Modern Research in Polar Regions

Jörn Thiede

Research in the polar regions, in particular in Antarctica and the Southern Ocean, is demanding on scientists, equipment, and financial resources. However, it is also urgently needed by governments, not only because of the sensitivity of the polar regions to global change in real time but also because of the role of the polar regions as major drivers for global climate and environmental changes (e.g., sea level, ocean circulation through the "conveyor belt," etc.). As highlighted by the present president of the Scientific Committee on Antarctic Research (SCAR), Antarctic research is research at the "frontiers to the unknown" (subglacial geology, subglacial lakes, ice older than 1 million years, etc.), and the topics selected for the Antarctic Treaty Summit (the ozone hole, the ice core story, cosmology from Antarctica, and the Southern Ocean) not only cover an enormous range of scales in time and space but also demonstrate the excellence and relevance of Antarctic research.

Research in Antarctica and the Southern Ocean is challenging and also dangerous because the environment is hostile to mankind, and thus, it is exceptionally important that we have the right tools. Are we properly equipped and are our methods robust and safe? During the last International Polar Year (IPY) many traverses were organised using nonspecialist vehicles, but frequent breakdowns of vehicles illustrated how dangerous they could be; luckily, no lives were lost. Over the past 50 years many stations have been established in Antarctica, probably too many in some places (i.e., the situation on King George Island). Some are now outdated and little used, and yet the international exchange of scientists that could use these station is really in its infancy. The hypermodern French-Italian station on Dome Concordia is an extraordinary exception and shows that at least at the bilateral level international stations are possible (compare with the Argentine-German station at Jubany). The leading nations in Antarctic research should be more forthcoming with their support to the emerging polar research nations, certainly much more than they have been so far, through sharing their infrastructure, both on land and at sea, as well as developing their scientific programs jointly with their "younger" partners.

There have been remarkable political changes in the attitude of nations with interests in Antarctic research. First, there are a remarkable number of new nations that have joined SCAR, adding strength to all of the scientific efforts in and

Jörn Thiede, Alfred Wegener Institute, Am Handelshafen 12, D-27570 Bremerhaven, Germany. Correspondence, jt@geo.ku.dk.

around Antarctica. Second, we have seen the emergence of regional groups of nations that found value in coordinating their polar research with the aim of supporting and strengthening their scientific efforts. For example, the European Polar Board of the European Science Foundation has succeeded in raising enough interest with the political authorities of the European Union to generate substantial European funding for some aspects of Antarctic research (e.g., the European Project for Ice Coring in Antarctica [EPICA] project). The same applies to nations in the Far East (PAG), where nations now coordinate their Arctic and Antarctic research efforts.

The Council of Managers of National Antarctic Programs (COMNAP), with the help of SCAR, has established new systems to relieve precious polar research vessels from logistical obligations in East Antarctica, thus giving them more cruise time for science, and an increased transport efficiency more like that in New Zealand and Australia. The Dronning Maud Land Air Network (DROMLAN) serves blue ice runways close to the Russian Novolazarevskaja and the Norwegian Troll stations directly from Cape Town, thus allowing many researchers much more rapid access to their Antarctic laboratories and, again, saving substantial amounts of precious research time. The shipping network Dronning Maud Land Shipment (DROMSHIP) employs an ice-strengthened freighter (also from Cape Town) with the aim of conserving ship time of dedicated polar research vessels that would otherwise have to be used for logistical purposes. More sharing of transport systems must be adopted as operators look for ways of reducing costs while increasing efficiencies.

Dedicated ice-breaking polar research vessels are rare and are usually not in the Southern Ocean during the unfavourable seasons of the year. There is a pressing demand for research ships that can master Antarctic winter sea ice and the storms of the Southern Ocean. The capacities of large modern research ice breakers will probably also require a system of international consortia to run such vessels.

Progress in the internationalisation of Antarctic and Southern Ocean research has been slow, despite the IPYs, and I relate this to the fragmented nature of the organisations supporting science-related activities in high southern latitudes. The Antarctic Treaty (AT) with its recently established office in Buenos Aires, SCAR and the Convention for the Conservation of Marine Living Resources (CCAMLR) with their separate offices, and the loose link between COMNAP and SCAR are all examples of this fragmentation. The linkage to the International Arctic Science Committee (IASC) in the north is only growing slowly and needs to be much better developed in the future because the two polar regions share many interesting attributes. The 50th Anniversary of the AT offered a wonderful opportunity to consider these problems, and one would hope that the coming years will be used to promote the internationalisation of research in Antarctica and the Southern Ocean. One important feature is that scientific data are deposited in internationally accessible data banks and hence open to the international science community. There is so much to be done and space for everybody to contribute to sustainable scientific exploration. The momentum of polar research gained during the Fourth IPY should not be lost but used to keep a young and motivated generation of researchers engaged in the polar regions, while more new countries join the relevant international organisations.

