

FDI Feature Interview

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'The Search to Understand a Changing Climate Leads Inexorably to Antarctica and the Southern Ocean' – Dr Tony Fleming, Australian Antarctic Division

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Key Points

- Antarctica-based scientific research is critical to developing an understanding of climate change and its likely environmental and ecological implications.
- Understanding globally significant processes driven by the South Ocean, principally, changes in surface energy, future greenhouse gas levels, sea-level rise, the variability and rate of change of climate and changes in atmospheric composition is vital to forecasting climate and environmental changes and impacts.
- Understanding the impact of climate change on Antarctica's ecosystems is integral to better preparing Australia to confront the challenges to its environment and economy.

Summary

The impact of climate change is forecast to have major implications for the future of the world's climate system. According to **Dr Tony Fleming**, who heads the Australian Antarctic Division, developing an in-depth appreciation of the impact of climate change through scientific research in Antarctica, the Southern Ocean and the southern Indian Ocean will provide valuable information that will help Australia to adapt to its challenges.

Commentary

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Q: Tell us about the Australian Antarctic Division's mandate, resources and operations?

Tony Fleming: The Australian Antarctic Program (AAP) is the primary mechanism for delivering Australia's activities in the Antarctic and sub-Antarctic. In addition to the Australian Antarctic Division (AAD), a wide range of other government and non-government stakeholders are involved in the AAP. The AAP is administered by the AAD. The amount of money appropriated for the AAD in 2011-12 was approximately \$120 million.

The AAD provides the capabilities to perform Australia's Antarctic activities through a mix of assets and infrastructure. There are three permanent stations on mainland Antarctica (Casey, Davis and Mawson) and a fourth on Macquarie Island in the sub-Antarctic (which forms part of Tasmania and is not part of the Australian Antarctic Territory). These stations are supported by shipping, aviation and traverse transport capabilities. Around 500 expeditioners are taken south each year during the summer operating season.

Australia's Antarctic science program is internationally recognised for the excellence of its research and is a leader in fields such as: (a) Understanding the role of Antarctica and the Southern Ocean in the global climate system and predicting the impacts of climate change (ie: on weather in Australia, and primary production); (b) Providing the basis for conservation and sustainable management of living resources in the Southern Ocean (including whales, krill, fish and seabirds); and (c) Understanding and minimising the impacts of human activities on the Antarctic environment.

Australia's Antarctic science program has positioned Australia at the forefront of Antarctic and Southern Ocean science, securing Australia's position as a leading and influential player within the Antarctic Treaty System. Antarctic science and monitoring also makes an important contribution to Australia's standing international forums, such as the Comprehensive Nuclear-Test-Ban Treaty.

The AAD administers the Australian Antarctic Territory (AAT) as well as the Heard Island and McDonald Islands external territory (located around 4,000km south-west of Perth). The administrative and policy roles of the AAD include: administering various pieces of legislation; engaging under the Antarctic Treaty System and other international agreements; overseeing management plans, environmental permits and authorisations; and managing Australia's Antarctic heritage.

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Q: How important is Antarctica to Australia? What are Australia's key interests and goals when it comes to Antarctica and how can we progress them?

Tony Fleming: Australia's interests in the Antarctic are broad and deep spanning concrete issues such as science, environment and economics, through to the less tangible but obvious advantages that flow from a peaceful and stable international governance regime for the continent to Australia's south. Eastern Antarctica is proximate to Australia. The distance from Hobart to Antarctica is about the same as to Perth (around 2,700km).

Antarctica's unique environment offers globally significant opportunities for scientific research. In particular, changes in Antarctica and the Southern Ocean will have profound impacts on Australia's climate and primary industries. Better understanding of key Antarctic ecosystems is crucial to environmental protection for the region and ecosystem-based management of natural resources. Australia's commitment to working through the Antarctic Treaty System demonstrates the weight we place on negotiations and diplomacy within international relations. The peaceful relations in Antarctica achieved through the system has clear benefits for how Australia is able to pursue its significant interests in the region.

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Q: How important is HIMI and Macquarie Island to Australian interests in general and, more specifically, to the Australian Antarctic Division's overall operations?

Tony Fleming: There are practical, administrative and scientific differences between the islands and their relevance to the AAD's operations. While the islands are both sub-Antarctic, Heard Island and McDonald Islands (HIMI) is an external territory and therefore is a Commonwealth responsibility whereas Macquarie Island is part of the State of Tasmania. From an international governance perspective, HIMI is in the area covered by the Convention on the Conservation of Antarctic Marine Living Resources which brings with it additional obligations. Macquarie Island is outside this area.

