



Fifty Years of Peace and Science

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IPY Report: Accomplishments and challenges

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IPY has emerged as the largest internationally coordinated planetary research effort in the past 50 years. It has engaged the intellectual resources of thousands of scientists – many more than expected and often from non-polar countries – representing an unprecedented breadth of specialties, from geophysical to biological to social sciences. IPY has been a truly international, interdisciplinary endeavour with over 160 endorsed science projects involving researchers in more than 60 countries. Substantial new funding – more than USD 400 million – was pledged for IPY, which coordinated with and supplemented ongoing polar research and monitoring programmes. In addition, novel system-level approaches, and observational and analysis technologies, including in-situ and remote sensing, were fundamental features of IPY science. Many IPY projects and their offspring will continue beyond the formal observational period, which ends in March 2009.

The planners of IPY 2007–2008 intended that it would pave the way for a new era of scientific progress in knowledge and understanding of the polar regions, and leave a vital legacy of sustained observing systems, increased international research coordination and collaboration, stronger links between researchers across different disciplinary fields, reference datasets for comparison with the future and the past, development of a new generation of enthused polar researchers, and full engagement and understanding of the public and decision-makers worldwide in the purpose and value of polar research.

Observational systems, facilities and infrastructure

Observing systems for monitoring change are essential for validating and improving predictions, especially of future global warming and its impacts. An unprecedented enhancement of ocean and ice observations took place in the Antarctic. Many national and international organizations are making plans to sustain improved polar observing systems. Ongoing work on the Southern Ocean Observing System is closely integrated with global observational initiatives. New national and international data systems and increased coordination across systems is helping lay a foundation of data sharing, access and preservation as more IPY data come online.

Scientific and political cooperation

Owing to the common interest in polar science during IPY, the links between science and the political framework provided by the Antarctic Treaty System have been strengthened. This heightened level of political attention and financial support has enhanced opportunities for direct international scientific collaboration, facilitated polar access and effective international sharing of polar logistical assets and infrastructure, accelerated the exchange of technological information and improved reporting from nationally supported operational networks. It has also increased connections and collaboration among polar science organisations, such as the Scientific Committee on Antarctic Research and the International Arctic Science Committee, and with non-polar science organisations.

Cross-disciplinary collaboration, synthesis and integration

The very complexity of the Earth system, in which physics, biology, chemistry and geology all interact, demands an interdisciplinary approach to advance understanding and improve predictions of the future. The science scope of this IPY was remarkably different from that of its predecessors and other large-scale science programmes in polar research. Dedicated efforts were made to include synthetic cross-disciplinary studies and projects exploring the human dimension, ecological diversity, and community and ecosystem health. This new form of cross-disciplinary collaboration is widely perceived as a lasting achievement of IPY. It marks an extraordinary advance in our perception of the complexities of the polar regions and of the importance of synthesis, knowledge integration and data sharing in the understanding of processes that affect our planet.

Reference data

In both hemispheres, and throughout the IPY period, enhanced international coordination and cooperation among space agencies have produced an extraordinary quantity and quality of satellite observations of polar regions. These, and many other broad-ranging and easily accessible reference data on the status of the polar regions that IPY provides, will be crucial for comparisons with the future and the past.

A new generation of polar scientists and engineers

IPY has offered an opportunity to hundreds of graduate students and post-doctoral researchers in many specialties to be trained to meet new polar challenges. In many countries this surge represents the largest ever recruitment of new polar scientists. An international group of motivated and energetic young researchers has established the interdisciplinary Association of Polar Early Career Scientists, which offers and promotes career development, collaboration, leadership, and education and outreach tools and opportunities. The leading Antarctic science organisation, the Scientific Committee on Antarctic Research, has formally recognised the Association as a vital long-term partner.

Broad public interest and participation

Enhanced investment in polar research for the benefit of all can only be achieved through the political will that comes from greater public understanding. IPY outreach efforts have contributed to increased public attention to climate and environmental issues and improved awareness of connections between polar regions and the rest of the planet.

IPY has attracted extensive media coverage. Explicit education and outreach components embedded in IPY science projects — coupled with dedicated funding for education, outreach and communication activities in several nations — have produced new, high-quality educational, outreach and communication initiatives and networks. Through publications, exhibitions, films, web pages and lectures, scientists participating in IPY have enlightened a broad audience around the world about the importance of polar regions. International outreach networks have been established largely through IPY Polar Science Days and other internationally coordinated IPY events.

The Prediction Challenge

A challenging and urgent gap exists between the many observations and studies of polar systems underway during IPY and the development of useful predictive skill for the integrated geophysical, biological, and environmental system of the Antarctic. Yet, for scientific and economic reasons, we must quickly develop robust predictive skill for key Antarctic questions about ice, ocean circulation, and ecosystems; reliance on ‘climatologies’ or extrapolation of recent trends clearly will not provide guidance to the future Antarctic. A prediction focus and framework, covering the physical, biological and economic features of the Antarctic system represents the fastest and most effective way to exploit IPY science for the benefit of Antarctic species and global citizens.

