



HM Government

UK Science in Antarctica 2014-2020





Cover: Twin Otter aircraft flying over the Antarctic Peninsula

This page: UK sea-ice scientists pass in front of a huge iceberg in the Bellingshausen Sea, Antarctica

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Foreword

Antarctica is the largest and most pristine wilderness on Earth, and an unrivalled natural laboratory for scientific research.

Antarctica's importance as a continent for international scientific collaboration was first recognised during the International Geophysical Year (IGY 1957-58). Today the Antarctic Treaty provides the international framework for scientific collaboration, environmental stewardship and peaceful use of the continent.

Britain was one of the original 12 nations to sign the Antarctic Treaty – a highly successful agreement that came into force in 1961 and now has 50 signatories. The UK continues to be a leader in the Antarctic Treaty System (ATS). The UK Antarctic Acts of 1994 and 2013 emphasise our long-term commitment to the ATS. An effective legislative and administrative framework seeks to ensure that all British activities in Antarctica are conducted in a safe and environmentally-sensitive way.

Much of our current understanding of global climate change, ocean circulation, weather patterns, space weather, glaciology, geological history, biodiversity and the resilience of life on Earth is the result of decades of scientific observation, analysis and monitoring studies in

Antarctica. UK scientists have played a leading role in this global research effort.

Britain's Antarctic scientific research and its operational presence are critical for informing UK Government policy objectives, including those for climate change, energy security, global food security, innovation and economic growth. The UK strives to achieve excellence in all that we do in Antarctica. We fund science that benefits humanity, sustainable use of resources, helps protect the planet and generates economic and social impact. We insist that our research outcomes are disseminated to the international academic community. We deliver stakeholder and public engagement campaigns which explain the importance and relevance of our investment in Antarctica to everyday life.

The focal point for the UK's polar science community is the British Antarctic Survey (BAS). Owned and managed by NERC (Natural Environment Research Council), BAS is responsible for delivering and supporting UK scientific research and infrastructure in accordance with the ATS on behalf of the UK Government. BAS manages Antarctic and subantarctic infrastructure to enable UK and international polar scientists to work safely and effectively at research stations, in the field, on ships and on aircraft.

The ability to conduct world-class research in Antarctica now and in the future is closely connected with the UK's wider responsibilities in Antarctica. The UK

Government has earmarked over £200 million for a new UK polar research ship to enable new and continuing investigations into the impact of environmental change.

Britain has had a long-standing interest in the region, beginning with the first circumnavigation of the continent by Captain James Cook in 1772-75, through the 'Heroic Age' of Scott and Shackleton's expeditions, to modern-day science and responsible tourism. Along with such interest has come responsibility, for the British Antarctic Territory, as well as for South Georgia & the South Sandwich Islands, both of which are UK Overseas Territories. In all its actions involving science and presence in the region the UK fully respects and supports the provisions of the Antarctic Treaty System, to ensure that the region remains a continent devoted to peace and science.

This document, *UK Science in Antarctica 2014-2020*, creates a framework for British research in one of the most important regions of our planet. It addresses the urgent need to refine our understanding of the Earth's climate system; how the Southern Ocean ecosystem will evolve in coming decades; and urges the science community to make new and important research discoveries that will benefit UK society and its economy.

Innovation and research are at the heart of the UK growth agenda. The advancement of Antarctic knowledge and understanding is essential to a promising future for the UK. As the key Ministers with responsibilities for investment and increased national and international collaboration in Antarctic research, infrastructure and governance, we expect UK polar science to continue to be amongst the best in the world.