HIMI was inscribed on the World Heritage List in 1997 for its outstanding universal natural values. A substantive part of the HIMI exclusive economic zone (EEZ) is declared as a Commonwealth Marine Reserve. The HIMI Marine Reserve is managed by the AAD as an IUCN category 1a Strict Nature Reserve. The Kerguelen Plateau, on which the HIMI region is located, is of scientific importance to the AAD as an area for climatologic, oceanographic and fisheries research. Marine research activities benefit the conservation objectives of the government and fisheries interests in the EEZ. The AAD does not have a permanent presence on Heard Island.

Part of the Macquarie Island EEZ is also declared as a Commonwealth Marine Reserve and lies adjacent to the Macquarie Island Nature Reserve which is managed by the Tasmanian Government. The island was also inscribed on the World Heritage List in 1997. The AAD's station on Macquarie Island has been continuously occupied since 1948 with an ongoing winter program and extensive summer projects. The AAD maintains the station and field huts and provides logistic support for all the activities there, including those of the Tasmanian Parks and Wildlife Service related to their management of the Macquarie Island Nature Reserve and World Heritage Area, and the activities of the Bureau of Meteorology.

Heard Island and Macquarie Island are in a zone of rapid environmental change and are located in different positions relative to the climatically important ocean frontal systems. For this reason they are valuable ecosystems to include in a network of long-term observing sites designed to identify functional and structural ecosystem change. Studies on Heard Island have revealed that one particular glacier has retreated by over one kilometre and has lost 38 per cent of its mass, as a consequence of an overall mean temperature rise of about 1°C. Heard Island region has also been observed as having experienced a shift in ocean currents in recent years.

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Q: *What is scientifically and ecologically significant about Antarctica and the Southern Ocean?*

Tony Fleming: Scientific efforts are redoubling as we turn to Antarctica for answers to one of the great challenges of our time – understanding and adapting to changes occurring in our climate, ecosystems and oceans as a result of our high carbon dioxide emitting lifestyles. The search to understand the drivers and impacts of a changing climate leads inexorably to Antarctica and the Southern Ocean, which we now understand are sentinels of global climate change.

In addition to climate change, krill – one of the most abundant animals on earth – help sustain the iconic ecosystems of this remote ocean, and will be critical to recovering populations of whales and seals.

The seasonal growth of sea ice each year is one of the earth’s most significant seasonable cycles, covering an area of 19 million square kilometers at maximum extent. This is 1.5 times the area of the Antarctic continent. Antarctic and Southern Ocean water masses dominate the global oceans and in so doing influence the climate of Australia and all of the other continents. The Southern Ocean is a major sink for global carbon dioxide emissions (accounting for 30 per cent of the global ocean uptake). Regional weather and global climate are heavily influenced by the composition and dynamics of the atmosphere above Antarctica. The unique ecosystems and iconic wildlife of the continent and Southern Ocean are sentinels for the rest of the world on the impacts of ocean acidification and global warming.

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Q: *How is climate change likely to impact Antarctica and the Southern Ocean?*

Tony Fleming: Antarctica and its surrounding ocean are dominated and shaped by the presence of snow and ice which, while themselves controlled by the climatic regime and very sensitive to climate change, also influence and provide major feedbacks to the global climate system. Many globally significant processes are driven by the unique climate and geography of the Antarctic region. These include the uptake of carbon dioxide by the Southern Ocean; the overturning circulation of the deep ocean; the balance between water storage and discharge in the main continental ice-sheet; changes in surface energy, mass and momentum exchange by ice masses; and energy transfer between all levels of the atmosphere to space.

Understanding these processes is vital for understanding and predicting climate and environmental changes and their impacts. These impacts include future greenhouse gas levels, sea-level rise, the variability and rate of change of climate, and changes in atmospheric composition. The latter includes the stratospheric 'ozone hole', which affects life in Southern Hemisphere nations.

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Q: *How can complex issues such as fisheries management be effectively regulated?*

Tony Fleming: Management and regulation of activities in areas like the Southern Ocean depends on agreements and institutions at the international level (in some cases in addition to national laws where they apply). In the case of the marine resources of the Southern

Ocean, the nations active in the Antarctic region built on the existing agreement of the Antarctic Treaty, by adopting the Convention on the Conservation of Antarctic Marine Living Resources. This Convention, and its governing Commission, provides the framework for conserving and managing, (including managing harvesting), the marine resources in the Antarctic region.

Countries that wish to be active in fisheries exploitation in the region, for example, may become members and participate according to the rules and management measures agreed, which ensure sustainability of the harvested resources and their dependent and associated ecosystems. The countries with interests in the region and its conservation (the Members), also take international action (such as fisheries surveillance and reporting, or trade control of marine products), and exert diplomatic pressure, coordinated through the Commission, to prevent activities by non-Contracting Parties that are contrary to the objectives of the Convention. These actions are supported by broader international agreements relating to marine resources and fisheries.

