SOUTHERN QUEST

TEXT PREPARED FOR ANTARCTIC AND SOUTHERN OCEAN

CO-OPERATIVE RESEARCH CENTRE

1 Warnings from the South

To the south of Australia is a place like no other on Earth.

A place of contrast. Of darkness and light, tumult and calm, life and no-life.

A stark, hard-edged world of ice and rock, of hurricane winds and terrifying seas, of surreal, sublime vistas and astonishing sky-shows. A world dominated by water, frozen and fluid.

For the natural inhabitants of this place, death is the only alternative to health. They win their right to life through strength and endurance. The human is never more than a privileged, protected visitor.

We are both repelled and fascinated by the Antarctic. Its terrible beauty is mute testimony to the grandeur and power of nature. It is also a reminder of what we can lose – have lost – in our headlong rush to dominate the planet.

Perhaps most important of all: the Antarctic has stories to tell and tidings to bring that we will do well to heed.

As our quest for knowledge about Spaceship Earth gathers pace, we are coming to see the inestimable value of the things that this extraordinary place can tell us about past climates, present changes and events yet to happen.

Complex patterns

Antarctica's vast ice sheets, holding about 70 percent of our planet's fresh surface and ground water and about 90 percent of its ice, also store information about ages past that are enabling us to track climate changes over tens of thousands of years.

Antarctica's ice cover is constantly moving, enlarging and contracting, making it the most mobile of continents. Knowing how these changes happen can help us understand and predict, among other things, changes in world sea level.

The climate of Australia, an island nation, is dominated by oceanic events. Getting to know our own climate means understanding the workings of the dynamic ocean waters to our south and their pivotal role in the global climate system.

Infinitely complex patterns on an enormous scale – dictating weather and climate throughout the Southern Hemisphere and beyond – arise out of the intricate relationships between the Antarctic atmosphere, continental ice, sea ice and the waters and living organisms of the Southern Ocean.

Studying the Antarctic is teaching us the importance of cooperative effort, adventurous thinking and open minds, because without them we cannot hope to comprehend this vast region and its integral place in global processes.

Science and diplomacy

Science has been part of Antarctic history since the 18th century. But while the quest for knowledge was always a motivation for early southern voyages, it usually had to take second place behind national glory, commercial gain or simple survival. Early Antarctic expeditions tended to be led by naval officers or entrepreneurs, and only rarely did a scientist assume a position of command. Even into the 20th century, the scientist-leader Douglas Mawson was an exception.

But science was to have its time. In the 1950s something extraordinary happened. With the support of their governments, a massive global observational study called the International Geophysical Year saw scientists from many nations converging on Antarctica. Out of their work came the view that for the sake of the world, the Antarctic needed to be free from political competition.

In the depths of the Cold War, nations from opposite ends of the political spectrum and from all colours between met to negotiate the future of Antarctica. In 1961 they came together in Canberra, under the umbrella of the new Antarctic Treaty, to ensure the region remained dedicated to peace and science.

The Antarctic Treaty was an unprecedented demonstration that science could bind nations while it also enlarged our minds, and that working together we could achieve so much more than in our separate national boxes. As one of 12 founding members of this unique assemblage, Australia has much at stake in ensuring that the Treaty continues to support the primacy of science and cooperative endeavour in the Antarctic.

A GLOBAL RESEARCH NETWORK

The Antarctic Treaty system has been the most publicly visible part of a complex international global research network, some of which pre-dated the Treaty. The moving forces behind most of these initiatives have been the World Meteorological Organisation and the International Council for Science.

The ambitious Global Atmospheric Research Programme, launched in 1967, was a multi-year effort that sought a better understanding of global atmospheric forces. Its crowning achievement was the 1979 Global Weather Experiment, involving atmospheric and space scientists from 170 nations, which laid the foundation of today's world-wide system of geostationary and polar-orbiting satellites.

The World Climate Research Programme, established in 1980 to gather information about the physical climate system, encompassed studies of the global atmosphere, oceans, land surface, and sea and land ice. Out of this ambitious international effort emerged the World Ocean Circulation Experiment, using the resources of many nations to undertake multi-year field and satellite observations of the global ocean and its physical processes.

The International Geosphere-Biosphere Programme was established in 1986. This study – truly global both in its membership and the scope of its work – sought to know how the Earth system works and how human activity is affecting it. It asked: How does the physical climate system function? How is Earth able to deal with growing human-driven pressures? Where is Earth's climate headed, and how will this affect its life systems? Should we try to return Earth to its pre-industrial state, and how? How can human societies respond to this challenge?

