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## SCAR Report to XXIX ATCM



**THE INTERNATIONAL COUNCIL FOR SCIENCE  
SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH**

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**SCAR Annual Report for 2005**

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**Executive Summary**

SCAR's main objective is to initiate, develop, and coordinate high quality international scientific research in the Antarctic region, and on the role of the Antarctic region in the Earth system. SCAR coordinates scientific research that adds value to ongoing national research by enabling national researchers to tackle issues of pan-Antarctic scale and having global reach.

SCAR also provides objective and independent scientific advice on issues affecting the management of the environment to the Antarctic Treaty Consultative Meetings; the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR); and the Advisory Committee of the Agreement on Conservation of Albatrosses and Petrels (ACAP).

Through 2005, SCAR focused on ramping up the effort on its five major new Scientific Research Programmes (SRPs) that will be SCAR's scientific flagships for the next 5–10 years, and published implementation plans for each. They are:

- Antarctica and the Global Climate System (AGCS), a study of the modern ocean-atmosphere-ice system;
- Antarctic Climate Evolution (ACE), a study of climate change over the past 34 million years since glaciation began;
- Evolution and Biodiversity in the Antarctic (EBA), a study of the response of life to change;
- Subglacial Antarctic Lake Exploration (SALE), a study of the chemistry and biology of lakes long-buried beneath the ice sheet;
- Interhemispheric Conjugacy Effects in Solar-Terres-

trial and Aeronomy Research (ICESTAR), a study of the response of the Earth's outer atmosphere to the changing impact of the solar wind at both poles.

Particular highlights include the following: A major warming was revealed in the Antarctic winter troposphere that is larger than any previously identified regional tropospheric warming on Earth. The largest warming is close to 5 km above sea level where temperatures increased at a rate of 0.5 – 0.7° C per decade over the last 30 years.

Numerical models show that the shift in the Southern hemisphere Annular Mode in the atmosphere in recent decades was probably due to anthropogenic forcing. This is the first evidence that the rapid warming on the Antarctic Peninsula is man-made.

SCAR launched the Census of Antarctic Marine Life (CAML), a major five-year international project to investigate Antarctica's marine biodiversity. A science plan was published and expeditions are now being organised for the International Polar Year.

The inventory of sub-glacial lakes increased to over 140, showing that they are widespread beneath Antarctica's ice sheets. These lakes are believed to help to control ice flow.

Around 750 abstracts have been submitted for SCAR's second Open Science Conference (Hobart, 12–14 July 2006), which should be very well attended.

SCAR programmes were prominent among the proposals endorsed by the Steering Committee for the International Polar year.

## 1. What is SCAR?

SCAR, the Scientific Committee on Antarctic Research, is the principal non-governmental organization responsible for the international coordination of scientific research taking place in the Antarctic region. SCAR is an Interdisciplinary Body of the International Council for Science (ICSU). ICSU began coordinating scientific research in Antarctica during the International Geophysical Year of 1957-58, and formed SCAR in 1958 to continue the work. The need for such coordination has grown as the role of Antarctica in the global system has become apparent, and continues unabated as we approach the International Polar Year of 2007-2008, in which SCAR is playing a leading role, and which is led jointly by ICSU and the World Meteorological Organisation (WMO).

SCAR's 28 Full and 4 Associate Members are national

scientific organizations associated with ICSU. These Members include representatives of all countries that are Parties to the Antarctic Treaty. SCAR's Members also include 7 of ICSU's Scientific Unions, which link SCAR to a wide range of ICSU's activities. SCAR continues to grow: after the XXIX SCAR meeting, in July 2006, there are likely to be 30 Full, 4 Associate and 8 Union Members.

SCAR aims to improve understanding of the nature of Antarctica, the role of Antarctica in the Earth System, and the effects of global change on Antarctica. Its primary objectives are:

- to initiate, develop, and co-ordinate high quality international scientific research in the Antarctic region, and on the role of the Antarctic region in the Earth system;
- to provide objective and independent scientific advice to the Antarctic Treaty Consultative Meetings and other organizations on issues of science and conservation affecting the management of Antarctica and the Southern Ocean.

To meet these objectives, SCAR carries out a comprehensive programme of coordinated scientific research that adds value to ongoing national research by enabling national researchers - often having sub-regional remits - to work together on major issues of pan-Antarctic scale and having global reach. In addition it provides independent scientific advice, as an official Observer, to three intergovernmental bodies having responsibilities in the Antarctic region:

- (i) the Antarctic Treaty System through the Antarctic Treaty Consultative Meeting (ATCM) and the Committee for Environmental Protection (CEP);
- (ii) the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), and its Scientific Committee;
- (iii) the Advisory Committee of the Agreement on Conservation of Albatrosses and Petrels (ACAP).

To ensure an effective link between the SCAR Executive Committee and its subsidiary bodies, the Executive Committee met with the Chief Officers of its Standing Scientific Groups for the Physical Sciences, Life Sciences and Geosciences, its Standing Committee for the Antarctic Treaty System, and its Joint SCAR/COMNAP Committee on Antarctic Data Management (JCADM) in Sofia, Bulgaria, in July 2005. The Chief Officers of the SSGs and of JCADM then met in Amsterdam in November 2005 with the Principal Investigators of SCAR's five Scientific Research Programmes (SRPs) in order to ensure that these different groups are all working in harmony with one another, and to ensure that opportunities are grasped for

interdisciplinary work. The Amsterdam meeting focused on areas of common interest, such as how climate change will affect the Antarctic over the coming century.

## 2. SCAR Science

### 2.1 Major Scientific Research Programmes

Through 2005, SCAR has focused on ramping up the effort on its five major new Scientific Research Programmes (SRPs) that will be SCAR's scientific flagships for the next 5–10 years. They are:

- Antarctica and the Global Climate System (AGCS), a study of the modern ocean-atmosphere-ice system;
- Antarctic Climate Evolution (ACE), a study of climate change over the past 34 million years since glaciation began;
- Evolution and Biodiversity in the Antarctic (EBA), a study of the response of life to change;
- Subglacial Antarctic Lake Exploration (SALE), a study of the chemistry and biology of lakes long-buried beneath the ice sheet;
- Interhemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR), a study of how the Earth's outer atmosphere responds to the changing impact of the solar wind at both poles.

Each has developed an Implementation Plan, now available from the SCAR web site. Main advances in the 5 programmes during the year are described below.

**SCAR Members are encouraged to adapt their national research programmes so as to make these pan-Antarctic programmes fully effective. Scientists from all SCAR Member countries are encouraged to nominate themselves as participants (contact the Principle Investigator or send an enquiry to [info@scar.org](mailto:info@scar.org)).**

#### 2.1.1 *Antarctica in the Global Climate System (AGCS)*

##### 2.1.1.1 Progress

In order to improve confidence in the outputs of numerical forecasts of climate change for the next 100 years, AGCS is investigating the linkages between the climate of the Antarctic and the rest of the Earth system over the past 10,000 years, with particular reference the behaviour of and interactions between the atmospheric, oceanic and cryospheric elements of the climate system. AGCS will use existing deep and shallow ice cores, satellite data, the output of global and regional coupled atmosphere-ocean climate models, and in-situ meteorological and oceanic data to understand how signals

of tropical and mid-latitude climate variability reach the Antarctic, and high latitude climate signals are exported northwards. It will work closely with the ACE programme, which is looking deeper into the past. Results will be of use to governments in developing national inputs to the Intergovernmental Panel on Climate Change and the UN Framework Convention on Climate Change, and national responses to climate change.

In 2005 AGCS finalised and published its implementation plan. A Scientific Steering Committee was appointed (Appendix 4) and formally started work on the programme. An AGCS web site is at: [http://www.antarctica.ac.uk/met/SCAR\\_ssg\\_ps/AGCS.htm](http://www.antarctica.ac.uk/met/SCAR_ssg_ps/AGCS.htm). AGCS and its various sub-programmes are co-sponsored by SCAR and the World Climate Research programme (WCRP).

A number of advances have been made. For instance, analysis of the balloon-launched radiosonde data for the Antarctic extending back into the 1950's has revealed a major warming of the Antarctic winter troposphere that is larger than any previously identified regional tropospheric warming on Earth. The largest warming has been close to 5 km above sea level where temperatures have increased at a rate of 0.5 – 0.7° C per decade over the last 30 years.

The variability of the linkages between the El Niño-Southern Oscillation (ENSO) and the climate of the high latitude South Pacific has been investigated. It was found that there was a sharp annual contrast between the 1980s and the 1990s, with the link in the 1990s being significantly amplified. The analysis reveals that the 1980s spring season teleconnection is weak due to the interference between the Pacific South American pattern associated with ENSO, and the Southern Hemisphere Annular Mode (SAM), the primary mode of variability of the extra-tropical Southern Hemisphere atmosphere.

Recent trends in Antarctic snow accumulation have been investigated using the Polar MM5 climate model. Averaged over the continent the annual trends are small and not statistically different from zero, suggesting that recent Antarctic snowfall changes do not mitigate current sea level rise.

The west Antarctic Peninsula (WAP) is known to be undergoing one of the most rapid atmospheric warmings of any region in the world, with temperatures having risen by nearly 3°C in the past 50 years. A putative long-term decrease in sea ice in the adjacent Bellingshausen Sea has been linked to this, but little understanding has been obtained of the ocean's role in these climatic changes. To address this, a long series of oceanographic measurements (temperature and salinity) was compiled and examined, covering the second half of the twentieth century. It was found that a very significant warming had occurred in the

summertime surface and near-surface ocean, of greater than 1°C – this greatly exceeds general rates of warming of the world ocean, and is one of the most rapid regional ocean warmings noted to date. Concurrent with this warming was a surface-intensified summer salinification, of greater than 0.25. Although initially counter-intuitive, this salinification is linked to oceanic mixed layer processes driven by the reduction in sea ice, and is related to the summertime-only availability of data. These profound changes reveal the strong atmosphere/ocean/ice coupling involved in the climate change at the WAP. The ocean changes are both positive feedbacks, acting to promote further decreases in ice production and further atmospheric warming. They also suggest that the initial cause of the climate change here may be atmospheric in origin, rather than oceanic as some people have suggested. The changes are also very significant for the operation of the marine ecosystem, which has evolved to be unusually sensitive to changes in ocean temperature. If the warming progresses further, population and species level losses might be expected.

