SCAR Strategic Plan 2004–2010






Scientific Committee on Antarctic Research

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Scientific Committee on Antarctic Research

(SCAR)

Strategic Plan 2004–2010

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Executive Summary

SCAR, the Scientific Committee on Antarctic Research, is the principal organisation dealing with Antarctic scientific research. Formed in 1958 to continue activities begun during the International Geophysical Year of 1957-58, it is an interdisciplinary committee of the International Council for Science (ICSU). Its area of interest includes Antarctica, its offshore islands, and the surrounding Southern Ocean including the Antarctic Circumpolar Current.

SCAR's mission is *"to be the leading independent organisation for facilitating and coordinating Antarctic research, and for identifying issues emerging from greater scientific understanding of the region that should be brought to the attention of policy makers"*. To achieve its mission, SCAR aims to achieve five main objectives:

1. 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;
2. 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.
3. to facilitate free and unrestricted access to Antarctic scientific data and information;
4. to develop scientific capacity in all SCAR Members, especially with respect to younger scientists, and to promote the incorporation of Antarctic science in education at all levels;
5. to communicate scientific information about the Antarctic region to the public.

To ensure that it can deliver effectively on these objectives, SCAR has undergone a major reorganisation that was completed in 2004 with

i. the transformation of its Secretariat into an Executive Office headed by an Executive Director,
ii. the creation of a streamlined structure led by Standing Scientific Groups on Geosciences, Life Sciences and Physical Sciences,
iii. a more focused scientific research programme,
iv. a new Constitution and Rules of Procedure, and
v. a new financial strategy.

SCAR is focusing its efforts on five Scientific Research Programmes addressing major topical issues of the day. These programmes are:

- Subglacial Lake Exploration (SALE)
- Antarctica and the Global Climate System (AGCS)
- Antarctic Climate Evolution (ACE)
- Evolution and Biodiversity in the Antarctic (EBA)
- Inter-hemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR)

The bulk of the activities contributing to these programmes will be funded nationally. SCAR's international coordination is intended to add value to those national efforts.

SCAR also supports a variety of other scientific activities in which value is added to national efforts through international cooperation. These activities are coordinated by Action Groups operating for short periods, and Expert Groups where more time is needed to achieve success.

SCAR's activities will make significant contributions to achieving the goals of the International Polar Year (IPY) (2007–09). SCAR will work with partner organisations to influence the development of the IPY.

SCAR recognises the growing importance of working in partnership with other organisations having a global remit and including Antarctic interests, in order to place SCAR's research firmly in the global context.

SCAR's Standing Committee on the Antarctic Treaty System will work closely with the Standing Scientific Groups and the Executive Committee to bring key scientific issues to the attention of the Antarctic Treaty Consultative Meeting.

In order to improve for the benefit of scientists the way in which data and information are managed and made available, SCAR will

i. review the activities of the Joint SCAR/COMNAP Committee on Antarctic Data Management (JCADM) and the Expert Group on Geographical Information (EGGI), and
ii. work with JCADM and EGGI and the scientific community to develop a strategy for data and information management.

SCAR will also develop a strategy setting out how it proposes to meet the requirement to develop scientific capacity in all SCAR Members, especially with respect to younger scientists, and to promote the incorporation of Antarctic science in education at all levels. One key element of this strategy will be the development of a Fellowship programme building on the scheme that was supported in 2003-04 by the Prince of Asturias Prize.

SCAR will in addition develop a strategy to meet the requirement to communicate scientific information about the Antarctic region to the public. Steps have already been taken in this direction with renewal of the SCAR web site, and production of a SCAR poster and Power-Point presentation that are available on the web site.

To ensure that progress is made in these different areas, the members of SCAR's Executive Committee will each carry a responsibility for a specific activity from a list including: the Antarctic Treaty System; Scientific Affairs; Administration; Data and Information Management; Finance; Communication; and Capacity Building and Education.

SCAR's performance will be reviewed in depth at intervals of 8 years, and subsidiary groups at intervals of 5 years. The progress of all groups and the Secretariat against stated action plans will be monitored annually.

SCAR's intentions are set out in this Strategic Plan for three biennial planning cycles covering the period 2004-10. The Plan is intended to show where SCAR fits in the world of science, to enable SCAR to take a long-term view of its evolving role in relation to changing developments, and to provide a blueprint for SCAR activities at the national level. It will be revisited at each biennial meeting of the SCAR Delegates, and revised as appropriate. The work programme and budget that the Delegates approve at each biennial meeting comprise the short-term components of an overall Implementation Plan. The specific requirements of the Strategic Plan for areas such as Communications will be translated into strategic and implementation plans for those specific areas.

1. Introduction

1.1 SCAR Development

SCAR, the Scientific Committee on Antarctic Research, is the principal organisation dealing with Antarctic scientific research. It is the authoritative voice on Antarctic scientific research from the ionosphere to the mantle, from bacteria to seals, from the ice sheet to the deep sea floor, on the role of Antarctica in the Earth System, and on astronomy from Antarctica.

SCAR is an interdisciplinary committee of the International Council for Science (ICSU). Formed in 1958, SCAR (then the Special Committee on Antarctic Research) was charged with "furthering the coordination of scientific activity in Antarctica, with a view to framing a scientific programme of circumpolar scope and significance". In this role SCAR inherited the mantle of the Antarctic component of the International Geophysical Year for 1957-58 (IGY). SCAR held its first meeting, in The Hague, on February 3-5 1958. In 1961 ICSU recognised that there was a 'permanent' requirement for a committee dealing with Antarctic science, and SCAR's name was changed to its present form.

In carrying out its activities as a committee of ICSU, SCAR is expected to follow the requirements of ICSU, which are listed in Annex 1.

SCAR's area of interest includes Antarctica, its offshore islands, and the surrounding Southern Ocean including the Antarctic Circumpolar Current, the northern boundary of which is the Subantarctic Front. Subantarctic islands that lie north of the Subantarctic Front and yet fall into SCAR's area of interest include: Ile Amsterdam, Ile St Paul, Macquarie Island and Gough Island.

SCAR's remit has evolved in part because of the development of the Antarctic Treaty System. When the Antarctic Treaty came into force in 1961, SCAR accepted the task of being the primary source of objective, independent scientific advice to the Antarctic Treaty Parties through the biennial Antarctic Treaty Consultative Meeting (ATCM), and was granted the status of Observer to the ATCM. Subsequently, some of the tasks formerly addressed by SCAR were taken up by organisations of the Antarctic Treaty System. For instance, in 1982, under the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR), the Antarctic Treaty Consultative Parties created a commission and a scientific committee to oversee the development of an ecosystem-wide approach to management of the waters south of the Antarctic Convergence. In 1991, the Protocol on Environmental Protection to the Antarctic Treaty was concluded to apply environmental protection principles to human activities in Antarctica. The Protocol required the formation of a Committee for Environmental Protection (CEP) to advise the ATCM on the implementation of the Protocol.

A different change in SCAR's remit took place in 1988, when the Council of Managers of National Antarctic Programs (COMNAP) was created to coordinate the operations of the national research programmes operating in Antarctica, a task formerly carried out by the SCAR Working Group on Logistics.

SCAR's Members (Annex 2) are representatives of national organisations adhering to ICSU, or nominated by national organisations adhering to ICSU. Members are represented at biennial SCAR meetings by one voting Delegate and an Alternate Delegate. SCAR's membership has changed from 12 countries initially to 32 including 4 Associate Members (nations with an interest in becoming full members). ICSU Unions may also be Members; the number of Unions that are SCAR Members has increased from 4 initially, to 7 (Annex 2). .

