scientists. As mentioned above, the Planning Group did outline scientific themes (refined iteratively based on the receipt of more than 600 initial ideas from individuals, IPY national committees and international polar science groups) for this IPY, which proved quite attractive but hardly definitive – most of the eventual IPY Projects classified their proposed research as a contribution to three or more of the themes.

This process of building the IPY science programme from fresh ideas solicited widely and openly from all potential participants set the fundamental inclusive nature of this IPY and reflected both wisdom and humility on the part of the Planning Group and the subsequent Joint Committee. Both groups recognized that their small membership could neither determine the optimal science nor adequately represent the breadth of science possible during a modern IPY. They recognized that scientific ideas and options would and should change, evolve and improve as they moved from Expressions of Intent to actual research proposals submitted (and re-submitted) to national funding programmes many months later, defeating any attempt by any committee to filter or codify the ideas as a definitive science plan at an early stage.

Thus this IPY never produced a detailed science plan. It never set specific data targets, nor, as it turns out, parameters by which to quantitatively measure achievement. No IPY planning document called for a updated assessment of ice-sheet contributions to sea level rise to within ± 1 mm, nor for determination of net polar carbon dioxide or methane fluxes to one part per million, nor for complete terrestrial or marine biodiversity inventories at specific taxonomic or trophic levels, nor for definitive reports on incidence of tuberculosis or levels of mercury in the blood of Arctic residents. By taking an inclusive, ideas from the “bottom” approach, the IPY planners recognized that the actual quantity and quality of scientific ideas would derive from the crucible of competitive national funding processes, and that through those processes IPY would in fact make substantial quantitative progress on the most important polar and global issues. The planners managed the initial IPY processes in a way that encouraged and sustained a sense of discovery (one of the IPY themes), of possibility, and, most importantly, of inclusivity. Their vision and processes, in part by design and in part by the enthusiasm of international participants, resulted in the unique and defining character of this IPY – its breadth of science.

14.3 From Ideas to Projects

The IPY organization, with the Joint Committee (JC) now supported by an International Programme Office (IPO), recognized the management and administrative need to apply order and structure to the broad array of IPY Expressions of Interest, which by 2006 had increased to more than 900 in number. Through a process best described as "match-making" (the external identification and encouragement of partnerships), the JC solicited for evaluation and endorsement IPY Full Proposals formed in all cases of three or more Expressions of Interest and in many cases of 10 or more Expressions of Interest. For example, several Expressions of Interest proposing to study dynamics of local or regional glaciers received explicit encouragement to combine into a comprehensive assessment of northern hemisphere glaciers. Likewise, many proposed ship-based studies of Antarctic marine ecosystems received encouragement to cooperate in a systematic census. In most cases these partnership recommendations included suggestions of individual or group leaders for the resultant Full Proposal. The IPO, in particular, played a very active role in encouraging and mediating among the partners of these nascent IPY Projects and in supporting the cautious Project Coordinators.

Recognizing the broad enthusiasm that drove the initial Expressions of Interest, and respectful of the level of effort asked of the IPY Project Coordinators, most of whom did not gain additional time, staff or salary resources to support their IPY leadership activities, the Joint Committee abandoned initial ideas of flagship projects and hierarchical project structures. The resulting egalitarian structure, with 170 endorsed IPY Projects limited only by their own abilities to attract funding, followed very naturally the initial IPY approach of breadth and inclusivity.

The Joint Committee expressed its ideals for the IPY through its evaluation criteria for the IPY Full Proposals. By these criteria, to qualify as an IPY Project each Full Proposal:

1. Addressed one or both polar regions and, where possible, their global relevance;
2. Had the potential to make significant advances within one or more of the IPY themes;
3. Represented an intensive, time-limited burst of scientific activity that took place primarily during the IPY timeframe;
4. Contributed to international collaboration and coordination;
5. Was logistically and technically feasible within the IPY 2007–2008 timeframe;
6. Avoided duplication or disruption of established initiatives and plans;
7. Provided open and timely access to data and encouraged the long-term management of IPY data and information;

8. Followed guidelines, as appropriate, for ethically and environmentally sensitive research practices;
9. Maximized effective utilization of available logistical assets, as appropriate;
10. Explicitly included roles and tasks for young scientists, engineers and technicians; and
11. Included specific outreach activities.