VENTURING INTO THE UNKNOWN

In the late 1980s, some senior scientists and research agency administrators started a move to establish a new Australian Antarctic research centre in Hobart. Known by its shortened title of 'Antarctic CRC', the Cooperative Research Centre for the Antarctic and Southern Ocean Environment (later to be renamed the CRC for Antarctica and the Southern Ocean) was one of many such study centres mooted around Australia in

response to the Australian Government's proposed CRC program.

The Antarctic CRC's proponents were aware of the importance of Antarctic processes in shaping global climate. They recognised that Australia's climate research in the region was being done by several small, separate groups without the resources needed to address the big questions about the role of the Antarctic in global change.

They were also aware there was much more to Antarctic processes than met the eye. They knew, for instance, that in the distant geological past trees had grown in Antarctica and that its ice sheet had changed in size and form many times over the millennia. But they did not know whether at present it was expanding or contracting, nor did they have adequate knowledge of how key aspects of changing climate might affect the ice sheet.

They knew that the interaction of atmosphere, ice sheet and ocean was an important contributor to far southern weather and climate, but they knew very little about how this affected conditions on the global scale or in the longer term.

They knew that the Antarctic region was a considerable influence on global climate systems and that Antarctica itself was an important part of this. But the Southern Ocean is the greater part of that region, and their knowledge of this body of water – its structures, processes and circulation – had many gaps.

They knew the Southern Ocean influenced oceans and climate well beyond the Southern Hemisphere, but they had little knowledge of the extent of this, nor how it might currently be changing.

They knew that the turbulent waters of the Southern Ocean absorbed atmospheric carbon dioxide, but they did not know how much. Nor did they have much information on the extent of these processes or how their components fitted together.

More fundamentally, like all scientists they understood that all our discoveries down through the ages are no more than the tip of a giant iceberg. They knew that for all their knowledge of the Antarctic, critical elements were still missing.

Creative thinking

The University of Tasmania's growing Antarctic interest was reflected in its establishment in 1989 of the Institute for Antarctic and Southern Ocean Studies

(IASOS). IASOS was the springboard for some creative thinking and hard work by three key Antarctic research agencies based in Hobart: the Australian Antarctic Division (AAD), the Oceanography Division of the Commonwealth Scientific and Industrial Research Organisation (CSIRO), and the University of Tasmania.

Each of these bodies was painfully aware of the fragmented nature of Australian Antarctic research and the need to provide a focus for this work. As the Australian base of Antarctic operations, Hobart was the obvious location for a centre to help bring this research effort together and gain strength from numbers. The funding support offered by the CRC framework was an opportunity to bring this to reality. But it also meant that the venture partners would need to pool resources for a common interest and in a spirit of cooperation.

The three agencies brought other partners into the fold. Two long-standing Antarctic research agencies – the Bureau of Meteorology and the Bureau of Mineral Resources, Geology and Geophysics (soon to be re-named Australian Geological Survey Organisation – AGSO – and now known as Geoscience Australia) – joined the proposal for an Antarctic CRC.

A SINGULAR ACHIEVEMENT

The joint application of these five organisations bore fruit early in 1991 with the announcement that Antarctic research would have a place in the first Australia-wide network of CRCs. The repercussions of this singular achievement were to be felt for many years, not just in Australia but world-wide, as this newly-focused Antarctic research effort made its impact on the international Antarctic community. It was to become one of the world's largest Antarctic research centres.

There was further incentive for the kind of focused research effort that the CRC would provide. Some areas of Antarctic science had been given a reasonable level of attention over the years, notably those areas directly supported by the major operational agency, the Australian Antarctic Division: biology, glaciology, upper atmosphere physics and space physics.

Antarctic science's traditional focus on land-based studies was shifting to the marine environment through the 1980s, but with the exception of the effort to

give effect to the 1981 Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), this work lacked the support of basic physical and chemical oceanography, which must underpin any comprehensive marine research program.

An immediate incentive for an Antarctic CRC was the current availability, for the first time, of key facilities and technology. Australia's new icebreaking research vessel, *Aurora Australis*, was commissioned for service early in 1990. It provided an unprecedented opportunity for oceanic research with its fully-equipped laboratories, facilities for ocean sampling, helicopter facilities and a much greater ability than its predecessors to penetrate and work in Antarctic pack-ice.

Added to this was access by Tasmanian-based research institutions to new remote-sensing satellite technology. Using a local earth station, CSIRO and University of Tasmania scientists could now use data from a new generation of environmental monitoring satellites providing broad-scale data at an unprecedented level of sophistication.

The prospects were favourable for some fruitful and stimulating years ahead for Antarctic science.