The Challenges of Polar Science

We gain a better understanding of our planet through excellent science. However, carrying out scientific research at the poles presents some unique challenges, and requires special cooperation among countries and individual scientists.

The International Polar Years

Cooperation in polar research has been marked by bursts of activity called International Polar Years. Such an IPY typically lasts for more than twelve months, to include full winter and summer seasons at both poles. The first IPY was held in 1882 – 83 and the second fifty years later. A third IPY, planned for 1957-58, grew into an 'International Geophysical Year'.

Understanding the complex and rapidly changing polar systems during IPY 2007 – 08 demanded international collaboration across disciplines and among nations. For example, understanding the net change of Antarctic or Greenland ice sheets required integrated research and knowledge from glaciologists, meteorologists, hydrologists and oceanographers of many countries.

In addition to excellent and broad interdisciplinary science, the planners of this 'fourth' IPY recommended effective science communication to a wide audience, communication that would involve many languages, fonts, writing styles and modern communication tools. This IPY also highlighted a need for improved communications and data sharing within science, among researchers working in different locations and disciplines.

The cold remote polar regions remain difficult places for humans to live and work, and are places where governments maintain small but expensive research stations. The logistics of polar research (including transport, food, fuel, hardware, safety and communications) also require extraordinary international cooperation at all levels.

Science funding and relevance

Science competes for funding priority in every country. As national budgets get 'squeezed', justifying the expense of polar science gets progressively harder. Sometimes, as happened during the recent IPY, public attention, informed by polar news from 'online' sources, stimulates and converges with political interest, allowing a momentary burst of funding for polar research.

Despite this ready access to scientific news, the public generally does not grasp the natural processes of science. As a consequence, distinction between legitimate scientific news and deliberate disinformation becomes difficult, as can be seen with the current confusion around climate change. Science itself exacerbates this disconnect when it fails to utilise modern information tools. For individuals who have grown up in a world of instant, informal and international access to almost any piece of information, the way current scientific data is portrayed seems irrelevant and cumbersome.

Examining sponges in Antarctica,
Image, University of Illinois, Wikicommons

The speed of science

The 2007 – 08 IPY revealed surprisingly rapid changes in sea ice, permafrost, glaciers, oceans, terrestrial and marine polar ecosystems, and the internal and external challenges faced by polar communities. In many cases these rapid changes challenged our fundamental understanding of the earth's processes. Meanwhile, the speed at which science operates remains snail-like, with:

- 5 years of specialised education needed to develop skills;
- 3 – 5 years needed to gain funding and collect data
- 2 – 3 years needed to interpret the data
- 5 – 7 years needed to publish the results and develop predictive models.

Such a timeline for research careers unfortunately means that results become quickly outdated and preliminary hypotheses become irrelevant, especially in a rapidly changing environment such as the poles. Although many IPY Projects focussed on vulnerable polar ecosystems, with the hope of developing prediction skills and protection strategies, it is likely that major changes have already occurred.

About science communication...

"In the time it took me to write 15 words for the printed page, young students walking within my sight sent at least 1500 words as txt to and from each other's mobile phone. We publish our data as obscure black-and-white graphs, while the public views colourful video messages on buses and trains and plays vivid 3D games on handheld devices.

Meanwhile I download recent sea ice data as ASCII text files, but I can see live train schedules, watch approaching weather, read the menus of nearby restaurants and broadcast instant colour photos from my mobile device.

My physician can quickly compare my just-completed EKG to thousands of others from males of my age across Europe, but I can't show her comparisons of future temperature projections from the latest IPCC climate models.

Thousands of students in computer and electrical engineering departments around the globe explore search algorithms, pattern matching, shortest distance algorithms and cool visualisation technologies, while most of our national and world data centres lack useful geographic interfaces.

Increasingly, the data and communication technologies of science fall behind the information tools of the modern world". -David Carlson.

(Director IPY, International Programme Office).

The Assets of Polar Science

International Cooperation

Representatives of the Antarctic Treaty nations often start their meetings with expressions of thanks. In doing so they acknowledge that working in Antarctica is only possible through international cooperation. Only through mutual assistance among countries, to share scarce fuel, provide timely icebreaking, or support an emergency evacuation, can operations in Antarctica continue.

The recent IPY proved the necessity and opportunity of international scientific collaborations. Dutch students explored sea ice in the Southern Ocean from a German research vessel, a Swedish ice-breaker carried US and Chilean oceanographers on its transit to Antarctica, and Russian aircraft supported French researchers drifting across the Arctic. International exchanges extended to conferences and workshops as well: a young New Zealand researcher opened the IPY celebration in Geneva.

Many IPY Projects, particularly those focused on exploited ecosystems, stimulated new exchanges among economists, ecologists, hydrologists, sedimentologists, climatologists, geneticists and even archaeologists. Despite its regional focus, polar research encourages the advancement of science through the cross-fertilisation of ideas among varied disciplines.

Free and Open Data Access

IPY 2007 – 08 established an advanced data policy: free and open access to all data. Achieving such a goal challenged the existing world data systems with some basic but crucial questions:

- Where would the data be stored?
- Which formats will be used to store the data?
- For how long will it be stored?
- How would providers contribute their data, and how would users find it?

One new solution to these questions came from the establishment of a Polar Information Commons (www.polarcommons.org) to ensure that data and information about the polar regions remains readily available, with minimal constraint, for the interests of all humanity. Today the PIC offers an open, virtual, online storehouse for vital scientific data and information. It encourages innovation, participation in research, education, planning and management in the polar regions.

Association of Polar Early Career Scientists

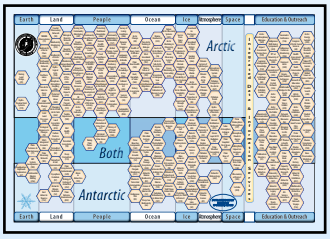
A major goal of the 2007 – 08 International Polar year was to, " ...inspire a new generation of polar scientists and engineers". A new umbrella organisation bringing together polar-related young researcher initiatives across disciplines and nations, the Association of Polar Early Career Scientists (APECS) filled this need for international and interdisciplinary career development activities for young researchers. APECS developed new ways to sustain the international leadership, involvement and energy of early career researchers after IPY and beyond polar science.

Visit: www.apecs.is

Future polar scientists? Image Public domain.

Task: Using an IPY chart

Introduction



This chart has developed into a much-used symbol of 2007 – 08 IPY.

Originally developed as a table to identify gaps in the programme, the hexagons were a useful way to show the abundance and variety of projects.

The chart's success continues, with regular updates continuing to show funding or data status of IPY Projects. Without national icons or acronyms, it reinforces the shared connection to the poles, a special region of our planet.

What to do

1. Search online to find a version of the chart. You may find the one relating to your own country.
2. Pick a project that interests you, from one hexagonal cell.
3. Search online for information about this project.
4. In less than 140 characters, describe what the project was about, or revealed.
5. Send your description to a mobile device (optional).

Relevance

The recent IPY

- achieved many of its goals.
- involved many disciplines.
- produced a unique chart
- encouraged the sharing of data, especially online
- for many people, represented an example of the right science in the right place at the right time.

Adapted from material by *David Carlson, Director IPY International Programme Office* by *Donald Reid, iMatters.co.nz* in association with *Gateway Antarctica. University of Canterbury.*

NZ Curricula: Science L4 - 8, Social Studies L3 - 4, Geography L6 - 8 Technology.