Despite the changes over the years, there is still an essential requirement for the international coordination of science in the Antarctic region and the provision of objective state-of-the-art scientific advice from an independent organisation. Bearing that in mind, SCAR will focus its mission on being the leading independent organisation for facilitating and coordinating scientific research in Antarctica, and the primary source of scientific advice on international environmental policy in the region. To ensure that SCAR maintains a high quality science programme and provides the best possible scientific advice, the SCAR Delegates and their Alternates should be scientists directly involved in Antarctic science.

1.2 SCAR's Role

SCAR continues to play a unique and crucial role in contributing to the scientific understanding of the south polar region of the planet. Under SCAR's leadership, and within the framework of SCAR Scientific Research Programmes, SCAR Members and their national scientific communities increase scientific knowledge about Antarctica and understanding of the processes taking place there on and under the land surface, in the atmosphere and the ocean, in the ice and in outer space. Studies by SCAR scientists increasingly show how Antarctic processes contribute to the working of the Earth System, and vice versa, and of how the south polar environment is influenced by human activities originating both within and outside the region. They also indicate what needs to be done to safeguard the environment. In addition, through the provision of relevant information, assessments and advice to the ATCM, SCAR helps policy makers meet international commitments in the Antarctic.

SCAR continues its leading role in international efforts to monitor and protect the environment, by providing critical information on the role of Antarctica in global warming, climate change and sea-level rise, and on the effects of climate change on living organisms.

Several SCAR activities have led to substantial advances in knowledge of the functioning of the Planet. For instance, SCAR's Programme on Biological Investigations of Marine Antarctic Systems and Stocks (BIOMASS) brought a breakthrough in understanding the operation

of the Southern Ocean ecosystem that was essential for the creation of the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR). It was SCAR's interest in conservation that led in 1964 to the adoption by the Antarctic Treaty of the Agreed Measures for the Conservation of Fauna and Flora. SCAR provides the essential forum in which discussions take place regarding the role of Antarctica in the global climate system, and the effect of global climate change on Antarctica. SCAR is coordinating a programme on ice sheet mass balance and sea-level (ISMASS), which is essential for the study of changes in global sea-level. Sea Ice Programmes, such as the Ecology of the Antarctic Sea Ice Zone (EASIZ), have clarified the role of sea ice in the productivity of the Southern Ocean.

In addition SCAR has helped to ensure the operation of a mechanism for the collection and exchange of scientific data and information that is a prerequisite for the development of an integrated and comprehensive understanding by all SCAR Members of how the different elements of the Earth System operate in the Antarctic environment. Among other things, SCAR has promoted integrated efforts to produce comprehensive maps of the continent. Topographic maps of Antarctica are created from Members' mapping data in the SCAR Antarctic Data Base, and are in wide use by COMNAP, tourist operators and the science community. The names of Antarctic features are available on line in a Gazetteer. Geodetic information across the continent is co-ordinated by SCAR and made available to all Treaty nations. Offshore seismic profiles are collected to form a central resource. The list is not exhaustive.

1.3 SCAR's Performance

SCAR aims for excellence and relevance in all of its activities. In recognition of SCAR's contribution to international cooperation in Antarctica, it was awarded Spain's Prince of Asturias Prize for International Cooperation, 2002. The award was used to sponsor 5 young scientists to undertake a research project in a SCAR country other than their own, as a contribution towards capacity building. SCAR is the first scientific institution to be awarded this significant prize.

With the object of seeing how SCAR could become more efficient and effective for the 21st Century, a "Review of SCAR Organisation and Strategy" was conducted between April 1999 and April 2000. In response to the recommendations of the 2000 Review, SCAR put in place a new structure in July 2002.

To revitalise itself in line with the recommendations of the Review, SCAR focused during 2000-04 on

i. engaging the delegates, officers and staff more actively in scientific leadership and management of SCAR, including its operating groups;
ii. modernising internal and external communications strategies and procedures; and
iii creating a more flexible and responsive operating structure.

In line with the recommendations of the Review (listed in Annex 3), the Strategic Plan continues the emphasis on making SCAR more proactive; improving the planning and decision making functions in the biennial SCAR cycle; modernising SCAR's secretariat; implementing change rapidly to maintain and enhance SCAR's position as the authoritative leader for scientific research in Antarctica; and engaging national Antarctic committees and other adhering bodies to renew their commitments to SCAR. The Plan also adopts the Review's recommendations to broaden SCAR's mission, as explained in Section 2, below.

In reviewing the performance of all of its environmental bodies, ICSU's 2003 *"Report on Environment and its Relation to Sustainable Development"* concluded that "*The importance of SCAR has increased over the years with greater understanding of the pivotal role of the Antarctic in the Earth system and its numerous connections with other physical and biological elements including space weather and Sun-Earth interactions. Antarctic science therefore has global relevance, whether in tracking the history of the atmosphere through ice-core analysis over the last half-million years, in determining levels of pollution (e.g. heavy metals, organic compounds) and their impacts, and ultimately in exploring life forms in subglacial Lake Vostok.*" The Report went on to note that SCAR was in the process of a reform, and recommended that "*These reforms should lead to better cooperation with other groups and institutions, particularly those within the ICSU family.*"

In order to ensure that SCAR continues to operate to high standards, SCAR's performance will be reviewed by an independent outside group at intervals of 8 years, with the next review being in 2008.

2. The Strategic Plan

2.1 What the Plan is for

Given the recommendations of the SCAR Review, the emergence of other Antarctic organisations, the growth in SCAR membership, and the new requirements of ICSU, it is clear that SCAR will benefit from developing a strategic planning process. This will enable it to take a long-term view of its evolving role in relation to changing developments, including consideration of its potential role in the proposed International Polar Year 2007-09.

The Strategic Plan is intended to:

- set broad objectives and strategies for the organization;
- provide guidance for formulating the biennial work programme and budget;
- provide a broad outlook of SCAR's priorities;
- set out the present thinking on SCAR Programme activities and deliverables;
- consider the possible impacts on SCAR activities of foreseeable scientific, technological, social and economic developments;
- optimize the programme structure and use of available resources;
- provide Members with the longer-term framework

within which to plan and manage at the national level those activities that contribute to SCAR's international cooperative programmes;
- provide SCAR committees and advisory groups with policy guidance and approved longer-term plans within which to organize their inter-sessional activities;
- give the Executive Committee a benchmark against which to monitor progress and performance in the implementation of the scientific programmes;
- describe SCAR's operations and make them more transparent
- provide guidance for the Secretariat.

The Plan is the product of extensive consultation with Members and with SCAR's constituent bodies and key partners It will help to foster a strong sense of commitment to the actions necessary for implementation.

The Plan is intended to help SCAR to exploit its comparative advantages to make strategic choices about future directions. SCAR's comparative advantages come from its particular geographical focus, its multi-disciplinary character, its ability to work in partnership with other bodies of ICSU, non-governmental organisations (NGOs) and intergovernmental bodies, and its ability to act as an independent source of advice and to provide comprehensive analyses and solutions of scientific and environmental relevance to the Antarctic Treaty Consultative Meeting. Further comparative advantage will come about through fostering interactions at the interfaces between the scientific disciplines to make activities interdisciplinary rather than simply multidisciplinary. The Plan also provides guidance to assist Members in the formulation of their own plans in relevant scientific fields.

The Plan covers a six-year period (2004-10), representing three of SCAR's biennial cycles.