In addition, the Joint Committee expected that each endorsed IPY Project would:

1. Leave a legacy of data, observing sites, facilities and systems to support on-going polar research and monitoring, and to provide value to future generations;
2. Build on and add value to existing or planned activities, where relevant;
3. Incorporate an interdisciplinary approach or the potential for interdisciplinary synthesis;
4. Facilitate international access to field sites;
5. Catalyse the broader involvement of nations in polar research;
6. Address training and capacity building;
7. Provide opportunities for regional scholarship within broader international activities; and
8. Communicate with the public.

By establishing an endorsement process according to these well-publicized values-based criteria, and by scrupulously avoiding competitive quality-based evaluation of the science contained in any IPY Full Proposal, the Joint Committee propagated and reinforced the inclusive and cooperative nature of this IPY. They also re-emphasized their four overall goals and expressed publicly their strong commitment to free and open sharing of data and to active outreach and communication. In practice, the Joint Committee very rarely rejected a Full Proposal. Most often they suggested improvements through combination with other similar Proposals or by otherwise strengthening international and interdisciplinary partnerships.

Determination, description and guidance of the details of the IPY science programme thus occurred at the level of the national funding processes. The IPY Project Coordinators almost invariably served as lead investigators on proposals to national funding agencies. National funding processes and decisions determined, at the individual proposal level but occasionally, through ad hoc multinational cooperation, at the IPY Project level, the science programme and resource level. In the absence of central international sources of funding for research, the process could hardly have happened otherwise. A few countries, notably Norway and Canada, adopted the Joint Committee's Project criteria and evaluation process as qualifying standards for their national IPY projects. Other countries largely ignored the "ICSU process". For its part, the IPO carefully and consistently avoided involvement in national evaluation or decision processes.

The IPO made extensive use of the Project structure (famously represented in the IPY chart – see Fig. 14.1) and built its communication systems around the Project Coordinators.

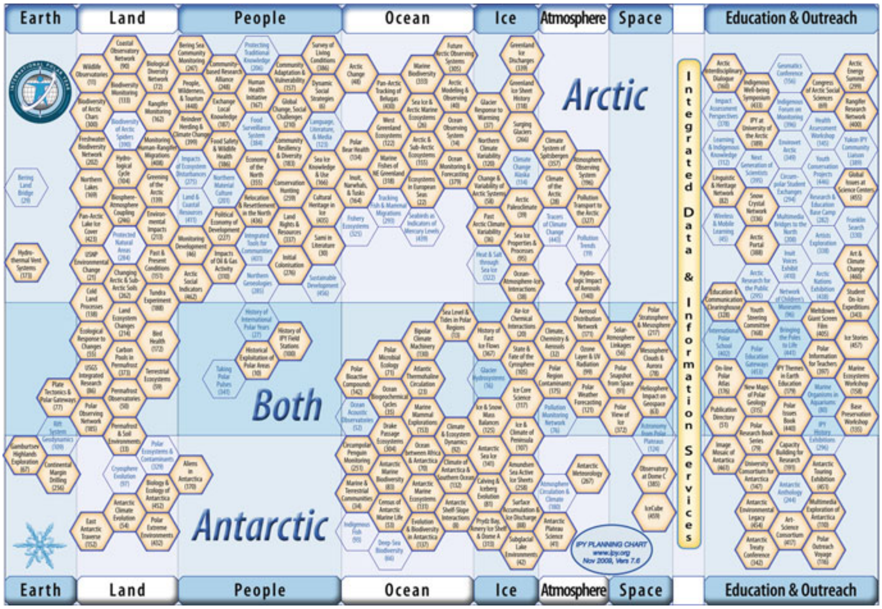


Fig. 14.1 The IPY Planning Chart showing all science and outreach projects arranged by geographic focus (Arctic, Antarctic or both) and by area of central scientific focus (Earth, People, etc.). All endorsed projects shown, with those that received at least partial funding designated by the *filled hexagons*

Although the Planning Group set high expectations for Project-level management ("Each IPY 2007–2008 project will have a Project Steering Committee responsible for the detailed planning, execution and reporting of science, data and education activities"), in practice, only the largest Projects, often organized outside and prior to IPY, maintained such management structures. Only in a few cases, generally on the basis of enlightened support from IPY national committees, did the Coordinator of an IPY Project receive additional staff or financial resources. In all cases, the IPO to Project Coordinator communications relied entirely on person-to-person first-name interactions, and entirely on voluntary, mutually beneficial cooperation and compliance. Through these linkages, the IPO tracked and shared information on funding progress and status, on international partnerships (country A would ask, for example, in how many Projects did its investigators have partnerships with researchers from country B), and on data compliance, for example.