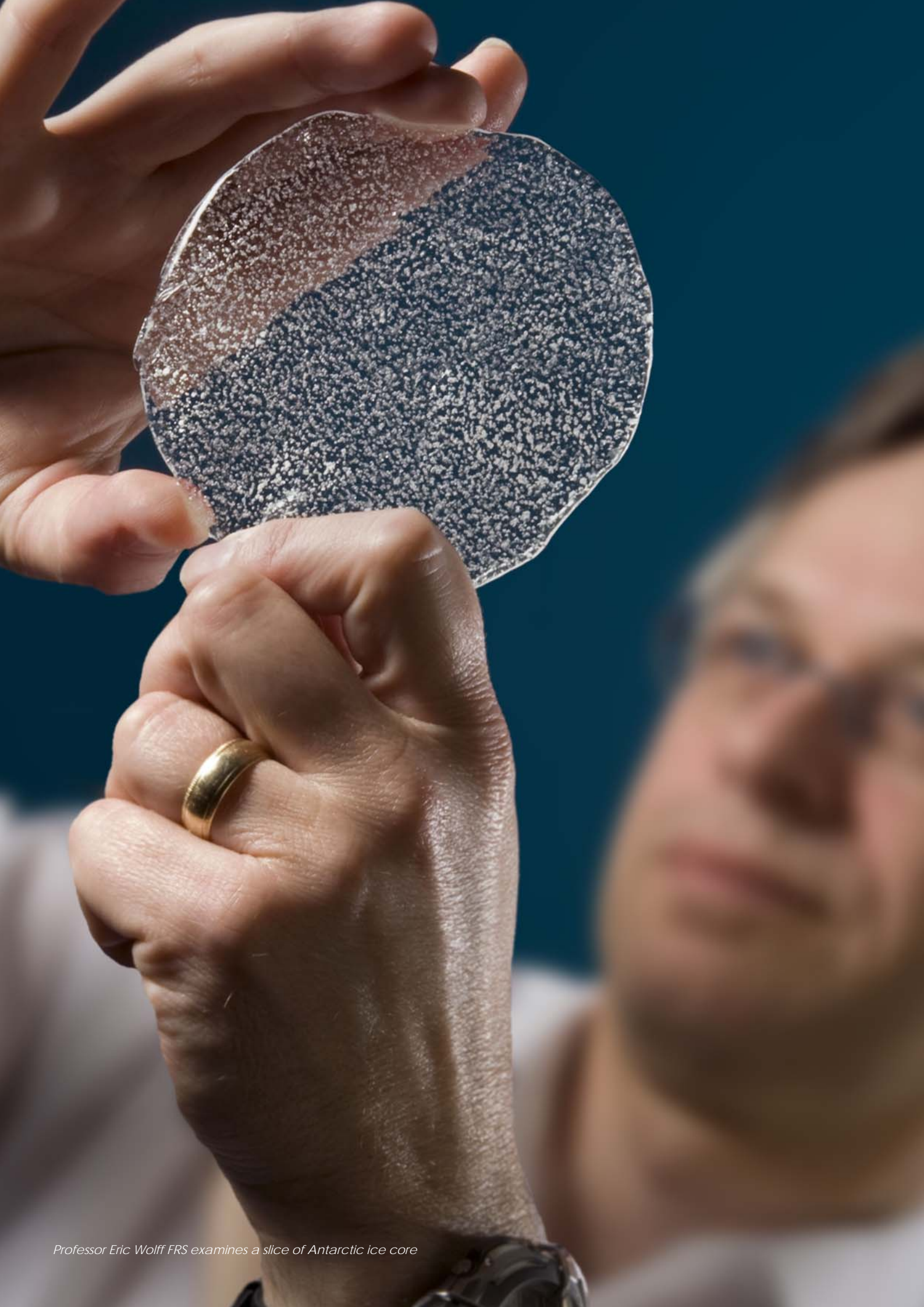
David Willetts MP
Minister of State
for Universities and
Science



Mark Simmonds MP
Parliamentary Under Secretary
of State for Foreign and
Commonwealth Affairs

*Timelapse of meteorological balloon release
at Halley Research Station, Antarctica*





Professor Eric Wolff FRS examines a slice of Antarctic ice core

Introduction

Vision: To place Antarctic environmental science at the heart of the responsible management of our planet

Purpose of this document

This document outlines the UK's high-level direction for science in Antarctica and the Southern Ocean from 2014 to 2020. It identifies the key research areas that Government will invest in, the geopolitical and economic context in which we work, and the value we place on working with international partners. It is a 'living document' that will be revised over time to take into account new discoveries, new technologies, and new ways of thinking.