Progress against the Plan will be examined at each biennial meeting of the Delegates, and the Plan will be revised as appropriate following the performance review in 2008.

Relevant sections of the Strategic Plan will be converted into a Implementation Plans with time lines. The work programme and budget approved by the Delegates at XXVIII SCAR forms a short-term Implementation Plan for the initial period of the Plan (2002-2004).

The SCAR Implementation Plan should include the recommendations by the Delegates at each of their biennial meetings for specific actions on selected topics (see the Recommendations in SCAR meeting reports on the SCAR web site).

2.2 The Vision Mission and Main Objectives of SCAR

By setting out the overall vision, or raison d'etre, for SCAR, along with a definition of the mission and main objectives, the Plan addresses what SCAR is, does, and should do, and the reasons why SCAR does it.

The vision of SCAR is:

"To establish through scientific research and international cooperation a broad understanding of the nature of Antarctica, the role of Antarctica in the Earth System, and the effects of global change on Antarctica."

SCAR's specific mission is:

"To be the leading independent organisation for facilitating and coordinating Antarctic research, and for identifying issues emerging from greater scientific understanding of the region that should be brought to the attention of policy makers".

To achieve its mission, SCAR aims to achieve the following five Main Objectives:

1. 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;
2. 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.
3. to facilitate free and unrestricted access to Antarctic scientific data and information;
4. to develop scientific capacity in all SCAR Members, especially with respect to younger scientists, and to promote the incorporation of Antarctic science in education at all levels;
5. to communicate scientific information about the Antarctic region to the public.

Underpinning these major objectives, and contributing to their success are two Cross Cutting Objectives:

6. to improve the effectiveness, efficiency and flexibility of the structure, working mechanisms and practices of SCAR.
7. to increase funding to match requirements, and to maintain a healthy funding stream.

To meet these objectives SCAR will adopt the strategic approaches set out in sections 3 through 9 of the Plan.

3.0 The Scientific Challenge

To meet SCAR's mission to be the leading independent organisation for facilitating and coordinating Antarctic research, SCAR's primary 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. To meet these goals SCAR will take the following strategic approach:

(i) generate and coordinate innovative high quality international science programmes addressing key issues of global importance;

(ii) provide a forum for excellence in Antarctic science, and for debate on the big issues to which Antarctic science can contribute (climate change, ozone hole etc);

(iii) promote the establishment of regional and international scientific networks;

(iv) encourage multi-disciplinary cooperation in relevant fields;

(v) maintain a high level of collaboration within ICSU and with other international organisations, enhancing and where appropriate developing joint programmes to address specific topics, so as to increase the involvement of the wider scientific community in SCAR's work.

3.1 Key Scientific Issues

Despite a century of scientific investigation of Antarctica and its surrounding ocean, our knowledge of Antarctic processes and their role in the Earth System is still in its infancy, due in large part to the remoteness of the region and the hostile conditions that prevail there, which make observation difficult. Increasing knowledge of what is there and understanding of why it is so are necessary first steps in being able to develop and apply advanced numerical models of the kind that will enable us to predict with increasing accuracy how the region will change in the future in response to global change, and what the effect of change in Antarctica may be on the rest of the world. SCAR's strategy for scientific research to raise our understanding of Antarctic processes to a new level is based on the following analysis of key scientific issues.

A pressing scientific and societal requirement is the full understanding of the Earth's climate system that is needed to underpin accurate forecasts of climate change. This depends in part on understanding Antarctica's role in the global climate system, which in turn requires comprehensive observation and analysis of the roles of the Antarctic atmosphere, ocean and cryosphere (comprising snow, ice and permafrost) in that system both now and in the past. Antarctica's crucial role is highlighted by the observation that the many rises and falls of sea-level that have characterised the past few millions of years have been controlled largely by the melting or growth of the Antarctic ice sheet, which locks up 80% of the world's fresh water. Currently all aspects of the climate system in Antarctic are grossly under-sampled. Yet it is clear that the global warming that is affecting most of the surface of the Earth is affecting at least parts of Antarctica, as can be seen from the break up of ice shelves in West Antarctica in recent years. Despite the importance of observations of climate parameters from the region, it is clear from the reports of the Global Climate Observing System (GCOS) to the parties to the UN Framework Convention on Climate Change that many more measurements of the atmosphere, ocean and cryosphere are required from the region to provide the basis for accurate forecasts of both regional and global climate change, and indeed for assessments of the state of the climate system such as that which will be provided in 2010 by the Intergovernmental Panel on Climate Change (IPCC) (see http://www.wmo.ch/web/gcos/gcoshome.html).

The Southern Ocean plays a key role in the global climate system, being the medium through which critical exchanges of heat, salt, carbon, oxygen and nutrients take place between Antarctica and the rest of the world. Along its northern margin, the Antarctic Circumpolar Current (ACC) – the world's largest ocean current, with a transport of around 130 million cubic meters per second (four times as much as the Gulf Stream) - acts as a thermal barrier between Antarctica and the tropics and keeps Antarctica cold. Forcing by westerly winds brings to the surface deep water that originated in northern seas, which stimulates high productivity. Water sinking in the ACC carries nutrients north in Antarctic Intermediate Water to influence the biological productivity of the global ocean. At the coast, cold surface waters sink to form the Antarctic Bottom Water that oxygenates the deep global ocean. Knowledge of these processes is now seen as critical to an understanding of global climate.

The Southern Ocean marine ecosystem is a complex product of the interaction of many key aspects of evolutionary history. Knowing how this ecosystem evolved will help to understand evolutionary pathways in many other parts of the world, especially the possible connection between the Antarctic deep-sea benthos and the benthic species in the other deep oceans. The understanding of the Earth's biodiversity will be incomplete without comprehensive studies of the ways in which plants and animals have adapted to living in the cold environments of the south polar region, where the extreme conditions provide extra selection pressure leading to unique features of biochemistry and biology in endemic species.

Monitoring sea-ice is important not just because it plays a role in the climate system. Annual changes in sea-ice do much to control the extent of biological activity around Antarctica. The crevices and channels in sea ice house a multitude of small organisms, which contribute substantially to Southern Ocean productivity and interact with the pelagic and benthic subsystems.

Deep beneath the ice sheet, water has accumulated over millennia to form more than 100 subglacial lakes, one - Lake Vostok – being the size of Lake Ontario. These lakes may be part of an immense interconnected, hydrological system that has previously gone unrecognized. Although the full extent and the interconnectedness of this major system are not yet fully known, the potential drainage systems identified are as extensive as large continental river basins. These environments are virtually unexplored and unknown. They formed in response to a complex interplay of tectonics, topography, climate and ice sheet flow over millions of years and contain a previously unaccounted reservoir of organic carbon. Sealed from free exchange with the atmosphere for possibly 10 to 35 million years, these lakes may be analogues for the icy domains of Mars and Europa that hold the greatest promise for the presence of life beyond Earth.

Evidence from studies of the overlying ice sheet indicates that unique life supporting ecosystems are likely locked within subglacial lake environments. Such life must have adapted to unique combinations of temperatures, pressures, gases, and carbon and energy sources. These settings may harbor specially adapted organisms and ecosystems. Lake sediments may contain unique records

of ice sheet variability over the last few hundred thousand years, which could critically advance our understanding of ice sheet stability.

Much still remains to be learned about the geological history of Antarctica. There is a need to focus geological attention on particular areas that are still largely unknown, like the subglacial highlands of the Gamburtsev Mountains hidden beneath the East Antarctic Ice Sheet. There is no continent on Earth other than Antarctica that has a huge central mountain range for which an explanation in terms of plate tectonics does not exist. How did these features come to be there, and how did they influence the growth of the ice sheet?