14.4 Extending the Science Plan Across Three Years

The Planning Group specified 24 months of IPY operations, from March 2007 through February 2009, in order to include the possibilities of full year-long (in practice, summer to summer with substantial transport and logistic activities both before and after) studies in both the Arctic and Antarctic regions. The IPY community marked those end-points with a Launch Event in Paris on 1 March 2007 and an IPY celebration in Geneva on 25 February 2009. In fact, several, mostly European, IPY Projects started earlier than March 2007 and several, mostly North American, nations maintained IPY-labelled programmes into 2009 or 2010. Recognizing these realities, the IPY Joint Committee adopted a more flexible definition, covering activities that ended or started within the original 24-month period. In practice, this IPY probably started with the freezing-in of the vessel *Tara* as part of the IPY Project DAMOCLES (Developing Arctic Modeling and Observing Capabilities for Long-term Environmental Studies) in September 2006. For most participants, the period of active IPY data gathering ended with the Oslo Science Conference in June 2010.

Although the IPY Planning Group set an ambitious goal: "June 2005: submission of complete proposals with updated plans and more detailed information on funding and support", science planning across multiple years, multiple countries and in some cases multiple agencies within countries does not and could not react so quickly or in so orderly a manner. The IPY IPO did not start until May 2005. National funding plans for IPY, even when prompt and favourable, did not become evident earlier than 2006 (and in some cases not until 2008!). Recognizing these delays, and the time needed to build international teams, the Joint Committee accepted and evaluated Full Proposals in three "batches" over nearly 12 months, all of them submitted later than the original June 2005 target. Governments changed, federal budgets went into continuation or holding patterns, national committees needed more time to develop local political support. Specific proposal review processes within those countries with substantial new IPY funding took longer than expected due to the large number of submissions. Some countries delayed projects based on funding profiles and logistical constraints. An initial IPY vision, expressed in the Framework document, that an early and nearly complete definition of IPY detailed science plans would emerge in time for multinational coordination and rectification with available logistic (e.g. ship) resources, disappeared under the overwhelming international and national proposal responses and due to the asynchronous funding decision schedules among the many nations.

14.5 The "Full and Final" IPY Science Plan

Describing, much less assessing and synthesizing, the full, as-delivered IPY science programme thus becomes a journey of discovery. As funding constraints and logistical realities interposed, the original Project plans (e.g. as described in the IPY Full Proposal database) represented more the ideal and less the actual. Many Projects developed their own websites, with initial timeliness and accuracy of content. Many of those sites will follow the rapid decline typical of on-line content. As part of cooperation on various education and outreach events, the IPO, over 24 months, established a Project page on ipy.org for all cooperating Projects, including those without Project-specific web pages, often with fresher and more accurate content than in the original Full Proposal descriptions. The IPO has archived all those pages, but will not update any of them. Only in the aftermath of the IPY observational periods (not complete, by any means, at this writing), as the Project leaders begin to consider reports to national agencies, special issues in science journals or renewal proposals, do they begin to take stock of their accomplishments and successes. The IPY Project structure, in which the IPO interacted with Project Coordinators who also and simultaneously served as leaders in the polar science community, as organizational leaders in their home institutions and national processes, and as in-the-field IPY researchers, virtually guaranteed that they would not have time for assessment or reporting until well after IPY operations. Recognizing the workloads created and imposed by the IPY Project structure, the IPO feels extraordinarily blessed by the high level of cooperation from so many generous partners.