Several national centres produce useful forecasts of daily Antarctic weather or daily Southern Ocean ice conditions. Other groups produce long-term global climate scenarios, on multi-century scales. None of these products addresses the crucial need for accurate integrated seasonal to decadal prediction skill in the Antarctic. Prediction induces focus, as suggested here on ice (for climate, sea level and ocean circulation applications), ecosystems (for future fisheries and biodiversity conservation) and the Southern Ocean (for current and future impacts on global carbon cycles), and identifies mutual dependencies: prediction of economic impacts of fisheries requires prediction of ecosystems, which requires prediction of ice. Producing a useful prediction entails substantial risk (and requires changes in thinking and funding), but focusses attention on quality, on user expectations, and on the ingredients necessary to produce regular and skilful forecasts. Prediction systems force us to think operationally, to assess the timeliness and quality of observations, to develop and use assimilation schemes, skill scores and error analyses, and to meet user needs. The requirements of a prediction process will advance communication and impact of Antarctic science like no other activity.

An urgent need for further polar research

IPY has demonstrated the benefits of an enhanced level of support for polar research into the future, as well as the absolute necessity to establish comprehensive and sustainable long-term polar observing systems. The pressing need for further polar research provides the motivation for a sustained high level of public awareness of the polar regions, significant national and international commitments to funding and operational support, ongoing global data stewardship, and recruitment and training of promising young researchers who are needed to carry the work forward.

The following research challenges will have great relevance and urgency beyond IPY:

- Rapid climate change in many parts of the Antarctic;
- Diminishing snow and ice worldwide (sea ice, glaciers, ice sheets, snow cover, permafrost);
- The contribution of the great ice sheets to sea-level rise and the role of subglacial environments in controlling ice-sheet dynamics;
- Global climate impacts of changes to ocean circulation;
- Loss of biodiversity and changing ecosystem patterns and ranges;
- Improved projections and forecasts from integrated coupled climate and weather models;
- Global transport of pollution and contamination to the polar regions and consequent impacts on environments and ecosystems.

Recommendations for the way forward

The next two to four years will be a crucial time for polar research. IPY projects must produce individual and integrated results in a timely and high-impact manner. A key objective should be to maximize the input of IPY research to the upcoming assessments of the Intergovernmental Panel on Climate Change and the deliberations of the United Nations Framework Convention on Climate Change. These include the thirtieth session of the Subsidiary Body for Scientific and Technological Advice to be held in Bonn in June 2009, when the adequacy of the existing terrestrial, atmospheric and oceanographic observing systems for climate will be assessed, and the fifteenth Conference of the Parties to take place in Copenhagen in December 2009, when an agreement on commitments for the post-Kyoto Protocol period after 2012 should be concluded. Major IPY conferences in June 2010 (Norway) and April 2012 (Canada) will provide additional milestones in assessing and reporting IPY accomplishments and shaping future directions for polar research.

Integrating the initial IPY results among projects and across disciplines to achieve system-level understanding and ensuring accessible archiving of IPY data remain substantial tasks for the immediate post-IPY period.

Increasing operational costs and global economic pressure on national research and development budgets will compound the challenge for politicians and science-funding organizations of maintaining and expanding polar research programmes. Nevertheless, the urgent need to understand the global impact of polar changes will remain, not least because climate change is affecting the polar regions more and faster than the rest of the globe.

Far-reaching scientific, public and political enthusiasm for IPY offers an excellent and unique basis for developing polar research in support of better understanding of the role of polar systems in the sustainable development, not only of those regions, but of the whole planet.

Therefore,

The IPY Joint Committee requests that the Treaty Parties consider approving a Resolution on Ensuring the IPY Legacy, along the following lines:

Draft Resolution 'X' (2009) from ATCM XXXII, on Ensuring the Legacy of the IPY

The Representatives,

Recalling the Edinburgh Antarctic Declaration on the IPY 2007-2008 that was agreed at ATCM XXIX, which supports the objective of delivering a lasting legacy for the IPY, and promotes increasing collaboration and coordination of scientific studies within Antarctica;

Recalling Resolution 3 (2007) from ATCM XXX, New Delhi, urging national Antarctic programmes (i) to maintain and extend long-term scientific monitoring and sustained observations of environmental change in the physical, chemical, geological and biological components of the Antarctic environment; (ii) to contribute to a coordinated Antarctic observing system network initiated during the IPY (2007-08) in cooperation with SCAR, CCAMLR, WMO, GOOS and other appropriate international bodies; and (iii) to support long-term monitoring and sustained observations of the Antarctic environment and the associated data management as a primary legacy of the IPY, to enable the detection, and underpin the understanding and forecasting of the impacts of environmental and climate change; and

Noting that at the Forty-first Session of the Executive Council of the Intergovernmental Oceanographic Commission (Paris 2008) several IOC Member States recommended that IOC should play a major role in the Antarctic Treaty Consultative Meeting (ATCM), particularly in the development of a Southern Ocean Observing System, under GOOS, and that the IOC Executive Council decided that further consideration of the legacy of the IPY would occur at the 25th Session of the IOC Assembly (Paris, 2009);

Recommend that the Parties:

- Continue to focus attention on polar research and polar issues at the highest levels of national and international science organisations;
- Develop integrated climate–ecosystem–economic prediction capabilities for polar regions and regional prediction capabilities for specific areas of the Antarctic;
- Identify stable long-term locations for the many networks and programmes established during IPY;
- Provide attention and assistance to the recruitment and retention of young polar scientists within national research programmes and to the growing international Association of Polar Early Career Scientists;
- Rapidly provide IPY data and outcomes as contributions to global and polar-specific integrated assessments; and
- Preserve, store and exchange reliable, accessible, long-term IPY data.