ANTARCTIC AND GLOBAL STEWARDSHIP: TIMES OF CHANGE IN THE NATURE OF POLAR RESEARCH

I have had the privilege to be involved in polar research both in high northern and southern latitudes for the past 30 years. My first exposure to the Arctic Ocean was the famous Swedish YMER-80 expedition, which was organised to commemorate the 100th anniversary of Nordenskjöld's first crossing of the Northern Sea Route on *Vega*. Political problems with the Soviet government prevented the *Ymer* from following Nordenskjöld's course. The *Ymer* therefore visited the deep waters around Svalbard and demonstrated for the first time that research could be done from conventional ice breakers in these difficult and ice-infested waters. Now, research icebreakers routinely plow the Arctic Ocean and are able to visit the North Pole. As chairman of European Polar Board (EPB) of the European Science Foundation (ESF) and president of SCAR as well as director of the German Alfred Wegener Institute, I have been able to have some influence on research in high southern latitudes and to contribute to their activities myself. I am extremely happy that the methods of doing polar research are experiencing a phase of rapid change, which is needed both to keep the attention and interest of politicians and to ensure the attraction of this type of research for the young generation of polar scientists who are appearing in a growing number of polar and nonpolar countries. An increasing number of smaller nonpolar countries are now entering the polar research arena, and the big "players" would be well advised to offer any assistance possible both to ensure a broadening

of the constituency of interests and to underpin the quality of all polar research.

The SCAR has played a central role in this development, and it continuously has to make sure that it remains the central and most qualified scientific organization in Antarctic research. Only in this way will it remain the best source for scientific advice to the Antarctic Treaty System (ATS). The membership of SCAR therefore has to be recruited from the best and most experienced scientists in its member countries. There is no monopoly in Antarctic sciences, and SCAR will be wise to play its role in close collaboration with other relevant international science organisations. It must promote excellence in Antarctic and Southern Ocean research, but providing scientific leadership also requires focus because nobody can do everything. The scheme of strategic research themes developed by SCAR represents an attempt at defining the most challenging scientific problems in Antarctica and the Southern Ocean as well as providing a series of umbrellas to gather in and focus research from rich and poorer countries alike.

The SCAR has changed greatly over the past 10 years from an almost "closed shop" into an open science organisation. The introduction of the Open Science Conferences since 2004 has attracted many established as well as numerous young polar scientists. They have provided an important base for the large efforts of the Fourth IPY, which brought more than 50,000 scientists into the polar regions.

In its role advising the ATS, SCAR has to strive to provide independent, high-quality advice, and it also has to critically evaluate the methods and ethics of the conduct of Antarctic research. To retain its position as the major scientific advisory body, SCAR has to express informed opinions on Antarctic research, be proactive in flagging important new developments for the ATS, and respond as far as possible to requests from the ATS; the recent publication of a major report on the impact of climate change in the Antarctic is an excellent example of this change in SCAR's attitude. The SCAR has succeeded in regaining the attention of the ATS and can look with confidence into the future in this area of science diplomacy.

However, the future is not without dangers, and I am extremely happy that the Forever Declaration of Antarctic Treaty Summit clearly highlights the importance of science and research for the ATS. There may be a problem in the future with the filtering effect of the Committee for Environmental Protection (CEP) in the consideration of SCAR's advice to the ATS, but SCAR has the opportunity to raise serious matters in the plenary. The separation of SCAR from COMNAP (in the south) and IASC from the Forum of Arctic Research Operators (FARO; in the north) weakens the impact of the polar sciences, and bipolar research topics gain momentum only slowly under the influence of the SCAR-IASC Bipolar Action Group (BipAG). The IASC and SCAR should find a common roof for the benefit of both and improve the impact of the research conducted under their auspices, maybe under a new "International Union of Polar Sciences."

In considering the past 50 years of Antarctic science we can conclude that much has been achieved, but even more is left to be done. I am certain that Antarctic science will have a bright future and it will continue to have a major role to play in the future of the AT.