This document was completed after a consultation process that ran from April to June 2014.

UK Science in Antarctica, the subantarctic and the Southern Ocean – 2014-2020

The UK's Antarctic research ambitions are to contribute to our understanding of how the planet works and predict how it will change, and to manage our presence in Antarctica responsibly.

For over a century Britain has been at the forefront of exploration and scientific research in Antarctica. The scientific advances that have been made over recent decades have gained international

recognition and have changed human-kind's understanding of planet Earth.

The UK's vibrant Antarctic research community plays a leading role in the international efforts to investigate and monitor environmental change in the Polar Regions. A multi-disciplinary science programme and supporting operations address key issues of global importance ranging across the environmental sciences, from biology (evolution, fisheries, genetics), to physical sciences (oceanography, climate and ice), to space weather, geology, and environmental chemistry.

Over 200 scientists in UK universities and research centres undertake frontier science in Antarctica, with over 50 young students per year involved in research programmes. The Association of Polar Early-Career Scientists (APECS) is an international organisation creating opportunities for innovative and interdisciplinary collaborations among early-career polar researchers as well as recruiting, retaining and promoting the next generation of polar scientists. The UK has a thriving group with over 300 members.

A core ambition of this strategy is to provide a framework that fosters UK and international partnerships so that scientists can address the challenges of understanding Antarctica's role in influencing the global environment. This research leads to new insight and discovery about our world, ensures an active and influential Antarctic regional presence for the UK, and is critical for informing and involving Government, civil society and business.

Funding and science delivery

NERC (Natural Environment Research Council) is the UK's leading public funder of environmental science.

One of seven Research Councils, operating under the Department of Business, Innovation and Skills, NERC is a world leader in excellence and efficiency.

NERC is the primary funder for UK Antarctic research and operational infrastructure. NERC investment to exploit the unique capability of low-orbiting satellites, including the European Space Agency Cryosat missions, has made a major contribution to UK and international scientific investigations of ice melt and rapid change in the West Antarctic Ice Sheet. NERC invests in research programmes that bring together the best UK polar scientists and infrastructure to understand how the changes to ocean circulation and the behaviour of ice sheets will impact on future sea level and climate.

The focal point for UK Antarctic research and operations is NERC's British Antarctic Survey (BAS). Based in Cambridge, BAS designs and delivers an interdisciplinary research programme, *Polar Science for Planet Earth*, and manages the research infrastructure that enables academics

from the UK science community, and colleagues from many nations, to work safely and effectively in the Antarctic and its surrounding areas.

The Foreign and Commonwealth Office allocate revenue, from income tax in the British Antarctic Territory and other sources, to a range of activities. These include the operation of King Edward Point Research Station on South Georgia, the Discovering Antarctica education and schools resource (www.discoveringantarctica.org.uk) and other environmental and research projects that provide practical benefits to the region. Funding from the European Union currently underpins pan-European collaborations to investigate topics such as future sea-level rise, the impact of ocean acidification on marine invertebrates and space weather research. This mix of funding is expected to continue and be supplemented by new sources resulting from partnerships with other research institutions, as well as from business.

Scientific access to Antarctica requires an operational infrastructure, including research stations, ships and aircraft, to provide the facilities and level of safety required in such a remote and hostile part of the planet. Antarctic Treaty nations work together in an effort to minimise operational costs.



Royal Research Ship James Clark Ross



Sea-ice survey in the Weddell Sea, Antarctica

Funding and science delivery

UK Antarctic science delivery – the international dimension

No one nation has the capability to study the entire Antarctic continent. International collaboration and co-operation are essential to achieve a co-ordinated research effort. The UK plays an active role in shaping research programmes and delivering efficient operational support through its interaction with the Scientific Committee on Antarctic Research (SCAR) and the Council of Managers of National Antarctic Programmes (COMNAP).