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Q: How secure is the Antarctic Treaty system? Are there any emerging threats to the status quo?

Tony Fleming: This year marks the 50th anniversary of the entry into force of the Antarctic Treaty in 1961. Membership of the Treaty, which is the highest level of international law, has increased from the 12 original signatories (including Australia) to 48 countries. This demonstrates that the Antarctic Treaty and its related international agreements, known collectively as the Antarctic Treaty system, are the internationally recognised way to effectively manage and govern the Antarctic region. The Antarctic Treaty parties, which include all countries active in Antarctica, consistently demonstrate their commitment to the core objectives of: using Antarctica for peaceful purposes only; promoting Antarctica as a place for scientific endeavour; and ensuring comprehensive protection of the environment. This strong and enduring international support ensures that the Antarctic Treaty framework is secure.

There are ongoing challenges for the management and protection of the Antarctic region. For example, the annual Antarctic Treaty Consultative Meeting and the concurrent Committee for Environmental Protection continue to consider how to address issues such as: the Antarctic implications of global climate change; how to ensure that increasing levels of Antarctic tourism are conducted in a safe and environmentally sensitive manner; and how to prevent the introduction of pest species. Challenges associated with the conservation of the marine environment and sustainable fishing are dealt with through the forums of the Convention on the Conservation of Antarctic Marine Living Resources. Over the last half century the Antarctic Treaty and its related agreements and institutions has effectively addressed a range of emerging issues, such as the possible exploitation of seals, other marine living resources, and minerals. The Antarctic Treaty system has proven to be robust, and is widely recognised as a model for international co-operation.

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Q: Given the increasing global dependence on resources, is it only a matter of time before nations seek to exploit Antarctica's natural resources? Could we see a similar sort of scenario to what is happening now in the Arctic?

Tony Fleming: Australia is proud to have led efforts to ensure that mining in Antarctica is banned. International law, through Article 7 of the Protocol on Environmental Protection to

the Antarctic Treaty, unambiguously bans mining and oil drilling – it says ‘Any activity relating to mineral resources, other than scientific research, shall be prohibited’. The ban is indefinite, and applies throughout the Antarctic Treaty area, which comprises the entire continent plus adjacent waters north to 60° South. The Antarctic region is very different from the Arctic geographically, and also in terms of the applicable legal framework, so the current Arctic situation is of limited relevance when considering future scenarios for Antarctica.

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Q: Tell us about the Australian Antarctic Division’s co-operation with polar scientific research teams/expeditions from China and India?

Tony Fleming: The AAD is collaborating with China and India (and Russia and Romania) on the protection of the Larsemann Hills, a 40 km² ice free area in East Antarctica. This work follows a successful joint nomination to have the region designated an Antarctic Specially Managed Area. The impetus for designation was to provide for the heightened protection of the local environment by promoting co-ordination and co-operation in the planning and conduct of activities. Ice free areas are of high conservation value and make up less than 1% of the continent.

We are currently collaborating with the Chinese Program who have deployed Automatic Weather Stations on their traverse route to Dome A and at Dome A itself. The two programs have a long history of collaboration, with joint studies on data from Australia’s Lambert Glacier Basin traverse, Automatic Weather Stations and through work large international ice core consortia. The history of joint work began in the late 1970s, extending through the 1980s where several Chinese glaciologists joined Australian Antarctic expeditions. They modeled much of their traversing capability on the Australian Program.

In the spirit of co-operation amongst countries active in East Antarctica, during the 2010/11 Austral summer the Chinese Antarctic program made available its vessel to provide for Australia to repatriate over a 1,000 tonnes of waste excavated from an old waste site near Casey station. Illustrating the importance that China places on co-operation in Antarctica has seen a Consul for Antarctic Affairs located at the Consulate-General of the People’s Republic of China in Sydney.

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Q: What are the key issues of concern over Antarctica’s future?

Tony Fleming: Antarctica is subject to one of the most successful and stable international governance regimes. As mentioned earlier, there are ongoing challenges with managing and minimising the environmental impacts of human activities in the Antarctic region, including the sustainable harvesting of marine resources. The Antarctic Treaty system is the best means of addressing these and other challenges associated with activities in the Antarctic region. The Antarctic Treaty System has proven to be extremely resilient and Australia is fully committed to the continued governance and management of Antarctica through the system, and ensuring it retains its position of leadership and influence within it.

Any opinions or views expressed in this paper are those of the individual author, unless stated to be those of Future Directions International.

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