Since the mid-1960s rapid regional summer warming has occurred on the east coast of the northern Antarctic Peninsula, with near-surface temperatures increasing by more than 2°C. This warming has contributed significantly to the collapse of the northern sections of the Larsen Ice Shelf. The explanation is that over the last few decades the Southern hemisphere Annular Mode (SAM) has shifted into its positive phase, with surface pressures dropping over the Antarctic and rising in mid-latitudes. This has caused the westerly winds to increase, especially in summer. Faced with these stronger westerlies the barrier effect of the Antarctic Peninsula has been reduced. As a result, the ice shelves on the eastern side of the peninsula have become less isolated from relatively warm, maritime air masses. Model experiments showed that the observed shift in the SAM to its positive phases in recent decades was larger than anything occurring in long simulations of the present climate. For that reason the shift is thought to be predominantly a response to anthropogenic forcing, and provides the first evidence that increasing levels of greenhouse gases contributed, at least in part, to the observed rapid warming on the Antarctic Peninsula.

#### 2.1.1.2 Plans

AGCS will be holding a workshop in Cambridge, UK during April 2006 to consider the strength and weaknesses of the high latitude elements of the atmospheric re-analysis data sets, which are proving a very powerful tool for the investigation of recent climate change. Together with ACE and EBA, AGCS will be holding a one day workshop on “Atmospheric, Oceanic, Cryospheric and Biological Variability Over Decadal to Millennial Timescales” in Hobart just prior to the SCAR Open Science Conference in July 2006.

### 2.1.2 Antarctic Climate Evolution (ACE)

#### 2.1.2.1 Progress

ACE is coordinating the integration of enhanced geological data and improved Antarctic palaeoclimate models for a series of time periods from the onset of glaciation around the Eocene-Oligocene boundary 34 Ma ago, to the last glacial maximum (LGM) 20,000 years ago, in order to establish the origin of the present configuration of the ice sheet. ACE results will be of use to governments in developing national inputs to the Intergovernmental Panel on Climate Change and the UN Framework Convention on Climate Change, and national responses to climate change.

In 2005 ACE finalised and published its implementation plan and formally started work on the programme. A Steering Committee was appointed, with cross membership to the SALE Steering Committee (Appendix 4). The ACE web site is at <http://www.ace.scar.org/>.

The ACE community has been active for a couple of years now, organising meetings and publishing the results of its workshops in the international literature. In 2005 ACE contributed to advances in pan-Antarctic science by publishing two special issues of international journals:

- Florindo, F., Harwood, D.M., Wilson, G.S. (Editors), 2005. Long-term changes in southern high-latitude ice sheets and climate: the Cenozoic history. *Global and Planetary Change*, vol. 45, 1-264.
- Barrett, P., Florindo, F. and Cooper, A. (Editors) (2006). “Antarctic Climate Evolution - view from the margin”. *Palaeogeography, Palaeoclimatology, Palaeoecology*, vol 231, 1-252.

This last special issue is the third in three years on the theme of Antarctic Climate Evolution. It covers a wide range of techniques and timeframes concerning the evolution of the Antarctic continental margin, ranging from detailed sedimentary analyses of the Cape Roberts Project core to numerical modelling investigations of ice sheet growth and decay.

ACE has continued to influence progress by organising four international meetings during the year:

- (i) August 2005, Aberystwyth, Wales: “Glacial Sedimentary Processes and Products”. This international symposium was co-sponsored by ACE, the International Association of Sedimentologists, the International Commission of Snow and Ice, the International Glaciological Society, the International Quaternary Association, the Quaternary Research Association and the British Geological Survey. It

promoted dialogue between researchers in the fields of contemporary glacial processes, glacial sedimentology and ice sheet modellers in order to advance these fields in an integrated way. Contributions were given from researchers working on all aspects of glacial sedimentary processes and products in glaciomarine, glaciolacustrine and terrestrial settings, from Archaean times to the present day. A special volume will appear in 2006 as a consequence of this meeting.

- (ii) August 2005, Calgary, Canada: “The Last Great Global Warming: Proxy Reconstructions and Modelling the Pliocene Climate”. This was a full session of an Earth Systems Science symposium. The Pliocene was the most recent period in Earth history in which temperatures were as warm as they are likely to be within the next century. The session addressed fundamental questions concerning our knowledge of the Pliocene world, including what the biota, climate and environments of the Pliocene were really like, why the climate was warmer than today, how variable Pliocene climate was, and the relevance of the period have to the ongoing climate change debate.
- (iii) September 2005, Spoleto, Italy: “Cenozoic onshore and offshore stratigraphic record from the East Antarctic margin: recent results and future directions”. This international workshop, co-sponsored by ACE with Italian and Spanish organisations, aimed to discuss the state of knowledge of Cenozoic East Antarctic ice sheet evolution, and to define future research activities in the east Antarctic margin, including activities related to proposed Wilkes Land drilling by the Integrated Ocean Drilling Program (IODP).
- (iv) December 2005, fall AGU, San Francisco: “Antarctic Ice Sheet Evolution from the Last Glacial Maximum to the Holocene: Recent Advances From Modeling and Field Investigations”. This special session brought together modellers and field-based researchers to discuss new results that advance our understanding of the development of the ice sheet during this period and the implications for regional and global climate change and ice retreat. The session attracted contributions from: terrestrial glacial geology and geomorphology; marine geology and geophysics; high-resolution ice core and sediment core records; glaciological modelling; climate modelling; and modelling of glacial isostatic adjustment.

An ACE proposal has been selected as a core proposal of the International Polar Year.

ACE is committed to supporting the next generation of Antarctic researchers. It supplies funds to allow students and young (post-doctoral) scientists to attend ACE-related

workshops.

#### 2.1.2.2 Plans

ACE has a comprehensive plan of activities for 2006. The plan can be seen in the Implementation Plan on the ACE web site. In addition, ACE plans the following activities:

- (i) a special session of the 2006 EGU entitled “Deep Time Perspectives on Climate Change: Marrying the Signal from Computer Models & Biological Proxies”.
- (ii) A field campaign in 2005/06, led by the British Antarctic Survey, to map, describe, sample and photograph glacial sedimentary sequences and associated fossils on James Ross Island. The rock and fossil samples will be analysed to create realistic environmental reconstructions and new data on environmental change, particularly Antarctic ice sheet history, over the past 7-10 million years, for input to climate models.
- (iii) Fostering the IODP Wilkes Land drilling plan, now in the preliminary IODP drilling schedule for Austral summer 2008-2009.
- (iv) Developing the IODP Ancillary Program for obtaining a Holocene ultra-high resolution record of climate variability from the Adelie Drift (Wilkes Land).
- (v) Supporting and encouraging involvement with the ANDRILL programme.
- (vi) Developing an international plan for the collection of airborne and ground-based geophysical data relating to the Antarctic ice sheet (i.e. ice thickness and bed elevation data) in current ‘data free’ zones and in regions of glaciological change.

#### 2.1.3 Evolution and Biodiversity in the Antarctic (EBA)

##### 2.1.3.1 Progress

EBA’s goals are to examine the evolution history of Antarctic organisms, the evolutionary adaptation of organisms to the Antarctic environment, the patterns of gene flow and consequences for population dynamics, the diversity of organisms, ecosystems and habitats in the Antarctic, and the impact of past, current and predicted future environments. Among other things EBA will lead to the production of scientific advice to the Antarctic Treaty parties and CCAMLR.

During 2005, considerable effort went into developing the EBA Implementation Plan, which was accepted at the end of the year. An EBA workshop was held at the 9th International SCAR Biology Symposium (July 2005, Curitiba, Brazil) to discuss the draft implementation plan,



and to decide on how to establish a Scientific Programme Group to manage EBA. This year saw the formal completion of EBA's two major predecessors, RiSCC (Regional Sensitivity to Climate Change in Antarctic Terrestrial and Limnetic Ecosystems) and EVOLANTA (Evolutionary Biology of Antarctic Organisms), whose activities now continue in modified form within EBA. The Symposium also saw a workshop on the Census of Antarctic Marine Life (CAML), which is a key field component of EBA. The EBA plan has five different work packages, each coordinated by two people who will form part of the Steering Committee (Appendix 4).

The Executive Committee approved an EBA Steering Committee (Appendix 4). The EBA web site is at: <http://www.nioo.knaw.nl/projects/scarlsssg/eba/>.

Elements of EBA, including the Census of Antarctic Marine Life, have been adopted as core proposals for the IPY.

The Census of Antarctic Marine Life (CAML) is a five-year international project to investigate the distribution and abundance of Antarctica's marine biodiversity. The aim is to study how biodiversity is affected by environmental change, and how change will alter the nature of the ecosystem services provided to the planet by the Southern Ocean. All groups of organisms will be included, from microbes to whales. In addition to traditional taxonomy, the use of powerful new tools for genetic sequencing will determine the extent to which the Antarctic marine fauna and flora is responding to change. CAML is collaborating with oceanographers and geophysicists, recognising the integrated nature of marine ecosystems. Research will be conducted in the pelagic, sea-ice, and benthic realms in as many locations around Antarctica as the provision of research vessels will allow. To date, CAML has the prospect of coordinating research on over a dozen ships from a similar number of nations, with the potential to be the largest project yet undertaken in Antarctic marine biodiversity. The fieldwork will occur mainly in 2007-08, during the International Polar Year (IPY).

The CAML Office is hosted by the Australian Antarctic Division and funded by the Sloan Foundation, and has a web site at [www.caml.aq](http://www.caml.aq).

The Scientific Steering Committee for CAML held a planning workshop with about 20 invited experts in Brussels during May 2005 to prepare a comprehensive science plan that is available from the CAML web site. Logistic and scientific coordination were discussed at the SSC meeting in Bremerhaven in June 2005. CAML also held meetings at the 9th SCAR Biology Symposium (July, Curitiba, Brazil) and the Dynamic Planet assembly (August, Cairns, Australia).

Two databases have already been developed that will help to accommodate the needs of EBA and CAML. One is the RiSCC terrestrial/freshwater database at the Australian Antarctic Division. The other is the Marine biodiversity portal (MarBIN) in Belgium. Both are linked to the Global Biodiversity Information Facility (GBIF) and MarBIN is linked to the Ocean Biogeographical Information System (OBIS).

#### 2.1.3.2 Plans

EBA's plans for 2006 include workshops on:

- (i) "Factors Driving Evolution in the Antarctic", as part of the SCAR Open Science Conference in Hobart in July 2006;
- (ii) Elephant Seals in a Changing Environment;

The Census of Antarctic Marine Life (CAML) is gearing up for the main fieldwork season during the International Polar Year (IPY) in 2007/08. Cruises in 2006 are likely to start in December, with expeditions on Polarstern, L'Astrolabe and OGS Explora.

Sampling protocols for the pelagic and benthic realms have been drafted. Protocols for microbes, habitat mapping, top predators and barcoding are underway.