The UK National Committee for Antarctic Research (UKNCAR) promotes and co-ordinates the UK's interest in the activities of SCAR. It operates under the auspices of the Royal Society, the national body representing UK interests to the International Council for Science (ICSU).

SCAR is a committee of ICSU and it is charged with the initiation, promotion and co-ordination of scientific research in Antarctica. SCAR also provides international, independent scientific advice to the Antarctic Treaty System and other bodies.

The membership of SCAR comprises the appropriate bodies of those national scientific academies or research councils which are the adhering bodies to ICSU (or by some other means, if a country currently has no national organisation adhering to ICSU). Members must be, or plan to be, active in Antarctic research, together with the relevant scientific Unions of ICSU.

The UK – through BAS – is a member of COMNAP. COMNAP is an international association, formed in 1988, which brings together national Antarctic programmes. National Antarctic programmes are those organisations that have responsibility for delivering and supporting scientific research in the Antarctic Treaty area on behalf of their respective governments and in the spirit of the Antarctic Treaty.

COMNAP's purpose is to "develop and promote best practice in managing the support of scientific research in Antarctica". It does this by:

- serving as a forum to develop practices that improve effectiveness of activities in an environmentally responsible manner
- facilitating and promoting international partnerships
- providing opportunities and systems for information exchange
- providing the Antarctic Treaty System with objective and practical, technical and non-political advice drawn from the national Antarctic programmes' pool of expertise

Science challenges 2014-2020

Designed to improve knowledge about our planet, to advance understanding of the processes, vulnerability and risks that arise from natural and man-made phenomena, this national research programme aims to increase our ability to predict environmental change, and inform the policy and economic decision-making process that will help society adapt and thrive in the future.

The UK's multi-disciplinary Antarctic research effort investigates how the processes of natural variability and human-induced change work – as a whole Earth system, from global to local scale, from millions of years past to the present and into the future.

The primary motivators for Britain's Antarctic research challenges are aimed at:

- understanding and managing environmental change through sustained observation and studies of physical processes, modelling of Antarctic systems and projecting their role within the future Earth system
- understanding Antarctic biodiversity and how it supports vital natural services, conservation of marine living resources and commercial fishing activity
- advancing knowledge through curiosity-driven research where the benefits to society emerge only as the research progresses

Collaboration in the Antarctic is essential for scientific and operational success. The UK will continue to work with the international polar science community to identify the most compelling scientific questions in Antarctic research and develop optimal strategies for delivering answers to those questions.

The UK is a key participant within the Scientific Committee on Antarctic Research (SCAR). The UK polar science community will contribute to development of a long-term strategy, which will identify and set science priorities in Antarctic and Southern Ocean science for the next two decades. BAS will continue to work with SCAR and COMNAP to identify critical infrastructure, logistical, and technological

requirements necessary to support the most important future science. This advice will inform national and international decisions concerning investment.

The UK Antarctic community will continue to provide expert commentary and science briefings to Government, including the Department for Energy and Climate Change (DECC).

The science challenges outlined in this document build on decades of accumulated scientific knowledge and expertise gained through the UK's long history of scientific endeavour.

Science challenge: Understanding global environmental change

Antarctica and the surrounding Southern Ocean play a key role in the global climate system. They exert important controls on global sea-level rise, atmospheric carbon dioxide concentrations and the transport of heat around the planet. The scientific evidence that the world's climate is changing is extensive and clear – and parts of the Polar Regions are warming much faster than most other regions. To refine our understanding of how the climate system works and how climate will change in the coming decades and centuries we must continue our investigative research. The UK polar community brings a broad range of scientific expertise to bear on research goals such as:



Melt pools on George VI Sound, Antarctica

Science challenges 2014-2020



Sea-level rise. On the Antarctic Peninsula and in West Antarctica the ice sheet is thinning, and satellite data reveal this rate is accelerating. In West Antarctica, warm ocean currents deep beneath the ice shelves are melting the ice and causing it to flow into the sea faster than snow can accumulate. The speed of changes in some areas, such as Pine Island Glacier in the Amundsen Sea region, has surprised scientists. Our goal is to quantify the processes causing the rapid ice loss so that we can make more accurate predictions of future sea-level rise. To do this we will:

- improve understanding of the ocean-atmosphere and bed interactions controlling ice-sheet flow and ice-sheet evolution
- build and apply a robust mathematical and numerical framework for computer simulation of ice-sheet change and sea-level rise
- establish improved histories of ice-sheet change to provide context and constraint for future projections

Global ocean circulation is one of the mechanisms by which polar processes can, within decades, directly influence the entire Earth System. This influence is felt in all areas, including the seas around the UK. Its importance results in large part from the enormous capacity of the ocean to store and redistribute fresh water, heat, carbon dioxide and other climatically-important substances. Our goal is to quantify and model these processes and make more accurate predictions about global impacts

Deep-field camp on Pine Island Glacier, Antarctica

of Southern Ocean changes, through:

- identification of processes that initiate and drive the overturning circulation in the Southern Ocean
- determination of the changing impact of melting ice on ocean circulation
- understanding the physical drivers of changes in the marine environment and the likely implications for climate and ecosystems
- quantification of the role of the Southern Ocean as one of the major carbon sinks, integrating studies of ocean circulation, air/sea/ice interactions and marine ecosystems

The climate of the Antarctic is controlled primarily by interactions between incoming solar radiation, the atmosphere, the ocean and ice. The complexity of these interactions, and the particular sensitivity of sea ice to climate change, makes accurate projection of Antarctic climate change a formidable challenge. The UK will continue to operate and develop sustainable observing systems required to identify trends and provide the foundation data that underpin significant areas of science. To maximise impact and minimise overlap, this will be done in collaboration with international programmes such as the World Meteorological Organisation's Global Atmospheric Watch, SCAR/SCOR's Southern Ocean Observing System and the UK's Centre for Polar Observation and Modelling (CPOM). To achieve a significant forward step in such regional climate modelling and its impact on global climate

change, the UK polar community will seek to:

- explain changes in atmospheric circulation, temperature and sea-ice extent in both polar regions over the past 50 years and determine how much of this change is due to human activity and how much is a result of natural factors
- improve the representation of polar climate processes in large-scale models by conducting science campaigns to advance understanding into those processes
- improve climate predictions in the polar regions on the space and timescales needed by the international scientific community (including glaciologists, oceanographers and biologists)

Science challenge: Refining our knowledge about past, present and future change

Policy and business decisions need to be backed up with evidence from data and scientific analysis that enables assessment of the benefits that different levels of action and investment will have. The Polar Regions hold unique natural archives that record how the planet changed in the past. Fundamental questions about future change on the planet may be answered by detailed investigations of these archives. In particular, hidden in the ice and geology of Antarctica are clues to the movement of continental plates, evolution of global climate and greenhouse gas concentrations, growth of ice sheets, and the adaptations that allow the plants

Science challenges 2014-2020

and animals that live in Antarctica today to survive. The UK has an exceptional capability in a range of palaeo-disciplines and these will focus on addressing topics such as:

- understanding what controlled the timing and strengths of the major climate shifts of the last million years and beyond, particularly the shifts from glacial periods (ice ages) to interglacial warm periods
- using the warmest periods of the last million years to tell us about the likely response of polar regions to future climate change
- explaining how evolutionary and palaeo-environmental conditions shaped present polar biogeography and biodiversity

Science challenge: Understanding biodiversity for responsible management of the environment

The Antarctic Treaty's Environmental Protocol, and the associated agreements based on it, play an important part in environmental protection and natural resource management in Antarctica and the Southern Ocean. A variety of measures put in place by the Antarctic Treaty, including the Committee for Environmental Protection (CEP), the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) and the Convention for the Conservation of Antarctic Seals (CCAS) aim to protect not only the resources that humans harvest, but also species whose survival depends on those resources. For example, CCAMLR, which

was agreed in 1982 and is intended to conserve all marine living organisms in Antarctica and related areas.