Studies like these are essential to understand the history of motion of the Earth's lithospheric plates, and the tectonic processes taking place in and around Antarctica, which are integral to our understanding of whole Earth evolution. In much the same way, geophysical observatories on Antarctica, such as those engaged in earthquake location, are integral parts of a global network of stations recording Earth properities. That network must be as complete as possible to provide maximum benefit.

Studies of the Antarctic atmosphere are essential for the forecasting of weather conditions, and to understand the chemical processes taking place high in the stratosphere above Antarctica that result in the ozone hole, creating conditions potentially harmful to life in those same areas, and depleting stratospheric ozone levels globally.

Antarctica is one of the best places to study "geospace" the region where the Earth's atmosphere interacts with the solar wind, a supersonic stream of charged particles emitted from the sun's corona. Electrons and ions in the solar wind collide with atoms and molecules in the upper atmosphere, causing them to emit photons, forming the aurora australis and heating the upper atmosphere. The interaction of the solar wind with the Earth's magnetic field also creates a wide range of other effects including geomagnetic storms, disruptions in short-wave radio communications, and power surges in long electricity transmission lines. Important gaps remain in our understanding of the interaction of the solar wind with the Earth's protective outer layers – the magnetosphere and the ionosphere - especially under extreme solar wind conditions associated with geomagnetic storms and with mass ejections from the sun's corona. Full understanding of the physics of "geospace" requires coordinated observations in both the Arctic and the Antarctic.

Antarctica is also one of the best places in the world from which to study the cosmos, because the skies above the Antarctic plateau are the coldest, driest and most stable on the Earth. This permits observations of extraordinary sensitivity to be made across the electromagnetic spectrum from the near ultra-violet to the millimetre wavebands. The combination of great sensitivity and clarity of vision makes Antarctic observatories strong candidates for exploring one of the most challenging and exciting frontiers in science, the detection of Earth-like planets in the Galaxy. In addition, conditions are favourable for the construction of telescopes capable of detecting the neutrino emission from individual astrophysical objects. Antarctica is a prime location for the observation of cosmic rays, because proximity to the magnetic pole allows rays of lower energy to penetrate to the ground more readily than at mid-latitude locations.

3.2 The SCAR Scientific Programmes

Based on the above analysis, SCAR has decided to focus its efforts on a limited number of major Scientific Research Programmes (SRPs) addressing significant topical issues.

To facilitate development of these programmes, and to manage its portfolio of science more effectively, SCAR created in 2002 a new science management structure (Annex 4). Centred on three Standing Scientific Groups (SSGs) on Geosciences, Life Sciences, and Physical Sciences, this structure is intended to ensure appropriate cross-disciplinary awareness and linkages inside and outside the organization. SCAR looks to the SSGs to identify the major scientific challenges of the time.

A Scientific Programme Planning Group will develop a plan for each SRP. Guidelines for Programme development are given in the SCAR Rules of Procedure for Subsidiary Bodies on the SCAR web site (http://www.scar.org). The SRPs are intended, to the extent possible, to be interdisciplinary; to interact with other SCAR research activities; and to have a lifetime of 5-10 years. They should make significant advances in our understanding of how the Antarctic region works, and its role in the global system. SCAR provides SRPs with seed-corn funds to facilitate meetings and workshops needed to develop the Programmes.

Plans for the first set of five programmes were approved by the SCAR National Delegates at their meeting in October 2004. Others will be developed as time goes by. The five approved Scientific Research Programmes (downloadable from the SCAR web page) are:

- Subglacial Lake Exploration (SALE)
- Antarctica and the Global Climate System (AGCS)
- Antarctic Climate Evolution (ACE)
- Evolution and Biodiversity in the Antarctic (EBA)
- Inter-hemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR)

For each of these Programmes a brief outline is given in Annex 5 of the purpose, scope and overall objectives. In each case, the scientific objectives will be addressed through a series of projects that together form a comprehensive research programme. Each research project will be defined by its own scientific objectives and requirements for logistics and technology. The timing of individual projects will ultimately be determined by the resources and technologies available and the priorities of the individual national Antarctic programmes through which funding is made available. The projects may not

necessarily be sequential and several may be pursued in parallel. However, some later objectives may be dependent on the information, results, and technological advances provided by earlier phases of research.

Although activities in the Antarctic region are nationally funded, the SCAR Scientific Research Programmes are synergistic, and designed to achieve outputs impossible for any one nation on its own. Indeed, the full value of much of this work will be realised only when the various national data sets are combined with those from elsewhere in the world to link the Antarctic firmly into the global system. SCAR's role is to assist in adding this value.

3.3 Action Groups and Expert Groups

It is also part of SCAR's strategy to support a variety of other scientific activities in which value is added to national efforts through international cooperation. These activities, many of which may have a single discipline focus, are managed through sub-groups of the Standing Scientific Groups, including:

i. Action Groups, which address specific matters and will normally complete their activity in 2-4 years; and
ii. Expert Groups, which will address matters on a longer time-scale.

Annex 6 illustrates the range of activities carried out by these sub-groups.

The activities cover a wide range of interests. Limitations on the size of SCAR's core budget means that not all of these can be funded from core funds at the same time. But they are all good cases for investment through the additional externally generated funding that is needed to support a fully comprehensive programme of internationally coordinated scientific research. The extent to which they are funded in fact will therefore depend on the goodwill of specific agencies with high levels of interest in seeing internationally coordinated programmes succeed. The highest priority investments, for core funding, will be listed by the SSGs in the work programme and budget that goes to the biennial Delegates meeting for approval.

From time to time SCAR SSGs will be required to consider new issues, or to maintain a watching brief on particular topics, like bioprospecting and acoustic impacts.

In addition to SCAR's normal scientific activities, the Delegates meeting in 2004 approved the creation of an Action Group on the History of Antarctic Science.

3.4 The International Polar Year (IPY) 2007-2009

The period 1 March 2007 to 1 March 2009 has been proposed as an International Polar Year (IPY) to mark the 50th anniversary of the International Geophysical Year (1957-58). SCAR and its scientific community contributed substantially to the development of the IPY Science Plan (http://www.ipy.org/), the key recommendations of which help to set the scene for SCAR science during the period covered by the SCAR Strategic Plan.

SCAR's Standing Scientific Groups are aligning their activities with the recommendations of the IPY Science Plan to focus on the following six main themes of the IPY:

- To determine the present environmental status of the polar regions by quantifying their spatial and temporal variability;
- To quantify, and understand, past and present environmental and human change in the polar regions in order to improve predictions;
- To advance our understanding of polar - global teleconnections on all scales, and of the processes controlling these interactions;
- To investigate the unknowns at the frontiers of science in the polar regions;
- To use the unique vantage point of the polar regions to develop and enhance observatories studying the Earth's inner core, the Earth's magnetic field, geospace, the Sun and beyond.
- To investigate the cultural, historical, and social processes that shape the resilience and sustainability of circumpolar human societies, and to identify their unique contributions to global cultural diversity and citizenship.

The SSGs and the SRPs will consider how their activities contribute to the observational initiatives that serve the scientific themes, and which include

i. a synoptic set of multidisciplinary observations to establish the status of the polar environment in 2007-08;
ii. the acquisition of key data sets necessary to understand factors controlling change in the polar environment;
iii. the establishment of a legacy of multidisciplinary observational networks (which will contribute to the collection of long term data sets called for in section 3.3, above) ;
iv. the launch of internationally coordinated, multidisciplinary expeditions into new scientific frontiers; and
v. the implementation of polar observatories to study important facets of Planet Earth and beyond. Ideally the SRPs will treat the IPY as a Special Observing Period, during which some particular aspect of each SRP will be the focus of attention.