Planned meetings include:

- (i) a contribution to the Cephalopod International Advisory Committee conference in Hobart, Australia, 6-10 February.
- (ii) a meeting in conjunction with the Polar Microbes workshop in Innsbruck, Austria, in March, 2006, focusing on Antarctic microbes.
- (iii) a steering committee meeting in Bremerhaven in June 2006 to discuss logistic and scientific coordination for IPY, in conjunction with the SCAR-MarBIN workshop to develop the Antarctic node of OBIS.
- (iv) a workshop on "Processes of Colonisation and Dispersal—how they shape the Biodiversity of Antarctic Marine Ecosystems.", as part of the XXIX SCAR meeting in Hobart in July.

#### 2.1.4 Subglacial Antarctic Lake Environments (SALE)

##### 2.1.4.1 Progress

SALE's main objective is to promote, facilitate, and champion cooperation and collaboration in the exploration and study of sub-glacial environments in Antarctica. It aims to understand the formation and evolution of sub-glacial lake processes and environments; to determine the origins, evolution and maintenance of life in sub-glacial lake environments; and to understand the limnology



and paleoclimate history recorded in sub-glacial lake sediments. SALE will also provide scientific advice for use by governments on scientific and technology issues including addressing environmental concerns and proposing safeguards. And it will encourage adherence to the agreed guiding principles for sub-glacial environmental stewardship, exploration, research, and data management.

The SALE Implementation Plan was completed and approved during the year, along with the membership of its Steering Committee (Appendix 4). The SALE Program Office was officially established at Texas A&M University (<http://salepo.tamu.edu/>). The SALE Program Office provides a central point of access for the US SALE ([http://salepo.tamu.edu/us\\_sale](http://salepo.tamu.edu/us_sale)), SALE-UNITED ([http://salepo.tamu.edu/sale\\_united](http://salepo.tamu.edu/sale_united)), and SCAR SALE ([http://salepo.tamu.edu/scar\\_sale](http://salepo.tamu.edu/scar_sale)) programs.

As part of the planning process, the first SCAR SALE meeting was held in Vienna, Austria in April 2005. Details are provided on the SCAR SALE Website ([http://salepo.tamu.edu/scar\\_sale/meetingreports/salemtg1](http://salepo.tamu.edu/scar_sale/meetingreports/salemtg1)).

The US National Science Foundation funded the National Academies to convene the “Committee on Principles of Environmental and Scientific Stewardship for the Exploration and Study of Sub-glacial Lake Environments”. The committee consists of a distinguished group of scientists (including international participation) and is expected to provide guidance on the standards needed to responsibly explore SALE.

The SALE - Unified International Team for Exploration and Discovery (UNITED) proposal was approved as a core program by the International Polar Year 2007-2008 Joint Committee.

Two oral scientific sessions and a poster session were held on “Icy Lakes” at the 2005 Fall AGU meeting in San Francisco.

Major scientific advances in the last year include:

- 1) The inventory of subglacial lake features increased to over 140, demonstrating that subglacial lake environments are widespread beneath Antarctica’s ice sheets.
- 2) Geophysical surveys identified additional large subglacial lakes that suggest an important role for these features in controlling ice movement and flow.
- 3) Evidence is mounting that subglacial accumulations of water were an important agent of geomorphological change of the earth’s surface over geological history.
- 4) Biogeochemical studies of Lake Vostok accretion ice

demonstrated that the lake environment have varied over time frames of thousands of years suggesting these systems are dynamic and not stagnant.

- 5) The age of Lake Vostok suggests that water has been cycled over 30 times yielding total dissolved gas concentrations high enough to have important implications for drilling into the lake. The high oxygen concentration (50 times more than air-equilibrated water) may pose a severe biological stress.

#### 2.1.4.2 Plans

During 2006 a number of important SALE events are planned. There will be one or more subglacial environment sessions at the EGU Annual Meeting in Vienna, Austria in April 2006. This will be followed by a major international SALE Science and Technology Advanced Planning workshop in Grenoble, France, also in April, 2006. The workshop is expected to attract 80 to 100 participants and will produce a comprehensive workshop report. SCAR SALE will hold its second meeting immediately following the SALE workshop. There will be a SALE Keynote presentation at the SCAR Open Science Conference in Hobart, Tasmania and more than likely parallel oral and poster sessions highlighting SALE research results. It is expected that the work of the US National Research Council SALE committee’s work will be close to completion in early 2007.

#### 2.1.5 *Inter-hemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR)*

##### 2.1.5.1 Progress

ICESTAR will create an integrated, quantitative description of the upper atmosphere over Antarctica, and of its coupling to the global atmosphere and the geospace environment. ICESTAR is coordinating its bipolar activities with the IAGA Polar Research working group. ICESTAR’S output will be of use to governments in the management of advanced communications and electronic systems, including satellites.

ICESTAR’s Implementation Plan was completed close to the end of the year, and an ICESTAR Steering Committee was appointed (Appendix 4). A web site has been established at [www.siena.edu/physics/ICESTAR/](http://www.siena.edu/physics/ICESTAR/).

Several invited talks have been given by steering committee members. ICESTAR Co-Chair Allan Weatherwax helped organize the “Coupled Geospace” workshop at the 2005 Santa Fe CEDAR/GEM meeting.

ICESTAR held a “Data Portal and Virtual Observatory” Workshop on 23 July 2005 in Toulouse, France, in conjunction with the IAGA 2005 Scientific Assembly.

Prototype virtual observatories and data portals have been released:

- (i) for optical data (browser for quicklook data): see <http://gaia-vxo.org>.
- (ii) for magnetometer data, VGMO.NET: see <http://mist.engin.umich.edu/mist/vgmo/vgmo.html>; and
- (iii) for the multi-instrument data sets at South Pole Station: see <http://siena.isti.com/>.

An ICESTAR proposal has been accepted for the IPY.

#### 2.1.5.2 Plans

Links are being made with the organisers of the International Heliophysical Year (IHY).

At the EGU General Assembly in Vienna in April there will be a Special Session on “Interhemispheric similarities and asymmetries in geospace phenomena”, which will be coordinated with the CAWSES programme.

ICESTAR will convene a Special Session on “Coupling from the Sun to the Ground” - for the Spring AGU.

There will be several ICESTAR sessions as part of the SCAR Open Science Conference in Hobart in July.

TAG Team Leader Nikolai Østgaard will give an invited talk at the International Conference on Substorms-8 on conjugate imaging of substorms.

ICESTAR will hold a Second Technical Workshop to refine specifications for technical solutions, and to evaluate programming languages, data catalogue structures, visualization tools and input and output data formats. The second updated version of the Optical VxO will be released. ICESTAR will also build a prototype of federated distributed archives and metadata collection routines.

Preparatory work will begin for the IPY-IHY activities, especially to submit proposals for Coordinated Investigation Programmes to facilitate the arrangement of coordinated multi-instrumental measurement campaigns and as the basis for collaboration in modeling and outreach activities.

## 2.2 Specific Research Areas

### 2.2.1 Life Sciences Group

The Standing Scientific Group for the Life Sciences (SSG-LS) held the 9th SCAR International Biology Symposium in Curitiba, Brazil, 25 - 29 July 2005, with the theme of “Evolution and Biodiversity in Antarctica”. There

were 246 oral and poster presentations from 29 countries with 70 from Brazil. A selection of the presentations will be published in a special issue of Antarctic Science.

Many members of the RiSCC programme contributed to the production of the book “Trends in Antarctic Terrestrial and Limnetic Ecosystems”, which will be published by Springer in the course of 2006.

The Expert Group on Birds plans to produce a book on the 119 sites designated as Important Bird Areas of Antarctica and the islands of the Southern Ocean. The group played an important role in the implementation of the Agreement on the Conservation of Albatrosses and Petrels (see details in section 5, below).

The Expert Group on Seals developed its website, revised its membership, held a workshop in Curitiba in July, and is working on the final APIS report.

The Expert Group on Human Biology and Medicine met in Bulgaria in July 2005. It has proposed a merger with COMNAP’s medical group, MEDINET; the proposal is under consideration by the SCAR and COMNAP Executive Committees. In the meantime the group has started having annual meetings with MEDINET. The group has developed an IPY proposal entitled “Taking the Polar Pulse”.

The Action Group on Biological Monitoring hosted a workshop in Texas, USA in March 2005, with 44 participants from 14 countries. Its purpose is to develop a biological protocol updating and combining existing biological, physical and chemical monitoring protocols for the Antarctic.

A workshop on Antarctic Conservation in the 21st Century was held in South Africa in May 2005, with the purpose of updating conservation protocols in the Antarctic Treaty.

The SCAR-sponsored Southern Ocean programme of GLOBEC, the Global Ecosystems Dynamics Programme of the International Geosphere-Biosphere Programme (IGBP), continued to study the year-round lifecycle of Antarctic zooplankton, particularly krill, as well as predators of krill, such as marine mammals and seabirds. Southern Ocean GLOBEC (SO-GLOBEC) is now concerned with the development and testing of ecosystem models that can explain the data and be used as the basis for forecasting trends and patterns in the krill. Although SO-GLOBEC will likely end by 2007, efforts to understand the operation of the Southern Ocean ecosystem will continue through the Southern Ocean component of a newly emerging IGBP programme, IMBER (Integrated Marine Biogeochemistry and Ecosystem Research). That

new component, co-sponsored by SCAR, is named ICED (Integrated Analyses of Circumpolar Climate Interactions and Ecosystem Dynamics in the Southern Ocean). The ICED Implementation Plan is now being developed.

These various groups plan to hold meetings during XXIX SCAR in Hobart, July 2006, or to hold special sessions as part of the SCAR Open Science Conference in Hobart. They will put their plans to the business meeting of the SSG-LS in Hobart for approval.

### 2.2.2 Geosciences Group

Within the Standing Scientific Group for the Geosciences (SSG-GS) are six Expert Groups and four Action Groups, whose reports follow:-

#### 2.2.2.1 Expert Group on International Bathymetric Chart of the Southern Ocean (IBCSO) (Leader: H. W. Schenke; Ger.)

High quality bathymetric maps are needed for safe navigation, as a first order control for modelers trying to understand the role of ocean currents, as an indicator of depth-related ecosystems, and as a first clue to geological processes. This Group exists to act as the steering group for production of a revised chart of the bathymetry of the Southern Ocean, in conjunction with the International Hydrographic Office (IHO) and the General Bathymetric Chart of the Oceans (GEBCO). The project was discussed in detail at the GEBCO meeting in Aguascalientes in July 2005, where it was recognized that the largest data gaps are in the South Pacific. The project was also discussed at meetings of the IHO Committee in Kystnos, Greece and in Christchurch, NZ. The IHO Committee formulated an explicit request to Member States for bathymetric data needed for the completion of the Nautical Charts in Antarctica (INT Chart Scheme). The project is also supported by COMNAP, which contributes to the compilation of Nautical Charts within the INT chart scheme, for safe navigation, and which needs bathymetric data to assist in protecting the marine environment within the Antarctic Treaty area. The good cooperation between COMNAP and the IHO Hydrographic Committee on Antarctica (HCA) is an asset for developing the IBCSO.

