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A year isn't a long time in polar studies

JIM GILCHRIST discovers that International Polar Year will cover two annual cycles

AS ICE sheets shrink and concerns about global climate change proliferate, International Polar Year (IPY) represents the largest and most ambitious international scientific effort for 50 years, covering every imaginable area of study, from major climatic and geophysical surveys enlisting satellite technology to studies of animal species, from endangered polar bears to sub-glacial micro-organisms, as well as indigenous peoples.

With 50,000 people from 63 countries carrying out 200 related projects, IPY aspires to leave as significant a legacy as that left by the International Geophysical Year (IGY) of 1957-58, which resulted in the enduring Antarctic Treaty, promoting international scientific co-operation, rather than territorial rivalry, between the many countries active on the continent.

Projects under the IPY umbrella will range from astronomy conducted through clear polar skies to studies of the four million people inhabiting the Arctic, but global warming is clearly a major unifying touchstone. With polar sciences crucial to our broader understanding of climate change – "the canary in the coal mine for global warming", as the government's chief scientific adviser, Sir David King, says – this new orchestrated explosion of scientific endeavour will see an unprecedented level of scientific collaboration between nations and agencies.

Dr Cynan Ellis-Evans, a senior adviser to International Polar Year, says: "One of the things already emerging from IPY is the emphasis on getting all the space agencies, for instance, to talk as one about providing data on the polar regions. One of the greatest legacies we'll have coming out of IPY is joined-up thinking." As an example, Dr Ellis-Evans, a microbiologist and head of the British Antarctic Survey's programme office, points to an initiative known as GIIPSY (Global Inter-agency IPY Polar Snapshot Year), with new insight into even minute changes in polar ice provided by satellites such as NASA's ICESat. Such state-of-the-art space technology was instrumental in recent revelations concerning rivers under the Antarctic ice sheet, with worrying potential consequences in terms of ice shrinkage and sea-level increase.

"If you look prior to International Geophysical Year," continues Ellis-Evans, "there was hardly any joined-up science presence in the Antarctic; after it there was something like 60 or 80 bases there and a lot of them stayed, like the BAS's Halley Station, which discovered the hole in the ozone layer.

"Many of the fantastic things that came out of IGY could never have been predicted – like discovering the Van Allen radiation belt and working out the thickness of the Antarctic ice, or the treaty. We can't foresee everything that will emerge from IPY, but I suspect there will be some remarkable outcomes – the breadth of science involved is stunning."

If the full title of International Polar Year 2007-8 raises a few eyebrows, Dr Ellis-Evans explains that the "year" has been stretched to allow research to cover two full annual cycles, from next month to March 2009, in both poles.

While the British Antarctic Survey welcomed the recent report by the Intergovernmental Panel on Climate Change, there is some feeling that the IPCC sidelined some findings by researchers which suggest that the Antarctic Peninsula is heating up faster than virtually anywhere else on the planet, with worrying implications for sea level rise. Ellis-Evans reckons the IPCC skimped on fresh evidence about the instability of areas such as the west Antarctic Ice Sheet, and he points to the recent revelations about sub-glacial "plumbing" such as rivers under the ice. "These are moving water around under the ice sheet and pumping it into the sea, which in turn has freshening effects which influence currents. There are a lot of potential implications, but we're only a year into recognising the reality of it," he says.

"Melting ice sheets inevitably mean sea-level rises, but they also mean a change in albedo [the whiteness or reflecting power of the Earth's surface]. A large part of the radiation that hits the Earth is reflected back by the ice caps, but that's going to change – over a considerable period of time, obviously, but when you start talking about the Arctic sea ice being virtually gone during the summer by 2040-50 ... That's a big area of ocean going to be opened up. Phytoplankton can start working there and, yes, they start taking up potentially more CO_2, but on the other hand there's issues coming out about how that CO_2 is going to be held within the system."

The impact on humans in these areas is equally profound, says Ellis-Evans. "One of the most compelling statements, for me, when they asked indigenous people what they thought about climate change, was, 'We don't understand the weather any more'. And this from people who have such an intimate link with their environment." he says.

One of Ellis-Evans's colleagues on an international committee concerned with sub-glacial lakes is Professor Martin Siegert, head of Edinburgh University's School of GeoSciences, who agrees that a vital aspect of IPY will be to engender international

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communication and collaboration. "This is the only real way to tackle big questions about global changes," he says, "and the legacy of IPY will, I believe, be seen in the connectivity between international scientists in the next ten to 20 years."

Siegert is in charge of two IPY programmes, one of them the detailed geophysical survey and exploration of Lake Ellsworth, a 10km-long sub-glacial lake in west Antarctica, which will result in the lake, buried under some 4km of ice, being described in more detail than any of the 145 sub-glacial lakes now known to exist in Antarctica. These lakes, the best known of which is Lake Vostok, currently the subject of a controversial (due to fears of contamination) drilling exercise by the Russians, are of particular interest for the widely accepted hypothesis that they contain unique forms of microbial life as well as sedimentary evidence of past climate change and possibly even fossil traces.

The second IPY project led by Siegert is investigating the geological history of Antarctica – "with a mind to seeing how the ice sheet changes with climate, which is very important for assessing how it may change in future".

Also looking back to the successes 1957-58, Siegert looks back to the triumphs of 50 years ago and agrees that IPY may well reaffirm the international collaboration procedures established by the Antarctic Treaty. He says: "It will also allow a new generation to think about their research in an international context, which, of course, will be healthy for the treaty as it needs to be renegotiated soon."

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