The IPY calls in particular for the establishment of observing systems and observatories that will facilitate the monitoring of long-term environmental processes that exhibit cyclical behaviour on time-scales of a decade or more, and which will therefore be needed long after the IPY has gone. The SCAR SSGs and SRPs have a crucial role to play in the development of the long-term data sets needed by the research community to study such long period phenomena. Establishment of such observing systems during the IPY will leave them behind as an important legacy, and should be seen as an important goal by SCAR's

SRPs. These systems will enable SCAR to contribute more effectively in future to meeting the needs not only of the research community but also of the operational forecasting community that is already observing weather, as part of the World Weather Watch (WWW); the oceans, as part of the Global Ocean Observing System (GOOS); and climate, as part of the Global Climate Observing System (GCOS). Their studies confirm that the Antarctic region is distinctly undersampled, and that many more synoptic observations are needed there to improve operational services worldwide. The potential exists to deploy dual-use observing systems that will serve the needs of both the research and operational communities, and in addition to create a network of remote observatories that will perform multiple operations serving different disciplines in a cost-effective way.

To enable SCAR to contribute effectively to the IPY, a SCAR Advisory Committee on the IPY has been created to work in consultation with COMNAP to advise the SCAR Executive Committee and Delegates on the IPY Science and Implementation Plans, and on the potential roles of SCAR in the IPY structure and process, and to monitor the process as it unfolds, advising SCAR on how its contribution to the IPY should develop.

SCAR should work with the IPY community on a major international synthesis event (or events) to wrap up the main results of the IPY, and to point the way forward. The SCAR Open Science Conferences for 2008 and 2010 could be suitable vehicles. Collaborative events should be organized with other agencies active in the Antarctic region, to illustrate the benefits of cooperation.

SCAR should play a primary role in the implementation of the proposed IPY, supporting and, where appropriate, leading the implementation of the Antarctic component of the IPY Science Plan. SCAR should choose an appropriate manner in which to celebrate its 50th anniversary in 2008 during the IPY, including an event during SCAR-XXX.

3.5 Partnerships

The key to solving the complex environmental problems of today is through partnerships with organisations having complementary skills, technologies and interests. The most important partnership for SCAR is the linkage between science and logistics, which comes about through the close relationship that exists between SCAR and COMNAP. SCAR coordinates its activities with COMNAP through:

i. annual meetings of the SCAR and COMNAP Executives;
ii. joint meetings of the full memberships of both organisations in even numbered years; and
iii. and liaison in the margins of the ATCM meetings.

In the course of carrying out SCAR's activities, its programme teams and specialist groups are encouraged to form partnerships with other organisations relevant to the achievement of particular objectives. In some cases, SCAR may decide that the relationship with certain partners warrants formal co-sponsorship of an activity; co-sponsorship implies a sharing of responsibility for programme management, and some commitment of resources.

As a constituent body of ICSU, SCAR is called upon to develop strong links with other ICSU environmental bodies. The extent and pattern of these links is substantial. Nevertheless, SCAR's SSGs should maintain, strengthen and diversify their links with other ICSU bodies.

SCAR plans to carry out in concert with the Scientific Committee on Oceanic Research (SCOR) the work of its new Expert Group on Oceanography. The international Antarctic Zone programme (iAnZone) is formally affiliated with both SCOR and the SCAR Oceanography Group.

To strengthen its involvement in climate studies, SCAR has signed a Memorandum of Understanding with the World Climate Research Programme (WCRP), to co-sponsor several WCRP activities, including:

i. the Climate and Cryosphere Programme (CliC);
ii. the Southern Ocean Implementation Panel shared by CliC and the WCRP's Climate Variability Programme (CLIVAR); and
iii. the International Programme on Antarctic Buoys (IPAB).

Together, SCAR and WCRP (CliC) are cosponsors of a bi-polar Cryosphere Theme developed as a contribution to the Partnership for an Integrated Global Observing Strategy (IGOS), with the goal of tackling the scientific challenges that must be met to understand and forecast the behaviour of the cryosphere. Specific objectives are: to expand the measurements needed to validate satellite data; to ensure comprehensive observations of sea-ice; and to significantly enhance ice-sheet and ice-cap monitoring.

SCAR cosponsors with the International Geosphere-Biosphere Programme (IGBP) the Expert Group on "International Trans-Antarctic Scientific Expedition" (ITASE), which aims to collect and interpret a continental-wide array of environmental parameters assembled through the coordinated efforts of scientists from several nations, as the basis for monitoring biogeochemical cycles and local-to-global scale climate change, so as to assess Antarctica's role in and response to environmental and climate change.

Research on the behaviour of the Southern Ocean ecosystem takes place through the Southern Ocean group of IGBP's Global Ocean Ecosystems Dynamics project (GLOBEC). SCAR is now a co-sponsor of Southern Ocean GLOBEC.

SCAR is co-sponsoring with the Sloan Foundation the Circum-Antarctic (Southern Ocean) element of the global Census of Marine Life (CoML) programme, to provide a multi-national systematic recording of the distribution and abundance of biodiversity in the waters surrounding Antarctica. This will make a direct contribution to SCAR's EBA programme.

SCAR should participate in programmes addressing carbon fluxes, through co-sponsorship of the relevant activities of the IGBP's Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) programme, and the International Global Carbon Project.

SCAR recognises that the Antarctic and Arctic science communities have many interests in common, especially in studies related to the cryosphere and to the connections of both regions with the climate system. SCAR will develop closer links with the International Arctic Science Committee (IASC) in the future, to improve bi-polar scientific research linkages.

SCAR should support its solar-terrestrial research programme in partnership with IASC and others, to create a framework for improved coordination of research, long-term scientific monitoring, and operational programmes throughout the next solar cycle. Strong links should be maintained with ICSU's Scientific Committee on Solar-Terrestrial Physics (SCOSTEP), and especially with the overarching program CAWSES (Climate and Weather of the Sun), to facilitate the achievement of excellence by SCAR's solar-terrestrial physics program.

The IOC's International Ocean Data and Information Exchange Programme (IODE) has developed the concept of an Ocean Data and Information Network (ODIN), which could be expanded to the Antarctic region. ODINs pull together into a coordinated regional system the National Ocean Data Centres (NODCs) of individual countries. As a contribution to the IPY, the IOC is considering the possible development of a Southern Ocean ODIN. SCAR should work with the IOC in taking this initiative forward.

4. Advice to the Antarctic Treaty Consultative Meeting

Part of SCAR's mission is to identify issues emerging from greater scientific understanding of the region that should be brought to the attention of policy makers, and one of SCAR's main objectives is 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 goals, SCAR will take the following strategic approach:

i. provide scientific advice to governments;
ii. promote productive linkages between scientists and decision-makers; and
iii. ensure that science contributes to relevant international legal instruments.

In taking these approaches, SCAR responds to requests from the Treaty for information, and initiates new activities relevant to environmental management of the continent and its surrounding seas and oceans. This close linkage to an international Treaty is unique among ICSU bodies.