All fishing in the Southern Ocean is regulated by CCAMLR. In this convention the word "conservation" is defined to include rational use of the resources. The convention applies to the marine areas south of the Polar Front (the border between cold Antarctic water and the warmer water to the north, which occurs between 45 and 60°S, including South Georgia & the South Sandwich Islands). The UK will continue to play an active role within CCAMLR and contribute to the development of policies for Marine Protected Areas.

The challenge for scientists is to understand biodiversity in Southern Ocean ecosystems and to provide the Antarctic Treaty System regulatory bodies with research outcomes and advice that facilitate environmental stewardship of Antarctica through an ecosystems management approach. A key focus of the UK's polar ecosystem science is to explore how key populations respond to change. Investigations will lead to:

- enhanced understanding of what determines the ability of species to adapt to change through genetic, physiological and ecological processes across a range of marine and terrestrial ecosystems
- the development of quantitative descriptions of the life-cycles of species to determine their likely response to environmental change

- determination of the resilience of polar ecosystems to past and current climate change to predict how they may respond in the future
- provision of data and policy advice on key species and whole ecosystems to underpin further development of sustainable fisheries management in the Southern Ocean

Science challenge: Exploring the frontiers of knowledge

Throughout the history of modern environmental science, curiosity and the desire to explore the unknown has delivered unforeseen benefits to society. Both Polar Regions still contain unexplored environments, both macroscopic and microscopic, whose scientific and practical importance cannot yet be determined. The UK environmental science community has developed world-leading technologies for exploring many of these environments. These include systems capable of mapping the geology of a continent covered by kilometres of ice, and autonomous submersible vehicles (e.g. Autosub) developed by the National Oceanography Centre, which can be used to explore safely the most inaccessible parts of the world's oceans. By continuing to develop and use innovative technologies, the UK will investigate the key features of many poorly-understood and unexplored environments. Focus areas include:

- mapping the geological structure of the unexplored Antarctic continental interior



Brittle star, Bellingshausen Sea, Antarctica

Science challenges 2014-2020

- searching for life in recently discovered lakes and connected hydrological systems that exist beneath the Antarctic ice sheet
- making the first oceanographic measurements in previously inaccessible ocean cavities beneath Antarctic ice shelves
- understanding environmental niches in which highly-adapted Antarctic species cling to life
- investigating the atmosphere above Antarctica where unique chemical processes occur, including the formation of the Antarctic Ozone Hole
- using the unique observing locations of Antarctica to study space weather

Science challenge: Models and future predictions

Models that represent the Earth as complex computer simulations are now central to building projections of future climate and understanding environmental change across a wide range of time and spatial scales. These models are also used by scientists to extrapolate sparse observational data and for exploring the importance of interactions and feedbacks within the Earth System. The UK polar science community is working alongside many groups across the world, such as the UK's Met Office Hadley Centre, to ensure that improvements in understanding of polar processes are properly represented in predictive models. Models cannot, however, be developed in isolation. Key

processes must be understood before they can be incorporated into models and it is only against real-world data that the performance of models can be tested and verified.

Polar science framework

Although there are strong geographic, geopolitical and social contrasts between the continental south Polar Region and its oceanic northern counterpart, UK scientists are active in both and there is a growing appreciation that a combined polar approach will lead to improved insight in many areas. For example, if climate change continues, many processes commonly observed in Arctic and subarctic glacial environments today may become significant in Antarctica in future decades. UK scientists are building an integrated programme of polar science. This will ensure that knowledge acquired in each Polar Region is properly integrated into polar and global research, recognising that:

- our understanding of many polar processes has applicability in both hemispheres
- instruments, techniques, and even ships and aircraft, developed for use in one polar region may have application in the other
- some scientific issues demand studies in both hemispheres (e.g. the north-south 'see-saw' identified in palaeo-climate records)



Working on the sea ice from RRS James Clark Ross

Supporting science – managing our assets

Britain's national Antarctic research effort is supported by large-scale infrastructure, services and facilities, and national-good services.

Managed on NERC's behalf by BAS, this support structure sustains a UK national capability in Antarctica to meet academic, policy and societal needs.