The interest of ocean modelers in bathymetry has led to the IBCSO Project being represented by its leader within the new SCAR/SCOR Oceanography Expert Group, which met in Venice in October 2005. In turn that led to the Chair of the Oceanography Group persuading the organising Committee for the International Polar Year (IPY) to stress the importance of collating all bathymetric data collected during the IPY.

A post-doctoral researcher will be employed during

2006 at the Alfred Wegener Institute in Bremerhaven (AWI) to be the scientific editor for the IBCSO. The next GEBCO-Meeting will be held at AWI from 14 to 23 June 2006. A major topic for this meeting is a discussion of the possible aggregation of bathymetric data from different international databases. There are plans to combine (i) the existing bathymetry from the AWI Bathymetric Chart of the Weddell Sea with (ii) the Indian Ocean Bathymetry from the GEBCO Digital Atlas Centenary Edition and (iii) the new bathymetric charts from the Ross Sea produced by V. Stagpoole and F. Davey, NZ.

#### 2.2.2.2 Expert Group on Geodetic Infrastructure of Antarctica (GIANT) (Leader: Reinhard Dietrich; Ger.)

This Group exists to provide a common geodetic reference system for all Antarctic scientists and operators; to contribute to global geodesy for studying the physical processes of the earth and the maintenance of the precise terrestrial reference frame; and to provide information for monitoring the horizontal and vertical motion of the Antarctic. Its efforts take place through twelve projects, whose progress is listed below. For more information see the GIANT web site: <http://www.geoscience.scar.org/geodesy/giant.htm>.

##### 1. Permanent Geoscientific Observatories

The Group carried out a programme of repeat measurements from existing Global Positioning System (GPS) observatories, and made new measurements from new GPS observatories. It provided access to data through international services, and collaborated with other SCAR scientists to identify requirements for space geodetic sites.

##### 2. Epoch Crustal Movement Campaigns

The Group coordinated continental-wide and regional epoch campaigns; archived and provided access to data from these campaigns; identified and coordinated the integration of regional campaigns; delivered results to ITRF along with results from permanent observatories; and collaborated with the International Association for Geodesy's Sub-Commission on Antarctica.

##### 3. Physical Geodesy

The Group collaborated with the IAG Antarctic Gravity project; promoted an Antarctic airborne gravity project; coordinated with others on new satellite gravity data missions such as GRACE and GOCE; and developed gravity ties between stations, airfields and Absolute gravity sites.

##### 4. Geodetic Control Database

The Group maintained the database and added newly

acquired data; developed draft guidelines for photo identification; and defined appropriate metadata for geodetic control.

5. Tide Gauge Data

The Group listed all permanent and significant tide gauges established for hydrographic information and scientific studies; put key data into the geodetic database and posted metadata on the Internet; and arranged a supply of tide gauge data to the TIGA project.

6. Atmospheric Impact on Global Navigational Satellite System (GNSS) Observations in Antarctica (in relation to Geophysical research)

The Group monitored the impact of atmosphere variability (troposphere and ionosphere) on Antarctic GPS observations; collected and enhanced accessibility to all available GPS-relevant atmospheric parameters and observations made near GPS sites; facilitated access to GPS observations from permanent GPS sites and the SCAR GPS epoch campaign, for computation of atmospheric delay to GPS signals; and evaluated tropospheric models, the accuracy of those models and the relationship of outputs to the height of the observing stations.

7. Ground Truthing for Satellite Missions

The Group identified new satellite missions that will provide geodetic data or require geodetic support (eg. ICESAT, CryoSat, Envisat) and facilitated the transfer of satellite mission data to the Antarctic scientific community.

8. Geodetic Advice on positioning limits of special areas in Antarctica

The Group carried out research how limits are described for protected areas and the accuracy of the coordinates, and identified difficulties / problems related to coordinates.

9. Remote Observing Technologies

This ongoing activity provides key input to the plans to implement the IPY proposal for a Polar Earth Observing Network (POLENET). A POLENET workshop will take place in Dresden, Germany, from October 4-6, 2006, co-sponsored by SCAR and the International Association of Geodesy.

10. In situ GNSS Antenna Tests and Validation of Phase Centre Calibration Data

The Group established in situ test sites in Antarctica. Test data obtained at non-Antarctica test network sites may be used in analysis.

11. High Accuracy Surface Change and DEM's from

Satellite and Airborne Imagery

The Group carried out research on the generation of high accuracy Digital Elevation Models (DEMs) over limited areas, and on using high accuracy DEM's in the monitoring of aircraft landing sites.

12. High Accuracy Kinematic GPS Positioning

The Group studied ice-shelf dynamics as a means of investigating the behaviour and effect of tides, and developed a technique for surface profile surveys.

2.2.2.3 Expert Group on Geographic Information (EGGI) (Leader: S. Vogt; Ger.)

Geographic location is a fundamental requirement for integrating and communicating Antarctic scientific information. This Group exists to create an Antarctic Spatial Data Infrastructure (AntSDI) by: providing fundamental geographic information products and policies in support of Antarctic science programmes, operations managers and the wider public; integrating and coordinating Antarctic mapping and GIS programmes; promoting an open standards approach to support free and unrestricted data access; promoting capacity building towards sound Antarctic geographic data management within all SCAR nations; and promoting to COMNAP the data and products that the GI Group produces. Its work will help to provide geographic limits to Antarctic Specially Protected Areas (ASPAs) and Antarctic Specially Managed Areas (ASMAs), or locations of Historic Sites and Monuments, and geospatial web services that might be needed for scientific, logistic, or tourism-related applications. A website has been created for communications about implementation of the Antarctic Spatial Data Infrastructure, including specifications and GI products: <http://www.antsdi.scar.org>

The EGGI has delivered a range of up to date Geographic Information products through its nine projects. The products are accessible on-line and used widely in scientific research, education and government. The 9 projects are:

- Spatial Data Model
- Geospatial Information - Enabling Technologies
- Antarctic Data Linkages
- Place Names (SCAR Composite Gazetteer)
- Map Catalogue (SCAR MapCat)
- Topographic Database (SCAR ADD)
- King George Island GIS (SCAR KGIS)
- Cybercartographic Atlas of Antarctica
- GIS Collaboration in East Antarctica

The first three projects aim to produce standards and specifications such as geospatial web service specifications, or the SCAR Feature Catalogue - which is



a major building block to enable database interoperability in the Antarctic community. Through EGGI member Paul Cooper (BAS) EGGI participates in the work of the International Organisation for Standardisation (ISO), particularly the ISO Technical Committee on Geographic Information standards (TC211), where SCAR has Class A Liaison status.

**Place Names:** The SCAR Composite Gazetteer of Antarctica provides an authoritative database of all Antarctic place names approved by recognised bodies, for reference by national Antarctic naming authorities, scientists and operators. At present the database includes 35551 records from 22 countries and from the GEBCO (IHO) gazetteer. The database has been updated with new entries and corrections: [http://www3.pnra.it/SCAR\\_GAZE](http://www3.pnra.it/SCAR_GAZE).

**Map Catalogue:** The SCAR Map Catalogue is a public-access on-line catalogue of all Antarctic mapping products. It allows searches for published maps of Antarctica using spatial coverage, keywords, place-names, etc. The catalogue has been set up as a framework that allows each SCAR member country to update the relevant information online: <http://aadc-maps.aad.gov.au/aadc/mapcat/>.

**Topographic Database:** The Antarctic Digital Database (ADD) is the primary source of continent-wide topographic data for Antarctica. A Web Map Server and a Web Feature Server have been created, allowing direct access to the ADD from both web sites and computer software: <http://www.add.scar.org/>.

**The SCAR King George Island Geographical Information System (KGIS):** This project provides an integrated geographic database of King George Island for use by all countries and for multi-disciplinary applications including scientific research and environmental management. The database provides integrated and consistent topographic data for King George Island. It has been and still is used extensively in the preparatory studies for the emerging discussions on a coordinated environmental management for the Fildes Peninsula Region (see e.g. ATCM XXVIII, IP 16). SCAR KGIS data has also contributed to the Admiralty Bay ASMA management plan. The database has been updated with new topographic and hydrographical data for the more important ice-free areas. An interactive map viewer, a Web Map Service and a Web Feature Service have been established, allowing direct access to the KGIS database from both web-sites and computer software. The interactive KGIS Map viewer was awarded third place in the Uni Freiburg Medienpreis 2004 (Media Award) including a 5000 Euro donation to support the project <http://www.kgis.scar.org/>.

**The Cybercartographic Atlas of Antarctica:** With its

‘open’ framework this Atlas has the potential for a wide range of use by scientists, the public, governments, the Antarctic Treaty Secretariat, and COMNAP. It can be an important aid in Education, Outreach and Information Exchange. The Atlas continues to develop with assistance from the Social Science and Humanities Research Council of Canada. A series of baseline content modules have been created including treatments of Antarctic topics such as: Exploration, Politics, Environmental Protection, Sea Ice, Glacial Morphology, Biodiversity, Ecology, and Territorial Claims. The modules use an Atlas development framework, which supports integration of multimedia content and connection to geographic information services. Four publications and three Masters theses by the project team were published or accepted during 2005 and early 2006: <http://www.carleton.ca/gcrc/caap/>.

The EGGI has been involved in three meetings since SCAR XXVIII. These included:

- a) SCAR Feature Catalogue Implementation Workshop at BAS in Cambridge, November 29th to December 3rd 2004. Feature catalogues provide a detailed description of the nature and the structure of spatial data, and promote the dissemination, sharing, and use of geographic data by providing a better understanding of the content and meaning of the data. The SCAR Feature Catalogue is being developed as part of the SCAR Spatial Data Standards project. Spatial databases that already implement the SCAR Feature Catalogue include those of the Australian Antarctic Data Centre and the SCAR King George Island GIS Project. The aim of the workshop was to transform the Antarctic Digital Database (ADD) to a SCAR Feature Catalogue compliant structure and to assess requirements on the further development of the Feature Catalogue.
- b) The Geographic Information Web Data Developments Workshop, in Baltimore, March 5, 2005 brought together people actively involved in the development of geospatial web services for Antarctic research applications to discuss the current status and future requirements for geospatial web service implementations.
- c) The EGGI met informally in the margins of a meeting of the Cybercartographic Atlas project, in Ottawa, from 18-20 September 2005, to discuss progress on Geographic Information projects. Most EGGI project leaders were included in the discussions by means of a teleconference hook-up.