Much of the advice relates to the management and conservation of Antarctic terrestrial, freshwater and marine ecosystems, and comes primarily from the activities of the Life Sciences SSG – especially those focused on biodiversity, habitat and ecosystem research. The Expert Groups on Birds and on Seals provide important data on population trends and habitat usage needed for conservation policy. These two Groups provide essential information to the Scientific Committee of CCAMLR and, if the Convention on the Conservation of Antarctic Seals were to meet, the SCAR Expert Group on Seals would be the primary focus for organising scientific input to it. Using the existing Antarctic Treaty System (ATS) mechanisms SCAR is able to propose Antarctic Specially Protected Areas and Specially Protected Species to the Committee on Environmental Protection (CEP), although, to date, SCAR has not exercised this potential. During the 1980s, SCAR and IUCN held three joint meetings on conservation in the Antarctic and Subantarctic islands. Based on these and other meetings, and on advice from the SCAR Sub-Committee on Conservation, IUCN published "A strategy for Antarctic Conservation" in 1991. Recognising that this is now out of date, an Action Group on Best Practices in Conservation has been established to develop a new version of this for the 21st century.

Although SCAR only appoints an Observer to the Scientific Committee of CCAMLR, many SCAR scientists are directly involved in providing data to this Committee through their national delegations. SCAR National Committees are active in the promotion, scientific review and development of protected and managed areas in Antarctica. That work needs to be highlighted, and the activities that relate to this work need to be specifically reported on, in SCAR National reports.

An example of SCAR's proactive approach is given by SCAR's leadership in addressing the problems associated with studying Lake Vostok, the largest lake under the Antarctic ice sheet. If properly sampled in a way that prevents contamination, Lake Vostok may provide a unique way to see historical changes in global processes, discover new organisms, and result in other insights that only a pristine, isolated environment might provide. SCAR will be proactive in bringing this kind of issue to the attention of the ATCM. New strategic issues for consideration in the future may include bioprospecting (see SCAR Recommendation XXVIII-12), and the introduction into the Antarctic of alien species, mostly in ballast water (see SCAR Recommendation XXVIII-11).

SCAR already has made a significant contribution to the orderly development of a spatial information system, in producing a composite names gazetteer to minimise the impact of duplicate, confusing and positionally incorrect names, and in recommending that Members check with this register before creating new names for already named features. In principle SCAR considers it desirable to aim for one name per feature, for both new and historical names (See SCAR Recommendation XXVIII-1). GPS technology now enables us to provide exact positions for all named features, The problem of multiple naming of features is

an issue that SCAR will bring to the attention of ATCM and COMNAP.

The SCAR President takes the primary responsibility on the Executive Committee for ATCM matters. To deal with SCAR's interactions with the ATS in detail, SCAR Delegates appoint a three-person committee – the Antarctic Treaty System (ATS) Standing Committee. The Chair of this Committee attends the ATCM, presents SCAR inputs as Working or Information Papers, and responds to requests from Parties and the CEP for scientific information and guidance. Papers submitted may be joint with other organisations such as COMNAP or the International Union for the Conservation of Nature (IUCN). Papers are prepared in consultation with the Standing Scientific Groups, and circulated to the Executive Committee before being submitted by the Secretariat. They may be based entirely on a synthesis of existing literature, or a special workshop may be called to help synthesize what is known.

In the inter-sessional periods, the ATS Committee monitors the work of relevant Inter-sessional Contact Groups and provides science input to their deliberations where appropriate. The Committee is funded to organise small workshop meetings if needed to progress especially difficult tasks. The Chair of the ATS Committee provides a report to the Executive and Delegates and briefs the SSGs on developments. It is recognised that the resources available for the provision of advice to the ATCM are finite and limited.

As part of its proactive approach, since 2003, SCAR has provided a plenary lecture on a relevant science topic to each ATCM as a means of informing the treaty parties about the exciting scientific topics of the day in the Antarctic contect. The lectures are intended to combine the interests of SCAR and COMNAP, to be prepared in consultation with the appropriate SSGs to ensure that the position of the SCAR community is reflected, and to be placed on the SCAR web site. If possible SCAR should arrange for the SCAR lecture to be given annually as part of the SCAR presentation to the Plenary session of the ATCM.

5. Data and Information Management

The third of SCAR's five main objectives is to facilitate free and unrestricted access to Antarctic scientific data and information. To meet this objective SCAR will take the following strategic approach:

i. encourage that maximum use is made of all available data;
ii. encourage the development and operation of appropriate mechanisms to facilitate the collection, storage, retrieval and dissemination of data and information for the common good; and
iii. encourage the community to ensure that these mechanisms are effective.

To ensure that the scientific (user) community gets what it needs in the way of data and information will require the development of a SCAR data and information strategy, an exercise that will be undertaken jointly with COMNAP, using the SCAR-COMNAP Joint Committee on Antarctic Data Management (JCADM) and the Steering Committee for Antarctic Data Management (STADM) and other existing structures as appropriate. Development of that strategy will have to bear in mind the following observations.

5.1 Data And Information Management

Meeting the increasingly complex, multidisciplinary and multinational challenges of today's Antarctic science, especially in the global context, requires access to an extensive base of scientific data and information. With the rapidly increasing volumes of data being provided by satellite and in situ systems, one of the most useful services SCAR can provide to the scientific community is a comprehensive and integrated high level data and information management system to facilitate high quality, interdisciplinary, pan-Antarctic science. Effective data and information management makes sound economic sense, adding value to data that were extremely costly to collect, by making them available to the wider community for multiple investigations. With the advent of advanced numerical modelling of weather, climate and ice systems, and the need to predict the behaviour of those systems on short time scales, it has become essential to obtain and share many kinds of data more or less in real-time from multiple sources.

SCAR has always encouraged the free and unrestricted exchange of scientific data (at no more than the cost of supplying it), which is consistent with Article III-c of the Treaty, with the data policies of ICSU and of intergovernmental organisations like the Intergovernmental Oceanographic Commission (IOC) and the World Meteorological Organisation (WMO), and indeed with the policies of many individual Treaty Parties. In these days of electronic storage of information, and electronic communications, data need not be physically exchanged, but rather made available through provision of access to databases - provided that information is available about where the databases are and what they hold (the metadata).

As SCAR holds no data of its own, its policy is to encourage good practice in data management, such as the use of common formats for data exchange and metadata, and the implementation of open standards-based interfaces to facilitate access to databases. For example, in order to assist the promulgation of international standards SCAR has Class 'A' liaison status with the International Standards Organisation Technical Committee 211 on Geographical Information (ISO TC211).

There is no single centralised Antarctic database. Instead, SCAR and COMNAP members have a wide range of data and database systems, information about which can be obtained by anyone from a one-stop-shop, the Antarctic Master Directory (AMD), a web based metadata catalogue populated with contributions from National Antarctic

Data Centres.

The SCAR-COMNAP Joint Committee on Antarctic Data Management (JCADM) advises SCAR and COMNAP on all aspects of Antarctic data matters. JCADM's activities are overseen by the Steering Committee for Antarctic Data Management (STADM). JCADM comprises the managers of each National Antarctic Data Centre (NADC), or relevant national contacts if a NADC has not yet been established. It enlists NADCs and helps them document their national Antarctic datasets through the creation and use of index (metadata) records. The result is the Antarctic Master Directory (AMD), which is part of the Global Change Master Directory (GCMD), and thus provides a link to global datasets. Data within some NADCs is made available through new Internet Web service initiatives, such as the Global Biodiversity Information Facility.

Together the AMD and the NADCs comprise the Antarctic Data Directory System (ADDS), development of which is coordinated by JCADM. The ADDS is intended to provide an index for access to all Antarctic data, no matter where or how they are stored. The beneficiaries of the System are SCAR and COMNAP members, the broader research community, and the public.