Most of those Project Coordinators will eventually produce reports or summaries, often as a by-product of other national or funding requirements or in the form of summary articles to accompany special issues of journals devoted to their Project. Many nations tracked their IPY projects, with more or less fidelity to the international Project structure; most nations will almost certainly choose to report the results of their national investments in the IPY. From those Project-specific and national reports, emerging gradually in 2009 and 2010 or later (see below), will come the most comprehensive assessment of IPY science as conducted. Synthesis, and assessment of the impact, of the IPY science will require several years and substantial special efforts; the IPY conference in Canada 2012 will represent an important milestone.

To conduct its own assessments, and to meet the expectation of the international sponsors, ICSU and WMO, the Joint Committee produced *The Scope of Science for the International Polar Year 2007–2008* (in February 2007, at the official start of IPY)[4] and *The State of Polar Research* (in February 2009, at the nominal closing of IPY).[5] In these documents the Joint Committee attempted to describe the breadth of IPY science (Scope) and a sample of initial results (State). However, even in those efforts the JC noted their ability only to describe the IPY science in outline and as planned and the initial results as emerging from only a few of the IPY Projects.

It seems doubtful that a full, complete, definitive description of the science of IPY 2007–2008 will emerge. In many IPY countries, investigators or group of investigators, without official IPY endorsement or funding, started or continued activities that they considered a contribution to IPY. (They always responded promptly and generously when the IPO asked for information!) Many times investigators from one country contributed actively to IPY-labelled activities in a second country, without recognition in their home country. The IPO charts and databases undoubtedly miss a lot of good IPY science; likewise, the various Joint Committee reports. It seems unlikely that the proposal tracking and accounting procedures in many countries

---

[4] Allison et al. (2007).

[5] Allison et al. (2009).

will record all the “official” IPY research undertaken by that nation’s researchers, much less the unofficial efforts described here. This resistance to containerization and characterization represents a pleasant, positive and entirely desirable consequence of the broad and inclusive nature of this IPY; we should enjoy, even if future historians of science will not, the fact that we will always have much to learn and discover about IPY 2007–2008.

14.6 Participating Countries

“62 Nations, . . ., more than 10,000 scientists backed by something like $500 million . . . .” So reported the US magazine *Time* in its weekly issue of Monday, Jul. 08, 1957. *Time* also reported IGY’s precise start and end dates: from 7:00 p.m. E.S.T. June 30, 1957 through Dec. 31, 1958; cf. “Extending the Science Plan across 3 years”, above. The IGY Annals would eventually list 67 participating countries.

IPY 2007–2008 makes a subtly different statement in its documents and press releases: “Approximately 10,000 scientists and 50,000 participants from more than 60 countries.” In its Frequently Asked Questions, this IPY lists 63 countries, not including three (Greenland, Nunavut and Scotland) claimed by partisan participants but perhaps not (yet) recognized by the UN. Where IGY recorded official participation by country, this IPY counted countries by identifying the nationalities of researchers listed as participants in each partly or substantially funded IPY Project. One presumes that every country knew about its official participation in IGY. This IPY has no way to certify that all countries know about the involvement of all national researchers.

This IPY does track national committees (34, here including Greenland because they did establish a local IPY committee) and national points of contact (3), Table 14.1. Of the 37 countries with formal IPY connections, most had formal status within IGY. All 12 of the original signatory nations to the Antarctic Treaty had formal commitments to IGY and have national committees for this IPY.

More important than total numbers of countries, this IPY tracks countries new (apparently or by self-identification) to polar science and those countries which achieved sufficient internal political support to produce new or incremental (over and above on-going) funding. Portugal, with a new funding line for polar research and with the intention of joining the Antarctic Treaty system, provides a fine example of a new national involvement in polar research. In many other newly independent (since IGY) countries, the establishment of an IPY national committee represented a mechanism to revive or re-establish and promote a national scientific programme.