EGGI will continue developing these projects according to the Geographic Information Programme 2004-2006 (<http://geoscience.scar.org/geog/geog.htm>). Progress will be reviewed at the EGGI meeting in Hobart at SCAR XXIX. There may be an EGGI workshop in Hobart prior

to SCAR XXIX.

#### 2.2.2.4 Antarctic Digital Magnetic Anomaly Project (ADMAP) (Leader: Marta E. Ghidella, Arg.)

ADMAP was created in 1995 under the auspices of SCAR and IAGA (International Association of Geomagnetism and Aeronomy) to compile national near-surface and satellite magnetic anomaly data into a digital map and database for the Antarctic continent and surrounding oceans. The unified data set will be a powerful tool for determining the structure, processes and tectonic evolution of the continent, together with providing information valuable in the reconstruction of the Gondwanaland and Rodinia supercontinents. The resulting merged potential field anomaly maps enable the geological mapping studies of the various national programmes to be better connected, providing a regional framework for the interpretation of smaller scale areas and enabling a more effective selection of areas for further investigation. ADMAP also coordinates protocols for data distribution; serves as a reference for future survey planning; and archives and maintains the magnetic anomaly data base of Antarctica. Recent achievements include:

- Development of a DVD of the compilation of data up to 1999 for release to the World Data Centers.
- Update of the near-surface anomaly predictions from Magsat in the ADMAP database with the significantly more accurate observations from the Ørsted and CHAMP satellite missions.
- Development of improved modeling of the Antarctic core field and its secular variations, and external fields for better definition of crustal anomalies in magnetic survey data.
- Compilation of rock magnetic and other physical properties into a database to support geological applications of the ADMAP data.
- Development and promotion of regional and continental scale interpretation efforts of ADMAP data to provide new insight into global tectonic and geologic processes in the Antarctic context.
- Support for the World Magnetic Anomaly Map initiative of the International Association of Geomagnetism and Aeronomy (IAGA).
- Production of 4 Ph.D. dissertations and over 40 in-review, in-press, or published scientific papers.
- Updates on the ADMAP website: <http://www.geology.ohio-state.edu/geophys/admap>

The ADMAP grids were released to the public in November 2003. They include:

- The 5-km grid of airborne and ship-borne survey data only with large coverage gaps.
- The 5-km grid of airborne and ship-borne survey

data with the coverage gaps filled in using a crustal magnetization model that satisfies both the near-surface and 400-km altitude magnetic observations from the Magsat satellite mission. This map merges over 400 thousand line-kilometers of airborne and ship-borne survey data with more than 5.6 million line-kilometers of Magsat satellite observations. Reference: Golynsky, A., M. Chiappini, D. Damaske, F. Ferraccioli, J. Ferris, C. Finn, M. Ghidella, T. Isihara, A. Johnson, H.R. Kim, L. Kovacs, J. LaBrecque, V. Masolov, Y. Nogi, M. Purucker, P. Taylor, and M. Torta, 2001, ADMAP – Magnetic Anomaly Map of the Antarctic, 1:10 000 000 scale map, in Morris, P., and R. von Frese, eds., BAS (Misc.) 10, Cambridge, British Antarctic Survey.

- A 10-km grid of airborne and ship-borne survey data with the coverage gaps filled in using a crustal magnetization model that satisfies both the near-surface and 650-km altitude magnetic observations from the Ørsted satellite mission.

The ADMAP magnetic compilation is part of the World Magnetic Anomaly Map.

In the short to medium term the group will complete implementation of ADMAP's protocols to maintain and update the database with new airborne and ship-borne magnetic survey data and related metadata as they become available. It will continue compiling all available terrestrial, marine, and satellite magnetic survey data collected by the international community since the IGY 1957-58 for the region south of 60oS. And it will continue the development and promotion of regional and continental scale interpretation efforts of the ADMAP data. New data and interpretations will also enhance studies addressing interplays between geological boundary conditions, Antarctic ice sheets and climate change. These efforts will also greatly assist in identifying high-priority areas for new collaborative magnetic surveys.

In the longer run, the Group will consider incorporating magnetic gradient measurements that will become available towards the end of the current decade from ESA's recently authorized multi-satellite SWARM mission. These observations will greatly improve crustal anomaly detail at satellite altitudes since one of the mission's main objectives is to model the polar external fields. The Group will also expand collaborative efforts with Arctic working groups for more bi-polar magnetic exploration and research. And it will provide a broad collaborative framework for new frontiers in the magnetic exploration of the Polar Regions, such as by long-range aircraft and unmanned autonomous vehicles.

#### 2.2.2.5 Expert Group on Permafrost and Periglacial Environments (EGPPE) (Leader: Jan Boelhouwers;



Swe.)

This Group exists to provide coordination, communication and exchange of data amongst Antarctic permafrost researchers within SCAR and the International Permafrost Association (IPA) and promote interaction and collaboration with SCAR and IPA working groups; to collect and collate spatial data on permafrost and cryosols and contribute to databases for Antarctic soils, permafrost and ground ice conditions including the active layer; to develop and promote monitoring/observation protocols and networks; to promote international cooperation and facilitate collaborative field research; and to address key science questions pertaining to permafrost. During the year EGPPE prepared a white paper on the State of Antarctic Permafrost Science; prepared a map showing permafrost and ground ice features in the southern circumpolar region; and prepared maps showing soils of the southern circumpolar region. It was involved in the meetings of CliC-IASC (Beijing – April 2005); EUCOP II (Potsdam - June 2005); IAG (Zaragoza – 2005); and ICARP II (Copenhagen - November 2005).

#### 2.2.2.6 ANTEC: Antarctic Neotectonics Expert Group (Leader: Terry Wilson, USA)

ANTEC's goals are to promote and coordinate multidisciplinary, multinational research relevant to Antarctic neotectonics; to identify 'target sites' where there is a need for deployment of geodetic and seismic stations and arrays, and airborne, marine and field campaigns; to encourage and coordinate the installation of instruments at permanent sites and in regional networks (GPS, gravity, seismic) for focused studies in target areas; and to promote and coordinate sharing of instrumentation, logistics, and data.

The Airborne Mapping Task Group encouraged development of coordinated international airborne campaigns over Antarctic regions that are promising targets for neotectonic research. A web-based resource of information on technological components required for autonomous remote observatories has been started as the Technological Information Resources project, jointly with GIANT (see above). A start has been made on compiling data for the integration of data sets to study neotectonics of selected regions. And an Antarctic Seismology Web Resource (AnSWeR) has been developed. <http://www.rses.anu.edu.au/seismology/answer/>. Information about ANTEC is available from the website: <http://www.antecc.scar.org/>.

In conjunction with a joint IRIS-UNAVCO meeting, Washington State, in June 2005, ANTEC held a workshop on Autonomous Remote Observatories for IPY, to finalize a science and implementation plan for deployment of

a network of remote autonomous observatories for the International Polar Year. ANTEC was also involved in the GSA-sponsored Earth System Processes II meeting on Geodynamics, Ice Sheets & Climate, in Calgary, from August 8-11, 2005.

#### 2.2.2.7 Communication and Outreach Action Group (COG) (Leader: G. Johnstone, Aus.)

This group exists to provide information on Antarctic geoscientific research to the scientific community and the wider public. Relevant geospatial and geoscientific information was disseminated through electronic communication methods. The Geosciences web site was maintained. Newsletters on geoscience activities were produced and distributed. Links were maintained with other SCAR groups and external bodies as appropriate. Assistance was provided for the organisation of the Antarctic Geodesy Symposium 2005 (Cairns, Australia, August 2005), and the 4th International Antarctic GIS Workshop (Chile, October 2005).

#### 2.2.2.8 Action Group on Acoustics in the Marine Environment (Leader: P. O'Brien, Aus.)

This Group exists to consider the effects on marine mammals of noise created by marine scientific activities such as echo-sounding and airgun surveys. The Group met in Cadiz, Spain from the 23rd to 26th January 2006 for its third workshop. At that meeting the Group reviewed progress in understanding the effects of anthropogenic noise on marine species, and a COMNAP survey of shipping activity in the Antarctic. The Group revised the risk analysis conducted in 2004 by simplifying some categories and including shipping noise as a separate matrix. And it concluded that ship noise levels in the Antarctic Peninsula needed consideration because of the increase in tourist vessel traffic.

This Group has provided input to CEP discussions at two previous Antarctic Treaty Consultative Meetings (ATCMs) and provides scientific background information for national regulators responsible for issuing permits for marine surveys. The report of the first workshop has been used widely by groups involved in the issues beyond the Antarctic. The risk analysis developed at the second workshop has also been considered widely (e.g. by the US Marine Mammal Commission). The results of the third workshop will be incorporated into a Working Paper for the May 2006 ATCM.

#### 2.2.2.9 Action Group on Marine Survey Coordination

This Group aims to develop mechanisms for improved communication about planned marine geophysical surveys within the Antarctic scientific community. It is

in the process of developing web-based forms to use to notify the wider community about upcoming surveys, and developing a list of national contacts to provide the information needed.

### 2.2.3 Physical Sciences Group

Reports are provided for a selection of the expert and action groups of the Standing Scientific Group for the Physical Sciences. Several of those not reported on below now form part of the AGCS Scientific Research Programme (see 2.1.1, above).

#### Ice Drilling Technology Expert Group:

This new Expert Group has been spinning up during the year, and is currently planning for the 6th International Ice Drilling Technology Workshop that will be held September 17-23, 2006 in Shepherdstown, West Virginia. There is a strong potential linkage to the International Partnership in Ice Core Science (IPICS), which SCAR proposed to co-sponsor.

#### Astronomy from Antarctica:

SCAR has two astronomy groups: the Antarctic Astronomy and Astrophysics Expert Group (AAA), and the Plateau Astronomy Site Testing in Antarctica Action Group (PASTA). Although neither group met during 2005, there were several important international astronomy meetings at which members of these SCAR groups were present, giving the opportunity for informal interactions. Perhaps the most significant of these was the "Wide Field Survey Telescope at Dome C/A conference" in Beijing, China, in June. This was the first conference on Antarctic astronomy to be held in China, and included a report from the Chinese traverse team on their successful expedition to Dome A.