Aside from storage in NADCs, some, but not all, Antarctic data are stored in ICSU's World Data Centres (WDCs). Other data may be stored in National Ocean Data Centres (NODCs) coordinated by the IOC's International Ocean Data and Information Exchange Programme (IODE), or in the National Meteorological Data Centres coordinated by the World Meteorological Organisation (WMO). SCAR needs a mechanism to ensure that connections can be made easily to and between these different databases.

The ATCM itself has acknowledged

i. that it is difficult to get investigators to provide data to NADCs;
ii. that some Treaty Parties have not nominated NADCs; and
iii. that data are not being managed by all so that free access is enabled.

For that reason, ATCM Resolution 4 (1998) recommended that:

- Parties who have not yet done so should establish National Antarctic Data Centres and link them to the ADDS;
- Parties and their NADCs encourage their scientists, through a process of education, support and the development of policies and procedures, to provide in a timely manner appropriate information to their NADCs for distribution through the ADDS; and
- Parties give priority consideration as to how the requirement for freedom of access to scientific information, in accordance with Article III (1)(c) of the Treaty, is achieved within their national data management systems.

SCAR will urge Members to fully implementation and support the Antarctic Data Directory System, which is essential to maximize the value of the data being collected in Antarctica, and to report on progress at biennial SCAR meetings.

Recognising that geographic location is vital to integrating and communicating Antarctic science data and information, SCAR should include in its data and information management strategy consideration of the role of Geospatial Information. To improve its use of geospatial information, SCAR aims to encourage the establishment of an Antarctic Spatial Data Infrastructure (ANTSDI) including fundamental geographic information products and related policies, specifications and enabling technologies. The ANTSDI is the main goal of the SCAR Expert Group on Geographical Information, which is another key element in the management and use of Antarctic data and information. Full implementation of and support for the Antarctic Spatial Data Infrastructure will be essential to ensure the spatial integrity of data collected and to be able to make use of the power of geographic location in data discovery and retrieval, data mining, and data analysis.

Generic advice on data and information management that SCAR should consider in developing its data and information management strategy is available from several sources, including a recent report by ICSU's Priority Area Assessment on Scientific Data and Information, which is available from the ICSU web site (http://www.icsu.org/). Data quality will be one of the key issues to be addressed in developing the SCAR strategy on data and information management.

As part of the development of its data and information management strategy SCAR should commission, with COMNAP, an external review of JCADM by data and information management experts. Particular attention should be paid, among other things, to the ways in which JCADM makes its capabilities and products known to the community, the extent to which its products ands services meet the needs of that community, and its interactions with the Expert Group on Geographical/Geospatial Information. SCAR should also require the Expert Group on Geographical Information (EGGI) to liaise closely with the potential users of its products, and particularly with COMNAP, to ensure that maximum us is made of its products and that those products are adapted to fully meet user requirements.

To ensure that data and information management are considered at the highest level, a Vice President will carry responsibility for the data and information management portfolio.

SCAR plays an important role in providing access to key databases, most of which are listed in Annex 7.

SCAR Delegates have made several recommendations about the need for particular improvements in the collection and exchange of certain kinds of data or information, especially:

- meteorological data (XXV1-4; XXVII-12; XXVII-13; XXVII-15; XXVIII-16 and 19),

- buoy data (XXVI-5; XXVII-11; XXVIII-14),
- bathymetric data (XXVI-3; XXVII-2; XVVIII-2),
- geodetic and geographical data (XXVI-11; XXVII-3 and 5; XXVIII-3 and 5),
- airborne gravity data (XXVI-12; XXVII-4); XXVIII-4,
- ice core data (XXVI-13; XXVII-14),
- magnetometer data (XXVI-14; XXVII-16),
- geospace observatories (XXVI-15; XXVII-17; XXVIII-15)
- upper atmosphere (XXVIII-17 and 18)
- metadata records (XXVI-8; XXVII-19),

Yet more efforts are needed to see that the required improvements come about.

As a new initiative, he Life Sciences SSG is creating a Marine Biodiversity Information Network (MarBIN) to compile, disseminate, and integrate information on Antarctic marine biodiversity for scientific, monitoring, management and conservation purposes.

6. Capacity Building and Education

To meet the objective of developing scientific capacity in all SCAR Members, especially with respect to younger scientists, and promoting the incorporation of Antarctic science in education at all levels, SCAR will take the following strategic approach:

i. work towards building human and institutional capacity for Antarctic science by a variety of means;
ii. promote education of the public and of students so as to increase awareness of the value of Antarctic science; and
iii. promote the development of Antarctic science through appropriate means.

To meet these requirements, SCAR will begin by developing a capacity building and education strategy, in consultation with COMNAP.

6.1 Developing a Capacity Building and Education Programme

The Antarctic research programmes of SCAR Member nations vary greatly in their size and capacity. Some have scientific communities that are large, scientifically advanced and long standing. Others have relatively small and new Antarctic science communities that are still developing. To enable all in the SCAR family to participate in, contribute to and benefit from SCAR's activities, it is incumbent on SCAR to work with appropriate agencies to help to enhance the research capacity of all of its Members and Associate Members. This requirement has become more pressing with the significant increase in SCAR Membership in recent years.

Until now, efforts at capacity building and education have been ad hoc, and left largely to the inclinations of individual Member nations. To give a few examples, New Zealand has provided opportunities for Malaysian scientists to work at Scott Base, and runs a postgraduate certificate course and a Masters degree programme at Gateway Antarctica. The UK and Germany provided initial Antarctic opportunities for Dutch scientists. The US has run and financially supported several post-graduate training courses at McMurdo Station that are internationally advertised and strongly competed for.

SCAR itself used the opportunity of the Prince of Asturias award in 2002 to offer 5 Fellowships creating new opportunities for young scientists. SCAR considers it desirable to continue such a fellowship programme with funds attracted from external sources. This is consistent with an aspect of capacity building and education that is particularly important to all SCAR Members - the need to create the cadre of Antarctic scientists for the future. It is vital to engage the young, and to interest young scientists, everywhere, in Antarctic research.

As a first step towards developing a capacity building and education strategy, SCAR XXVIII agreed to create a SCAR Capacity Building and Education Group. The Group should involve the Executive Director and report to the Delegates Committee on Outreach and Administration. A Vice President will carry the responsibility for the Capacity Building portfolio within the Executive Committee. SCAR should obtain advice on capacity building and education from other practitioners in the field, notably from ICSU and its scientific committees.

On the education front, to interest young people in Antarctica and its science it is desirable to contribute information about Antarctica and its science to educators in as many countries as possible. This should be the responsibility of National Antarctic Programmes in their own countries. Ideally, those national programmes should be made available to SCAR, so that SCAR can make them available to other countries through its web site. In due course, SCAR may wish to consider investing in an international educational package that draws on examples from different Members.

6.2 National Activities

Capacity building and education by individual Member countries should be encouraged through National Antarctic Committees, while recognising that the necessary funding may come from national agencies involved in Antarctic research. The committees (and agencies) can work to develop and strengthen the effectiveness of their national Antarctic region research programmes by:

- determining needs and specifying what is required to satisfy those needs;
- identifying and working to improve existing national capabilities, including human skills and available technology;
- identifying gaps in those capabilities, including inadequacies in present research and observing and data management systems, and working to correct them;
- paying special attention to exploiting the opportunities offered by the increasing number

and variety of observations of the Antarctic region from space satellites;
- developing and applying strategies for data acquisition, storage, dissemination, and archive, and exchange;
- promoting the development of Antarctic science through appropriate communication and education programmes.