BAS operates three research stations in the Antarctic and two on subantarctic South Georgia. One of these, King Edward Point (KEP), is managed on behalf of the Foreign and Commonwealth Office (FCO) and the Government of South Georgia & the South Sandwich Islands (GSGSSI).

Rothera Research Station is situated on Adelaide Island to the west of the Antarctic Peninsula. The site includes a crushed rock runway, hanger and wharf. Rothera is the UK centre for Antarctic biological research and for supporting deep-field and air operations. It is the largest British Antarctic facility and supports a wide range of collaborative science programmes.

Halley Research Station is built on a floating ice shelf in the south-east of the Weddell Sea. Scientific research concentrates on atmospheric sciences, meteorology and

chemistry. Halley has a snow runway and supports a number of summer field science activities.

Bird Island Research Station is located on a small island at the western end of South Georgia. The research concentrates on the biology of birds and seals, huge numbers of which live on the island.

King Edward Point Research Station is situated close to Grytviken on the main island of South Georgia. The station focuses on applied fisheries research and supports the GSGSSI.

Signy Research Station is a summer-only station situated on one of the South Orkney Islands. Signy supports terrestrial and freshwater sciences, especially biology, and a CCAMLR monitoring programme.

Ships. The UK ice-strengthened research vessel RRS *James Clark Ross* (JCR) is one of the world's most sophisticated floating laboratories. RRS *Ernest Shackleton* (ES) provides logistic support and resupplies the stations.

RRS *James Clark Ross*, launched in 1990, is primarily a marine research vessel for biological, oceanographic and geophysical cruises. It is equipped with a suite of laboratories and winch systems that allow scientific equipment to be deployed astern or amidships. The ship has an extremely low noise signature, allowing the deployment of sensitive acoustic equipment. A swath bathymetry system

was fitted in 2000. The JCR also carries out some cargo and logistical work. During the northern summer the JCR supports NERC research, largely in the Arctic.

RRS *Ernest Shackleton*, launched in 1995, is primarily a logistics vessel used to transport cargo, fuel and passengers. The ship also has a basic scientific capability and undertakes some research work. During the northern summer, the ES is commercially chartered and usually works in the North Sea.

In addition to the two BAS vessels, the Royal Navy Ice Patrol ship HMS *Protector* operates in the Antarctic. The ship supports UK science as well as fulfilling international hydrographic survey obligations and helping to discharge the UK's responsibilities under the Antarctic Treaty, including through hosting multi-national inspection teams.

A new polar marine vessel, to be in operation by 2019, will provide a world-leading platform to support complex multi-disciplinary scientific missions in the polar regions and provide logistic support to Antarctic research stations. This world-class, ice-strengthened research ship will have state-of-the-art laboratories, enhanced capabilities for sophisticated environmental monitoring, and facilities for the deployment and operation of remotely-operated and autonomous marine and airborne vehicles. The new vessel will maximise fuel and energy efficiency, have



The new flagship for polar science (artist's visualisation)

low emissions and will have ice-breaking capabilities that will allow a greater geographic area of operations.

Aircraft. Five polar aircraft support UK research and operations during the austral summer. The largest is the four-engined de Havilland Canada Dash 7, the primary role of which is to provide a link between points of departure in South America and the Falkland Islands, and Rothera Research Station for both passengers and cargo. It also undertakes flights to blue-ice runways to lay fuel depots, and carries out scientific survey work.

Four de Havilland Canada Twin Otter aircraft deploy deep-field parties and work as science platforms. Two of the aircraft are also configured to undertake aerial photography, remote sensing, meteorological studies and geophysical survey work. Usually based at Rothera, the Twin Otters also operate out of Halley.

Success through collaborations and partnerships

Antarctic science is driven by an unrivalled curiosity to understand our world.

Some of the best scientific evidence about our changing planet is generated by scientists from world-leading organisations working together. This evidence underpins the policy and business decisions that will help future generations live with and adapt to environmental change.