Another astronomical highlight of 2005 was the first winter-long operation of the French-Italian "Concordia" Station at Dome C. Both Dome C and Dome A show promise of offering exceptionally good conditions to astronomers.

#### Modelling and Observational Studies of Antarctic Katabatic winds (MOSAK):

This Action Group has been planning a workshop for March 2006, which will be concerned with determining our current understanding of the Antarctic wind field and our ability to represent it in climate models.

#### Reference Antarctic Data for Environmental Research (READER) Expert Group:

SCAR is developing a database of physical oceanographic data from the Southern Ocean (OCEAN-READER) to assist in understanding how the ocean

works, and the influence of the physical system on the chemistry and biology of the region.

#### Oceanography:

The joint SCAR/SCOR Oceanography Expert Group held its first formal meeting, in Venice, in October 2005. The Group's aims are: to encourage an inter-disciplinary approach to Southern Ocean observations, modelling and research, recognizing the inter-dependence of physical, chemical and biological processes in the ocean at present and in the past; to facilitate coordination between the physical oceanographic research groups currently active and those planning research in the Southern Ocean; to identify historical and reference data set of value to researchers, focusing initially on physical oceanography data; and to encourage the exchange of information with operational agencies. The Group is now working to the action plan developed at that meeting. The development of databases of physical oceanographic data from the Southern Ocean will assist in understanding how the ocean works, and the influence of the physical system on the chemistry and biology of the region.

SCAR also co-sponsors with SCOR the international Antarctic Zone (iAnZONE) Project, which undertakes physical oceanographic investigations around the Antarctic margins. And SCAR co-sponsors with CLIVAR and CliC the Southern Ocean Implementation Panel, which is devoted to establishing a Southern Ocean observing system. Both iAnZONE and the Southern Ocean Implementation Panel developed successful proposal for projects to be carried out during the IPY.

The Southern Ocean Implementation Panel organised a meeting hosted by SCAR at the Scott Polar Research Institute in Cambridge in June, to investigate modes of Variability in the Southern Ocean and to develop their IPY proposal.

#### Cryosphere:

SCAR continued with the World Climate Research Programme (WCRP) to co-sponsor the development of a Cryosphere Theme for the Integrated Global Observing System Partnership (IGOS-P). A draft is available from the IGOS Cryosphere Theme web site <http://stratus.ssec.wisc.edu/igos-cryo/>. The final version will be produced for review by the Committee on Earth Observing Satellites (CEOS) and the IGOS partners in May/June 2006. It is then expected to be implemented as part of the Global Earth Observing System of Systems (GEOSS).

### 3. Data and Information Management

One of SCAR's secondary objectives is to facilitate

free and unrestricted access to Antarctic scientific data and information in accordance with article III-1c of the Antarctic Treaty. This is the task of the Joint SCAR-COMNAP Committee on Antarctic Data Management (JCADM).

In early April, JCADM was reviewed favourably by an international Review Team chaired by Dr. Lesley Rickards, Deputy Director of the British Oceanographic Data Centre (BODC) and chair of the International Oceanographic Data and Information Exchange Committee (IODE). The full report from the Review Team may be downloaded from the SCAR (<http://www.scar.org/researchgroups/jcadm/>) or JCADM (<http://www.jcadm.scar.org>) web sites. One of the outcomes of the JCADM review was a series of recommendations to further improve JCADM. All these recommendations were discussed at the annual JCADM meeting and turned into JCADM action items for the coming year. The 9th annual JCADM meeting was held in Buenos Aires, September 12-16, 2005. It included a two day capacity building workshop.

JCADM's members are the managers of National Antarctic Data Centres (NADCs). Over the past year JCADM continued to recruit new members from SCAR Member nations, and there are now 30 countries involved in JCADM, with new NADCs in Malaysia, South Africa and Bulgaria. The total number of dataset descriptions (DIFs) in the Antarctic Master Directory (AMD) increased by 18% from 2966 (June 2004) to 3503 (July 2005). The growth can be attributed to the continued work by existing NADCs and the implementation of new NADCs. Each NADC can now have its own 'portal' into the AMD, through the Global Change Master Directory (GCMD), which is the host for the AMD. These portals enable each NADC to provide its own DIF entries to the AMD, and provide a national view of the metadata in the AMD. The data management capacity of existing NADCs has been strengthened by the capacity building workshop in Buenos Aires, and by valuable nation-to-nation support from the Australian Antarctic Data Centre.

NADCs vary greatly in the resources available for storing and disseminating Antarctic science data. NADCs submit data to relevant World Data Centres. In addition, NADCs have also made data freely available on the Internet as data files, as databases and using Web Services to international science portals such as the Global Biodiversity Information Facility and the Ocean Biogeographic Information System. Currently, over 30 million data records have been placed online by NADCs. Initiatives have been taken to promote the use of the JCADM/AMD infrastructure for data management during the upcoming International Polar Year.

JCADM plans to develop closer links with the SCAR

SSGs and Research Programmes, with SCAR's marine biodiversity database (MarBIN), and with international data programmes like the Global Biodiversity Information Facility (GBIF), the Ocean Biogeographic Information System (OBIS), the International Oceanographic Data and Information Exchange Committee (IODE), and the Climate and Cryosphere Project (CliC). To strengthen links with SCAR's 5 Scientific Research programmes (SRPs), JCADM has nominated JCADM personnel to each SRP. These arrangements were formalized at the SCAR Cross-Linkages workshop in Amsterdam in November. One direct result is that JCADM is actively involved in setting up an infrastructure to build the Southern Ocean database (or OceanREADER), as requested by AGCS.

#### **4. International Polar Year**

SCAR is making a significant contribution to the proposed International Polar Year (IPY)(1 March 2007 – 1 March 2009). SCAR is a member (ex-officio) of the Joint ICSU/WMO Committee for the IPY, which also contains several scientists eminent in SCAR science programmes, among them one current SCAR Vice President (Jeronimo López-Martínez) and one past SCAR Vice President (Chris Rapley); a member of the Steering Group for EBA (Edith Fanta); the Chairman of the DCAR/SCOR Oceanography Group (Eberhard Fahrback), and the Chairman of the Local Organising Committee for the SCAR Open Science Conference (Ian Allison). During 2005, the Joint Committee formally approved 139 proposals covering the Arctic or Antarctic or both. Several of the Antarctic or Bipolar ones are based on SCAR activities, including some based on the 5 SCAR SRPs; other SCAR-led proposals have been very well-received, to the point that they have been asked to lead regional clusters of activities in their thematic area of interest. It is good to see SCAR Science in this leading position in IPY. A SCAR scientist, Taco de Bruin (Neth), the Chairman of JCADM, co-chairs the IPY Subcommittee on Data Policy and Management.

#### **5. Scientific Advice to ATCM, CEP, CCAMLR and ACAP**

SCAR continues to be the primary source of independent scientific advice to the Antarctic Treaty Consultative Meeting (ATCM) and the Committee on Environmental Protection (CEP), through its status as Observer. During 2006 there will be a significant change in the working of SCAR's Standing Committee on the Antarctic Treaty System (SC-ATS), where the current Chief Officer, David Walton (UK) will retire following the Edinburgh ATCM meeting and be replaced by Prof Steve Chown (RSA). During the year, the SC-ATS has gained Sergio Marensi (Arg) and Graham Hosie (Aus.), while Michael Stoddart

(Aus) rotated off the committee after several years of service.

SCAR participated in the XXVIIIth ATCM in Stockholm (6-17 June 2005). The SCAR Lecture, on Biodiversity, by Prof Chown, was very well received. SCAR presented 2 Working Papers and 3 Information Papers. The Working Paper on how to go about listing endangered species was well received, but the Working Paper on the listing of Fur Seals was returned for further work. SCAR is proposing to provide up to 8 Working Papers and 5 Information Papers for the XXIXth ATCM in Edinburgh in June 2006. SCAR is also proposing to undertake a review on Antarctic Climate Change along the lines of the Arctic Climate Impact Assessment, for presentation to a future ATCM.

SCAR continues to be an Observer to the Committee on the Conservation of Antarctic Marine Living Resources (CCAMLR). During 2005, SCAR's representation at CCAMLR changed, with Dr. Graham Hosie (AUS) replacing Dr Edith Fanta (BRA), who had become Chairperson of CCAMLR's Scientific Committee. SCAR participated in the 24th CCAMLR meeting in Hobart (24 Oct to 4 Nov 2005). SCAR's Census of Antarctic Marine Life (CAML) programme provides perhaps the strongest current link to CCAMLR's interests. SCAR and CCAMLR also both have significant interests in IPY proposals where there is the potential for synergy between the two organisations during 2007-2008. SCAR's Marine Bioersity database (MarBIN) should also prove useful to CCAMLR, as should links to SCAR's EBA programme (Evolution and Biodiversity in the Antarctic). CCAMLR has routinely requested SCAR in the past for data on birds and seals. CCAMLR will be holding a workshop to decide on its specific requirements for such data in future. SCAR stands ready to provide what is required. The Executive Director of SCAR plans to attend the 25th CCAMLR meeting in 2006.

In recognition of the expertise of the SCAR Bird Group, SCAR continues to be invited to attend meetings of the Advisory Committee on Albatrosses and Petrels (ACAP) as an Observer, providing advice and data on the distribution, abundance, population trends and regional conservation status of Southern Giant Petrels. In addition, SCAR is a member of two ACAP Working Groups (Status and Trends, and Breeding Site Inventory). In 2006, SCAR will be providing ACAP with an Information Paper on the potential contribution of at-sea data to the selection of high seas Marine Protected Areas (MPAs). Such data may help to identify possible Marine Protected Areas, because seabirds can be used as proxies for related biological activity (i.e. prey species).

SCAR is planning its second Open Science Conference on 12-14 July 2006, in Hobart. At least 750 abstracts have been submitted, so some 700 attendees are expected at the meeting, which will provide important opportunities to develop cross-disciplinary links.

SCAR is already beginning to plan its XXXth meeting which takes place in Russia in 2008. It is expected that the SCAR Science Week will take place in St. Petersburg, in July, and the SCAR DElegates Meeting will take place in October. The theme for the Open Science Conference will be along the lines of Bipolar Science in the International Polar Year, and will be organised jointly with the International Arctic Science Committee (IASC). During these meetings, we will take the opportunity of celebrating SCAR's 50th Anniversary.

SCAR has implemented a Communications Plan to improve communications to the wider world about the Antarctic region (<http://www.scar.org/communications/>).

