Supporting big picture science

PETER NINK

This year sees the Australian Antarctic Division (AAD) preparing for a number of ambitious scientific events and projects. Fast approaching is the International Polar Year (IPY), which will span the 2007–08 and 2008–09 seasons. We are now planning for our role in this significant international programme, which includes leading a Census of Antarctic Marine Life. This project will see ships from many nations taking part in a collaborative, large-scale survey of species biodiversity, abundance and distribution in the Southern Ocean. We are also planning our role in a major oceanographic survey, an international climate project, and a number of other projects. The IPY will significantly advance polar research and establish new benchmarks in our understanding of Antarctica and the Southern Ocean.

Our ability to participate in the IPY and to conduct the vast range of scientific research encompassed by the Australian Antarctic programme depends on a range of supporting activities, individuals and tools. This issue of the *Australian Antarctic Magazine* features some of these.

Working behind the scenes, the AAD's Polar Medicine Unit, through its links with the Royal Hobart Hospital and other national and international medical and research facilities, recruits and trains doctors to provide specialised medical support in the unique Antarctic environment. It also supplies training to expeditioners willing to assist doctors in Antarctica and conducts research to improve the health and safety of expeditioners. Without these capabilities the AAD would be unable to pursue its research goals in Antarctica. The unique practice of remote and extreme medicine is also used as a test bed for other remote and extreme environments, including space.

Other unsung heroes of the Australian Antarctic programme are our voyage leaders. These men and women are critical to the smooth transfer of expeditioners and cargo between Australia and Antarctica and to the planning of scientific activities *en route*. Many voyage leaders are drawn from other jobs within the Antarctic programme to meet this critical leadership role.

Tourists too, play an important role in supporting Antarctic science. Through lectures on board cruise ships, for example, thousands of dollars have been raised to support seabird conservation projects. Some of these funds have assisted the development and testing of new longlining methods to help prevent deaths of albatrosses and petrels.

Through the newly established Advisory Committee to the Agreement on the Conservation of Albatrosses and Petrels, and a Threat Abatement Plan, a range of research and conservation initiatives will continue to support Australia's goal to protect these majestic birds.

The 2004–05 Antarctic season saw a number of reviews of Australia's environmental management procedures. Such reviews are necessary to ensure that our activities in Antarctica are not damaging the sensitive ecosystem we aim to protect. Australia also participated in inspections of the infrastructure

and activities of other Antarctic Treaty countries. These were the first by Australian observers for many years. Antarctic Treaty inspections ensure all Parties are upholding their obligations to conduct peaceful scientific research and minimise their environmental impacts in Antarctica.

The introduction of the new CASA 212–400 aircraft, 'Ginger' and 'Gadget', to Antarctica, was not without its teething troubles, but we were able to test and measure the capability of the aircraft and the systems that they operate with. We are looking forward to consolidating our new knowledge in the season that lies ahead and to see the aircraft play a central role in supporting Antarctic science.

This issue also brings you some surprising and exciting results from the Southern Ocean, an Antarctic ice core, the Davis lidar and the seabed near Casey. The discoveries reported in these articles illustrate the important roles technology and cooperation have in improving the amount, diversity and quality of information scientists can gather from their experiments. Robotic 'Argo' floats, for example, repeatedly gather information about the ocean's physical and chemical properties, from its surface to 2000 m below, and beam this information to satellites connected to computers around the world. Five years ago we could not have dreamed of collecting information from such remote and hostile regions of the Southern Ocean. Today, it is saving us time and money and fast-tracking our ability to monitor changes and predict their effect.

As this magazine goes to press I am pleased to report that the Prime Minister's Science and Engineering Innovation Council (PMSEIC) enthusiastically received a presentation and report on future opportunities in Antarctic and Southern Ocean science. Over the coming months my colleagues and I will follow up on initiatives flowing from PMSEIC's engagement with our work, to best position us for the future.

I am also delighted to hear that the May 2005 Federal Budget has announced the Government's commitment of $46.3 million over four years to introduce an air link between Hobart and Antarctica. The air link will revolutionise the way we go about supporting science in Antarctica. I look forward to telling you more about this exciting development in our next issue.

—TONY PRESS
Director, AAD

Setting up the drilling tent.

MIKE WOOLRIDGE

SCIENCE

650 years in an

A 120 m ice core retrieved from Law Dome inland of Casey Station last October will provide AAD scientists with a 650 year record of the Earth's climate. This record covers both natural and human induced changes in the Earth's climate, in particular the natural climate phenomenon known as the 'Little Ice Age'.

Historical records show that Northern Europe experienced the Little Ice Age between around 1400–1850 AD, but the extent to which it may have affected the global climate is not well understood. The sea ice that forms each year on the Southern Ocean around Antarctica may provide a clue, as the extent of the Antarctic sea ice cover varies in response to climate change. However, observations of sea ice extent are limited. Most research to date has used satellite data, ice edge records from whaling ships and even the observations of Captain Cook.

In November 2003 we published an article in Science magazine (*Science* 302:1203–1206) detailing the use of a 'proxy' record of sea ice extent, obtained through the analysis of methanesulphonic acid (MSA) in an ice core from Law Dome. This chemical is produced by certain species of algae associated with sea ice. The more sea ice there is, the more algae, and the more MSA in the ice core. MSA measurements on the ice core produced a 150 year record of sea ice extent. In order to extend the sea ice proxy into the Little Ice Age, however, we needed to obtain a core at least 500 years old.

Before going into the field to drill this ice core, there were a few considerations. Firstly, we needed to choose a drilling location on Law Dome that gave us low enough snow accumulation to get a 500 year record at around 100 m depth. If we chose the wrong site, we could have been drilling up to 500 m to obtain the 500 year record!

Secondly, we had a small 12-day window of opportunity to visit Law Dome and drill the ice core. This tight schedule required good planning, with a range of options, priorities and backups in case of poor weather and the 'A' (Antarctic) factor. With the help of the Operations Branch, Casey Station personnel and a lucky string of good weather, we were able to travel to the drill site, set up camp, assemble the drill, drill 120 m over eight days, disassemble the drill, and depart on schedule.