Nineteen countries (Table 14.2) proclaimed new or incremental research funding for IPY. In total, these new funds probably amounted to more than $400 million over the two IPY years. Vagaries of timing, definition and currency values make a more accurate number difficult to obtain. Inter-comparisons also have little value: in some countries, new funding included substantial salary support for senior personnel and students while in other countries the incremental support covered only fuel

Table 14.1 Countries with formal IPY connections

4th IPY National Committees (or Points of Contact)	Official IGY Participant	Original AT Signatory
Argentina	Yes	OS
Australia	Yes	OS
Austria (PC)	Yes	
Belgium	Yes	OS
Brazil	Yes	
Bulgaria	Yes	
Canada	Yes	
Chile	Yes	OS
China		
Czech Republic (PC)	Yes	
Denmark	Yes	
Finland	Yes	
France	Yes	OS
Germany	Yes	
Greenland (local)		
Iceland	Yes	
India	Yes	
Italy	Yes	
Japan	Yes	OS
Korea	Yes	
Luxembourg		
Malaysia	Yes	
Mongolia	Yes	
Netherlands	Yes	
New Zealand	Yes	OS
Norway	Yes	OS
Poland	Yes	
Portugal	Yes	
Russian Federation	Yes	OS
South Africa	Yes	OS
Spain	Yes	
Sweden	Yes	
Switzerland (PC)	Yes	
Ukraine	Yes	
UK	Yes	OS
USA	Yes	OS
Uruguay	Yes	

and logistics. The table does indicate that in a range of countries large and small, from both hemispheres, some with national boundaries closer to the equator than to polar circles, the national polar research community used IPY to raise internal political attention to the level of tangible financial support. Table 14.2 focuses on new research funds and does not account funds applied to new research infrastructure such as Antarctic bases or icebreakers. Many countries put forward infrastructure projects as components and achievements of their IPY programmes. The duration of most of these infrastructure projects extended well beyond the IPY operational

Table 14.2 "New" IPY funding

Brazil	New Zealand
Canada	Norway
Chile	Poland
China	Portugal
Denmark	Russia
EU	Spain
Finland	Sweden
France	UK
Malaysia	USA
Netherlands	

period; the infrastructure investment probably exceeded the new IPY research funding. This short accounting of IPY financial contributions must include the very large commitments by countries like Germany which, even as internal efforts to secure additional research funds met with resistance, made resources such as icebreakers widely and extensively available in both hemispheres for both IPY years.

14.7 A Focus on Northern Residents and Indigenous Partners

This IPY made serious efforts to vigorously address issues of individual and community well-being as part of its research programme and to engage northern residents as full partners in all aspects of the research activities. Quoting the Planning Group, again from the Framework document: "IPY 2007–2008 must strengthen the dialogue and links between Arctic residents and the research community, and must engage Arctic residents in the design and implementation of IPY science, education and outreach programmes." One can read elsewhere that the inclusion of "social" sciences in this IPY occurred by demand of the social scientists themselves and represents therefore a form of success. In truth, achieving "major advances in ... knowledge and understanding" of the Arctic requires economics and archaeology and political science and physiology just as much as it requires oceanography and glaciology, and it requires comprehension and inclusion of traditional knowledge. In this context the "social" sciences become useful scientific tools among the full set of tools necessary for the problem at hand; artificial distinctions of "natural" versus "social" or "hard" versus "soft" science become irrelevant. Likewise, northern residents play essential roles as observers and data gatherers but also as sources of and guides to relevant knowledge.

Northern residents engaged with IPY as leaders of and partners on IPY Projects. Six of the 123 funded or partially funded IPY Projects came from indigenous institutions and another 22 Projects included indigenous partners. These projects covered a broad range of terrestrial, social and marine sciences (Fig. 14.2). Several countries explicitly invited proposals targeted at northern social, economic and health issues; in some of those countries northern residents also participated in the evaluation