SCAR is developing plans for a Capacity Building and Education programme, especially for the benefit of those SCAR Members and others with limited experience of working in the Antarctic region. As part of this programme, SCAR continues to operate a Fellowship programme (4 Fellows funded in 2005-2006).

In the Secretariat, Dr. Peter Clarkson (UK) retired as Executive Secretary in June, and was replaced, as Executive Officer by Dr Marzena Kaczmarek (POL). Administrative Assistant Mandy Dalton left SCAR in August. A long-term secretarial appointment to replace her will be made in January 2006.

## 6. New Developments

## MEMBERSHIP OF SCAR

### **Full members (28):**

Argentina, Australia, Belgium, Brazil, Canada, Chile, China, Ecuador, Finland, France, Germany, India, Italy, Japan, Korea (Republic of), Netherlands, New Zealand, Norway, Peru, Poland, Russia, South Africa, Spain, Sweden, Switzerland, United Kingdom, United States of America, Uruguay

### **Associate Members (4):**

Pakistan, Ukraine, Bulgaria, Malaysia

### **ICSU Union Members (7):**

IGU International Geographical Union  
IUBS International Union of Biological Sciences  
IUGG International Union of Geodesy and Geophysics  
IUGS International Union of Geological Sciences  
IUPAC International Union of Pure and Applied Chemistry  
IUPS International Union of Physiological Sciences  
URSI Union Radio Scientifique Internationale

## SCAR Executive Committee (to July 2006)

### *President*

Professor Dr J Thiede  
Alfred-Wegener-Institut für Polar- und Meeresforschung,  
Building E-3221, Am Handelshafen, D-27570 Bremerhaven, Germany  
E-mail: jthiede@awi-bremerhaven.de

### *Vice-Presidents*

Professor J López-Martínez  
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Dr C Howard-Williams  
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Professor M C Kennicutt II  
Director Sustainable Development,  
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TX 77843-1112, United States  
E-mail: m-kennicutt@tamu.edu

Professor N. Shimamura (to 21/07/2005)  
Director, National Institute of Polar Research,  
Kaga 1-9-10, Itabashi-ku, Tokyo 173-8515, Japan

Professor Zhanhai Zhang (from 21/07/2005)  
Polar Research Institute of China,  
451 Jinqiao Road, Shanghai Pudong 200129, China  
E-mail: xhangzhanhai@263.net.cn

## SCAR Secretariat

Scott Polar Research Institute, Lensfield Road, Cambridge, CB2 1ER, United Kingdom.

### *Executive Director*

Dr C P Summerhayes (E-mail: cps32@cam.ac.uk)

### *Executive Officer*

Dr M I Kaczmarska (E-mail: mik24@cam.ac.uk)

### *Administrative Assistant*

Karen Smith (E-mail: ks466@cam.ac.uk) (from end Jan 2006)



## **SCAR Chief Officers**

### **Standing Scientific Groups (to July 2006)**

#### **Geosciences**

Professor A Capra  
DIMec Dept., Engineering Faculty of Modena  
University of Modena and Reggio Emilia  
Via Vignolese 905, 41100- Modena, Italy  
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#### **Life Sciences**

*Dr A H L Huiskes*  
Netherlands Institute of Ecology,  
Unit for Polar Ecology, PO Box 140, 4400 AC Yerseke, Netherlands  
E-mail:a.huiskes@nioo.knaw.nl

#### **Physical Sciences**

*Dr J Turner*  
British Antarctic Survey,  
High Cross, Madingley Road, Cambridge CB3 0ET, United Kingdom.  
E-mail:j.turner@bas.ac.uk

### **Standing Committees**

#### **Antarctic Treaty System**

*Professor D W H Walton (to June 2006)*  
British Antarctic Survey,  
High Cross, Madingley Road, Cambridge CB3 0ET, United Kingdom.  
E-mail:d.walton@bas.ac.uk

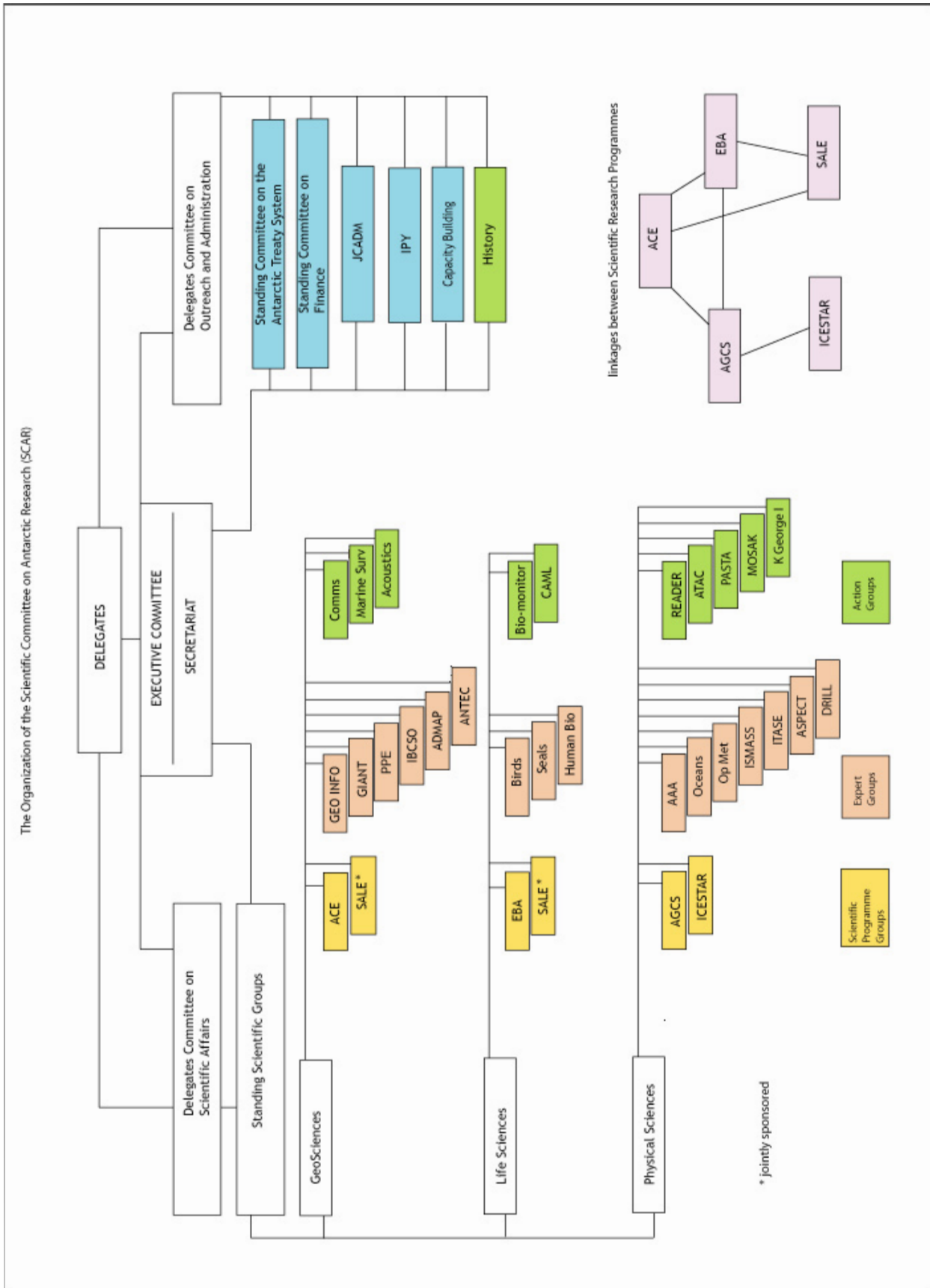
#### **Finance**

*Professor M C Kennicutt II*  
Director Sustainable Development, Office of the Vice President for Research, 1112 TAMU, College Station, TX  
77843-1112, United States  
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#### **SCAR-COMNAP Joint Committee on Antarctic Data Management**

*Dr T de Bruin*  
Royal Netherlands Institute for Sea Research (NIOZ),  
PO Box 59, 1790 AB Den Burg, Texel, The Netherlands  
E-mail:bruin@nioz.nl

SCAR Structure



## **List of Constituent sub-groups in the SCAR Organization**

### **Delegates Committee on Scientific Affairs**

#### **Standing Scientific Group on Geosciences**

*Expert Groups on:*

Geographic Information  
 Geodetic Infrastructure for Antarctica  
 Permafrost and Periglacial Environments  
 International Bathymetric Chart for the Southern Ocean  
 Antarctic Digital Magnetic Anomaly Project  
 Antarctic Neotectonics

*Action Groups on:*

Communications and Outreach  
 Marine Geophysical Surveying  
 Marine Acoustics

#### **Standing Scientific Group on Life Sciences**

*Expert Groups on :*

Birds  
 Seals  
 Human Biology and Medicine

*Action Groups on:*

Bio-monitoring of Human Impacts  
 Census of Antarctic Marine Life

#### **Standing Scientific Group on Physical Sciences**

*Expert Groups on:*

Antarctic and Astronomy and Astrophysics  
 Oceanography  
 Operational Meteorology  
 Ice Sheet Mass Balance and Sea Level  
 International Trans-Antarctic Scientific Expedition  
 Antarctic Sea-Ice Processes and Climate  
 Ice drilling technology

*Action Groups on:*

Reference Antarctic Data for Environmental Research  
 Antarctic Tropospheric Aerosols and their role in  
 climate  
 Plateau Astronomy Site Testing in Antarctica  
 Modelling and Observational Studies of Antarctic  
 Katabatics  
 Scientific Co-ordination on King George Island

### **Scientific Research Programmes**

Antarctic Climate Evolution

Antarctica and the Global Climate System

Evolution and Biodiversity in the Antarctic

Inter-hemispheric Conjugacy Effects in Solar-Terrestrial and  
 Aeronomy Research

Subglacial Antarctic Lake Environments

### **Delegates Committee on Outreach and Administration**

Standing Committee on the Antarctic Treaty System

Standing Committee on Finance

Joint Committee on Antarctic Data Management

International Polar Year 2007-09

Capacity Building

History of Scientific Research in Antarctica

## Memberships of Steering Committees of SCAR's Scientific Research Programmes

### 1. Antarctica in the Global Climate System (AGCS)

*Implementation takes place through four themes:*

- (1) Decadal time scale variability in the Antarctic climate system,
- (2) Global and regional climate signals in ice cores,
- (3) Natural and anthropogenic forcing on the Antarctic climate system,
- (4) The export of Antarctic climate signals.