Britain will continue to actively pursue national and international collaborations that bring together an extraordinary range of scientific expertise, stimulate interdisciplinary research, and initiate opportunities to develop a comprehensive Earth System approach. Our world-leading polar research and international networks frequently make us the partner of choice for science and logistics collaborations in the Polar Regions.

UK interests in maintaining peace, stability and the environmental stewardship of Antarctica will continue to advance through the Antarctic Treaty System. Long-standing relationships with Treaty nations, and high-level bi-lateral agreements, including the 2011 Norway-UK arrangement and the 2012 Chile-UK Memorandum of Understanding, will continue to increase scientific co-operation in all aspects of polar research.

Continued pressure on public expenditure affects most polar nations. We will continue to deliver value for money by scrutinising how we manage our assets and seek opportunities with partners to share polar infrastructure and logistics.

Major advances in polar satellite and airborne technologies, mathematical modelling, risk analysis and genetics provide a launch-pad for innovation. We will seek new opportunities to work with business and industry to develop novel products and services that deliver economic, societal and environmental benefit to the UK.

The creation of a new Innovation Centre at the British Antarctic Survey in Cambridge was announced in March 2013 by the Minister for Universities and Science, the Rt Hon David Willetts MP. The project has a budget of £3.8 million and the Centre is scheduled to open in March 2015. Funded by NERC, the initiative strengthens academic links between BAS and the University of Cambridge, including the Scott Polar Research Institute (SPRI). The ambition is to stimulate new scientific and business collaborations that will lead to improved economic benefit for the UK.



Flags flying at an international deep-field survey site in East Antarctica



Halley VI Research Station, Brunt Ice Shelf, Antarctica

Making an impact

An ambition of this Antarctic science strategy is to bring together the best talent from across the UK and create effective mechanisms to ensure research outcomes are excellent, push the frontiers of knowledge, and have the potential to deliver benefits for society and the economy.

Critical indicators of successful impact include: publication of results in high-quality peer-reviewed journals; high-level policy advice to UK Government; leadership in Antarctic affairs; and participation in influential reports such as those produced by the Intergovernmental Panel on Climate Change (IPCC).

Public attitudes to, and trust in, science will continue to shape public engagement in research programmes. Communication, dissemination and exploitation of research outcomes will demonstrate how the UK

polar research community works with international partners to achieve scientific excellence, contributes to competitiveness and solves societal challenges. To achieve this we will design and undertake strategic communication and public engagement campaigns that:

- ensure that research outcomes are taken up by policy and business decision makers
- demonstrate how research outcomes are relevant to everyday lives
- illustrate how collaboration has achieved more than would have been possible otherwise
- attract global media attention
- enthuse the next generation in science

We will measure our progress and achievements using the following indicators:

- **World-class excellence of UK Antarctic research** – benchmarked against other nations and measured through analysis of scientific publications, citations and wider measures of scientific quality
- **Impact** – economic and societal benefit demonstrated through case studies, user testimony, economic valuations and annual metrics agreed with NERC
- **Partnership effectiveness** demonstrated by satisfaction, outcomes and co-funding

Contacts

Department for Business, Innovation and Skills (BIS):

www.gov.uk/government/organisations/department-for-business-innovation-skills

Foreign and Commonwealth Office, Polar Regions Department (FCO):

www.gov.uk/government/world/organisations/british-antarctic-territory

Department of Energy and Climate Change (DECC):

www.gov.uk/government/organisations/department-of-energy-climate-change

NERC (Natural Environment Research Council):

www.nerc.ac.uk

British Antarctic Survey (BAS):

www.antarctica.ac.uk

Scott Polar Research Institute (SPRI):

www.spri.cam.ac.uk

Centre for Polar Observation and Modelling (CPOM):

www.cpom.org

UK National Committee for Antarctic Research (UKNCAR):

www.antarctica.ac.uk/UKNCAR

Scientific Committee on Antarctic Research (SCAR):

www.scar.org

Council of Managers of National Antarctic Programmes (COMNAP):

www.comnap.aq

Secretariat of the Antarctic Treaty:

www.ats.aq



Twin Otter aircraft landing at a remote Antarctic field site



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