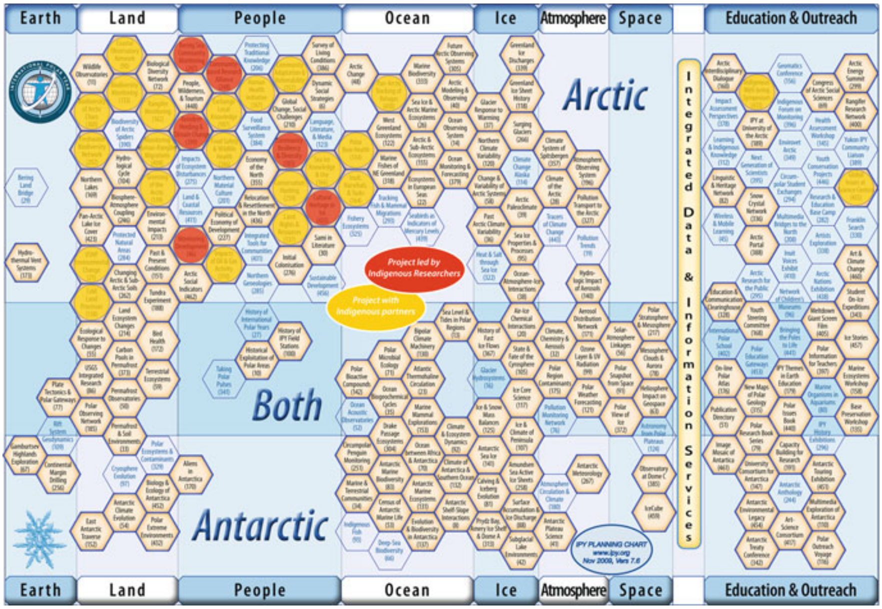


Fig. 14.2 As in Fig. 14.1, but highlighting IPY Projects led by (*red*) or involving (*yellow*) indigenous researchers

process for all IPY proposals. Canada funded IPY liaison positions in many northern communities, and many of the IPY Projects implemented specific community engagement plans before, during and following the research activities.

This IPY benefited from a growing effort by Arctic communities to monitor their own environment with the intent to generate questions, examine data, identify trends, and build on-going collaborations with ‘outside’ experts and institutions. These community monitoring programmes, often crossing regional and national boundaries, focused on many factors related to natural resources, community well-being and climate change: in migration of species; changes in location, abundance and quality of fish; changes in weather and ice patterns; impacts of development activities on environmental quality; presence of contaminants in traditional foods and occurrence of diseases in wildlife and humans and effectiveness of intervention strategies. During IPY, active networks operated around the Bering Sea and Straits, across the caribou and char regions of northern Canada, around Hudson Bay, throughout the fisheries regions of West Greenland and across the reindeer management regions of Scandinavia and northern Russia. These investigations, and the parallel development of effective and appropriate means of sharing information, will build local competence and circum-Arctic cooperation and integrate with regional and global census and research activities. Successful continuation of these networks, crossing generations of observers and building decennial pan-Arctic data sets, will represent a transformational IPY legacy.

14.8 Summary

The 4th IPY reflected its times, the habits and practices of the global/bipolar science community and its leadership: inclusive, flexible, highly decentralized and extremely broad in its curiosity, exploration and discovery. Whether this IPY alters, slightly or substantially, the current habits and practices of science remains unknown; this author would say unlikely.

Like their predecessors, researchers in this IPY operated in difficult, even hostile, work environments. Unlike its predecessors, this IPY addressed systems clearly under change, with the rate and prediction of those changes often itself the subject of research. This IPY will not discover the thickness of the ice-sheets, but will explore more difficult regions and more subtle processes under those ice-sheets and, through unprecedented combinations of in situ and space-borne observations and complex models, will, must, answer difficult questions of immediate and future change of those ice-sheets and indeed of the entire integrated polar–global geophysical–ecological–social system. This IPY will discover new sea-floor species and new sub-ice terrain, but it primarily confronts, with a portion of the public watching anxiously over its shoulders, questions of when, how much and how fast. Two years (or three) of intense observations will not suffice to answer those questions, but two years of enhanced resources and energy, of new technologies and new models, and of new and renewed international interdisciplinary cooperation might set polar science at the higher level necessary to meet those challenges.

References

Allison, I. et al., 2007: *The Scope of Science for the International Polar Year 2007–2008, WMO/TD-1364*. Geneva: WMO, 79 pp.

Allison, I. et al., 2009: *The State of Polar Research – A Statement from the International Council for Science/World Meteorological Organization Joint Committee for the International Polar Year 2007–2008*. Geneva: WMO.

Rapley, C., R. Bell, and the ICSU IPY 2007–2008 Planning Group, 2004: *A Framework for the International Polar Year 2007–2008*. Paris: ICSU.

Index

Note: Figures and tables are given with locators followed by f and t respectively. Notes are indexed with locators followed by an *italicised* '*n*'

S. Barr, C. Lüdecke (eds.), *The History of the International Polar Years (IPYs),* From Pole to Pole, DOI 10.1007/978-3-642-12402-0,