*The Scientific Steering Committee comprises:*

John Turner: (Chair and Leader Theme 3; UK)  
 David Bromwich (Leader Theme 1; USA)  
 Paul Mayewski: (Leader Theme 2; USA)  
 Mike Meredith: (Leader Theme 4; UK)  
 Xiaou Cunde: (China)  
 Tony Worby: (Australia)  
 Ilana Wainer: (Brazil)  
 Shigeru Aoki: (Japan)  
 Nancy Bertler: (New Zealand)  
 Gino Casassa: (Chile)  
 Alberto Naveira-Garabato: (UK)

### 2. Antarctic Climate Evolution (ACE)

*The Scientific Steering Committee comprises:*

Martin Siegert (co-chair; UK)  
 Rob Dunbar (co-chair; USA)  
 Carlota Escutia (Spain)  
 Damian Gore (Austral)  
 Rob DeConto (USA)  
 Fabio Florindo (Italy)  
 Jane Francis (UK)  
 Sandra Passchier (Neth)  
 Ross Powell (USA)  
 Rob Larter (UK)  
 Gary Wilson (NZ)  
 Eric Wolff (UK)

Six subcommittees were created to coordinate the research on different geological timeframes, and on technology:

LGM-Holocene	Chair: Tony Payne (UK)
Pleistocene	Chair: Tim Naish (NZ)
Middle Miocene-Pliocene	Chair: Alan Haywood (UK)
Oligocene-Miocene	Chair: Rob DeConto (USA)
Eocene/Oligocene	Chair: Jane Francis (UK)
Radio-Echo Sounding	Chair: Detlef Damaske (Germany)

### 3. Evolution and Biodiversity in the Antarctic (EBA)

Implementation takes place through four themes (work-packages):

1. Evolutionary history of Antarctic organisms
2. Evolutionary adaptation to the Antarctic environment
3. Patterns of gene flow within, into and out of the Antarctic, and consequences for population dynamics
4. Patterns and diversity of organisms, ecosystems and habitats in the Antarctic, and controlling processes
5. Impact of past, current and predicted future environmental change on biodiversity, and the consequences for Antarctic marine, terrestrial, and Limnetic ecosystem function.

*The Scientific Steering Committee comprises:*

Co-chair: Guido di Prisco (Italy, marine, also representing ICEFISH)  
 Co-chair: Peter Convey (UK, terrestrial)  
 Secretary: Dana Bergstrom (AUS, terrestrial)  
 Member: Angelika Brandt (D, marine)  
 Member: Marc Lebouvier (F, conservation matters)  
 Ex officio: Ad Huiskes (NL, terrestrial, Chief Officer Life Sciences Standing Scientific Group of SCAR)  
 Census of Antarctic Marine Life (CAML): Michael Stoddart (AUS, marine)  
 Work Package 1: Brigitte Hilbig (D, marine, also representing ANDEEP-SYSTCO), Dominic Hodgson (UK, terrestrial)  
 Work Package 2: Dan Costa (US, marine), Takeshi Naganuma (Jap, terrestrial)  
 Work Package 3: Antonio Mateo Sole-Cava (Brazil, marine), Ian Hogg (NZ, terrestrial)  
 Work Package 4: Julian Gutt (D, marine), Satoshi Imura (Jap, freshwater)  
 Work Package 5: Edith Fanta (Brazil, marine), Tad Day (US, terrestrial)

### 4. Subglacial Antarctic Lake Environments (SALE)

*The Scientific Steering Committee comprises:*

John Prisco (Chief Officer; USA)  
 Chuck Kennicutt (Secretary; USA)  
 Valery Lukin (Rus)  
 Martin Siegert (UK)  
 Jean Robert Petit (France)  
 Christophe Mayer (Germany)  
 Robin Bell (USA)  
 Sergey Bulat (Rus)  
 Cynan Ellis-Evans (UK)  
 Frank Pattyn (Bel).  
 Ross Powell (USA)

### 5. Inter-hemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR)

Four Thematic Action Groups (TAGs) were established to coordinate the main scientific activities and objectives proposed:

- TAG-A: Quantifying and understanding the similarities and differences between the Northern and Southern polar upper atmospheres;  
 TAG-B: Quantifying the effects on the polar ionosphere and atmosphere of the magnetospheric electromagnetic fields and plasma populations;  
 TAG-C: Quantifying the atmospheric consequences of the global electric circuit and further understanding the electric circuit in the middle atmosphere;  
 TAG-D: Creating a data portal to integrate all of the polar data sets and modeling results.

*The Scientific Steering Committee comprises:*

Allan Weatherwax (Co-Chair; USA)  
Kirsti Kauristie (Co-Chair; Finland)  
Brian Fraser (Australia)  
Scott Palo (TAG-C Co-Leader; USA)  
Martin Fullekrug (TAG-A Leader; UK)  
Ruiyuan Liu (China)  
Nikolai Østgaard (TAG-C Co-Leader; Norway)  
Aaron Ridley (TAG-D Leader; USA)  
Natsuo Sato (Japan)  
Eftyhia Zesta (TAG-B Leader; USA)  
Maurizio Candidi (Italy)



## List of Acronyms

AAA	Antarctic and Astronomy and Astrophysics
ACAP	Advisory Committee on Albatrosses and Petrels
ACE	Antarctic Climate Evolution
ADD	Antarctic Digital Database
ADMAP	Antarctic Digital Magnetic Anomaly Project
AGCS	Antarctica in the Global Climate System
AGU	American Geophysical Union
AMD	Antarctic Master Directory
ANDRILL	Antarctic Geological Drilling Project
ANTEC	Antarctic Neotectonics
ANTSDI	Antarctic Spatial Data Infrastructure
APIS	Antarctic Pack-Ice Seals
ASMA	Antarctic Specially Managed Area
ASPA	Antarctic Specially Protected Area
ATCM	Antarctic Treaty Consultative Meeting
AWI	Alfred Wegener Institute
BAS	British Antarctic Survey
BODC	British Oceanographic Data Centre
CAML	Census of Antarctic Marine Life
CAWSES	Climate and Weather of the Sun-Earth System
CCAMLR	Convention on Conservation of Antarctic Living Marine Resources
CEOS	Committee on Earth Observing Satellites
CEDAR	Coupling, Energetics and Dynamics of Atmospheric Regions
CEP	Committee for Environmental Protection
CliC	Climate and Cryosphere Programme
CLIVAR	Climate Variability programme of WCRP
COG	Communication and Outreach
COMNAP	Council of Managers of National Antarctic Programmes
DEM	Digital Elevation Model
DIF	dataset description
EBA	Evolution and Biodiversity in the Antarctic
EGGI	Expert Group on Geographical Information
EGPPE	Expert Group on Permafrost and Periglacial Environments
EGU	European Geophysical Union
ENSO	El Niño –Southern Oscillation
ESA	European Space Agency
EUCOP	European Conference on Permafrost
EVOLANTA	Evolutionary Biology of Antarctic Organisms
GEBCO	General Bathymetric Chart of the Oceans
GEM	Geospace Environment Modeling
GEOSS	Global Earth Observing System of Systems
GBIF	Global Biodiversity Information Facility
GCMD	Global Change Master Directory
GI	Geographical Information
GIANT	Geodetic Infrastructure for Antarctica
GIS	Geographic Information Systems
GLOBEC	Global Ocean Ecosystems Dynamics
GOCE	Gravity Field and Steady State Ocean Circulation Explorer
GPS	Global Positioning System
GRACE	Gravity Recovery and Climate Science Experiment
GSA	Geological Society of America
HCA	Hydrographic Committee on Antarctica (of IHO)
IABO	International Association of Biological Oceanography

IAG	International Association of Geodesy
IAGA	International Association of Geomagnetism and Aeronomy
IAnZone	International (Coordination of Oceanographic Research within the) Antarctic Zone
IASC	International Arctic Science Committee
IBCSO	International Bathymetric Chart of the Southern Ocean
ICARP	International Conference on Arctic Research Planning
ICED	Integrated Analysis of Circumpolar Climate Interactions and Ecosystem Dynamics in the Southern Ocean
ICESTAR	Inter-hemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research
ICSU	International Council for Science
IGBP	International Geosphere-Biosphere Programme
IGOS	Integrated Global Observing Strategy
IGOS-P	Integrated Global Observing Strategy Partnership
IGU	International Geographical Union
IGY	International Geophysical Year
IHO	International Hydrographic Office
IHY	International Heliophysical Year
INT	International Charts of IHO
IODE	International Ocean Data and Information Exchange Programme
IPA	International Permafrost Association
IPICA	International Partnership in Ice Core Science
IODP	Integrated Ocean Drilling Program
IMBER	Integrated Marine Biogeochemical and Ecosystem Research
IPY	International Polar Year
IRIS	Incorporated Research Institutes for Seismology
ISO	International Organisation for Standardisation
ITRF	International Terrestrial reference System
IUBS	International Union of Biological Sciences
IUGG	International Union of Geodesy and Geophysics
IUGS	International Union of Geological Sciences
IUPAC	International Union of Pure and Applied Chemistry
IUPS	International Union of Physiological Sciences
JCADM	Joint Committee on Antarctic Data Management
KGIS	King George Island Geographical Information System
LGM	Last Glacial Maximum
MarBIN	Marine Biodiversity Information Network
MEDINET	Medical Network
MOSAK	Modelling and Observational Studies of Antarctic Katabatic Winds
MPA	Marine Protected Area
NADC	National Antarctic Data Centre
OBIS	Ocean Biodiversity Information System
OGS	Oceanografia e Geofisica Sperimentale
PASTA	Plateau Astronomy Site Testing in Antarctica
PPE	Permafrost and Periglacial Environments
READER	Reference Antarctic Data for Environmental Research
RiSCC	Regional Sensitivity to Climate Change in Antarctic Terrestrial and Limnetic Ecosystems
SALE	Subglacial Antarctic Lake Environments
SAM	Southern hemisphere Annular Mode
SCAR	Scientific Committee on Antarctic Research
SC-ATS	Standing Committee on the Antarctic Treaty System
SCOR	Scientific Committee on Oceanic Research
SO	Southern Ocean
SRP	Scientific Research Programme
SSG	Standing Scientific Group
SSG-G	SSG on Geosciences
SSG-LS	SSG on Life Sciences

SSG-PS	SSG on Physical Sciences
TAG	Thematic Action Group
TIGA	Tide Gauge Benchmark Monitoring Project
UN	United Nations
UNAVCO	company name
URSI	Union Radio Scientifique Internationale
VGMO	Virtual Global Magnetic Observatory
WAP	Western Antarctic Peninsula
WCRP	World Climate Research Programme
WMO	World Meteorological Organization