6.3 Regional Activities

SCAR will continue to encourages Members clustered in particular regions to get together from time to time to consider common problems and possible joint solutions, and to assess examples of best practice. This already happens in Europe through the activities of the European Polar Board. Regional cooperation can be of particular use in capacity building and education. It can help to increase the effectiveness of scarce resources and the efficiency of the research, data management and logistical network. Allocation of local resources to manage regional linkages, for example through a secretariat, may be found to be desirable.

7. Communication

A key SCAR objective is to communicate scientific information about the Antarctic region to the public. This will be achieved through the following strategic approach:

i. improve knowledge of the benefits of Antarctic science in terms of outcomes which affect the wider community in Member countries;
ii. promote better coordination between government, the media, academia and others in relation to Antarctic scientific issues; and
iii. improve communication with funding institutions to encourage funding for key applications of science.

To meet these requirements, SCAR will begin by developing a communication strategy, in consultation with COMNAP.

7.1 A SCAR Communications Plan

Communication in the information age is vital for the success of any organization. As identified by the SCAR Review, SCAR needs to develop effective communications with the public so as to explain its mission and its relevance. Effective communications will help:

- to raise the visibility of SCAR and its activities;
- to promote concepts that inspire its agenda;
- to implement programmes;
- to develop cooperation with partners;
- to mobilise resources;
- to link Secretariat staff more effectively with SCAR's Executive, scientific activities, and partners;
- to link SCAR more effectively with other Antarctic organisations; and
- to build the capacity of new Members to participate in and benefit from SCAR activities.

The Communications Plan should be developed by the Secretariat, in consultation with Delegates, Officers and the Executive. A Vice President will be made responsible for Communication, to work with the Secretariat to keep communications under review, and to advise on ways in which communications can be improved.

The Plan will be designed to ensure that communication is focused on helping SCAR to achieve its mission and its 5 main objectives. The long-term goals of the Communications Plan should be to:

- Establish SCAR as the premier agency where policy makers, scientists and journalists look for information with respect to scientific issues in the Antarctic region;
- Increase awareness of SCAR activities within the SCAR community (Members, and the Antarctic science community), and the wider global scientific community including ICSU and its constituent organisations;
- Increase the awareness, support and cooperation of governments and the general public to the issues that inspire SCAR's programmes and priorities;
- Establish SCAR programmes as preferred targets for the international donor community, to increase funding for SCAR's science;
- Achieve a culture of communication throughout the organisation.

The Communications Plan will identify a range of potential target audiences, the desired outcomes from each of audience, and the most appropriate mechanisms for communication with each audience. Consideration will be given to developing a variety of methods of communication. One key goal will be to provide information tailored for public consumption, on the SCR web site, about Antarctica and its surrounding oceans, about the key scientific issues in the region - and their importance, and about SCAR.

In developing the plan, SCAR should consult with other ICSU, and non-ICSU, organisations that are developing plans for Public Outreach. A concerted effort in areas where overlap of interests is present may be mutually beneficial (e.g. the outreach efforts of SCOSTEP (CAWSES), and the EC COST724 action (space weather), may be complementary to the SCAR Communication Plan).

Some of the activities that might form part of a Communications Plan are already in place, for instance:

i. the SCAR web site was significantly improved in July 2004, since when it has been receiving 30,000 hits per month;
ii. the first of a series of biennial Open Science Conferences that will take place in association with the biennial SCAR SSG meetings, and will advertise Antarctic science to the wider community, was held in July 2004 in Bremen;, Germany. It was attended by over 1000 people.

iii. the SSGs are organising a series of conferences on major topics (for example the SCAR International Biology Symposium, in Curitiba, Brazil, in 2005).
iv. the Geosciences SSG has a specific Action Group devoted to Communication and Outreach (other SSGs should follow suit);
v. SCAR provides the annual SCAR/COMNAP Lecture to the ATCM. Copies of past SCAR lectures to ATCM can be downloaded from the SCAR web site;
vi. A SCAR poster can be downloaded from the SCAR web site;
vii. A SCAR power point presentation can be downloaded from the SCAR web site.

To improve communications internally, Chief Officers of SSGs are invited to attend Executive Committee meetings, as ex officio members. SCAR is making effective use of e-mail as a primary means of communication, and will utilise a system of List Servers to facilitate the passing of information to the different elements of the SCAR community.

SCAR urges National Committees to raise awareness of the importance of Antarctic science by organizing Conferences or Symposia on Antarctic science, and drawing attention to the relevance of that science to major issues of public concern.

Recognising that English is the language of communication in SCAR, SCAR papers should be presented in Plain English, using simple direct language. At Delegates meetings key working documents should be projected from a computer onto a screen at the time the document is being discussed. To facilitate understanding documents should be made available well in advance.

Given the limitation on resources available to the SCAR Secretariat, where Members feel that translations would be desirable it would be helpful if individual Members would offer to translate documents on behalf of others where they share a common language (e.g. such as Spanish).

SSG Action Groups and Expert Groups and Scientific Research Programmes Groups are encouraged to publish the results of their activities, with scientific results preferably in the peer-reviewed literature. Where results are published in technical reports, digests should be published in the peer-reviewed literature. Publications should acknowledge the contribution of SCAR and where appropriate include the SCAR logo. Publications should be listed in the biennial reports of the SSGs.

8. SCAR Organization and Management

One key cross-cutting objective is to improve the effectiveness, efficiency and flexibility of the structure, working mechanisms and practices of SCAR.

In order to ensure that SCAR can discharge its responsibilities in a timely fashion it requires efficient and effective organisation. SCAR's organisation was a focus for the 2000 Review, which made a number of recommendations on organisation (Annex 3) that have been largely carried out.

8.1 SCAR Structure

In 2002, SCAR was reorganised into the structure shown in Annex 4, so as to give SCAR the ability to respond more quickly and flexibly to new scientific opportunities and problems. The new system provides SCAR with a number of mechanisms that can be matched to the urgency and importance of each activity, ranging from quick turn-around studies to sustained long-term research and data management programmes. This will enable SCAR to respond with appropriate speed to external stimuli.

How SCAR works is covered in depth in the revised Constitution and Rules of Procedure, which are available on the SCAR web site.

In brief, SCAR is governed by the National Delegates, who meet biennially to determine SCAR policy and strategy. The Delegates elect from amongst themselves a President and four Vice-Presidents, who, together with the Immediate Past President, constitute the Executive Committee, which is responsible for conducting the day-to-day administration of SCAR with the aid of the SCAR Secretariat.

Management of SCAR's scientific business is the responsibility of the Delegates' Committee on Scientific Affairs, which is responsible for oversight and approval of the activities of the three Standing Scientific Groups (Geosciences, Life Sciences, and Physical Sciences). The SSGs in turn are responsible for the development and management of the Scientific Research Programmes and associated activities carried out by Action Groups and Expert Groups, as described in section 3, above. SRPSs will be developed by Scientific Programme Planning Groups, then, once the programmes have been approved by Delegates, they will be implemented by Scientific Programme Groups. Terms of Reference and membership of the SSGs and related groups are given in Annexes to the Rules of Procedure. This part of the new structure is intended to enable SCAR to be more effective in addressing interdisciplinary science and in integrating its activities with other international and global programmes.

Other aspects of SCAR's affairs are the responsibility of the Delegates' Committee on Outreach and Administration, which is responsible for oversight and approval of the activities of the Standing Committee on the Antarctic Treaty System (described in section 4, above), the Standing Committee on Finance, and the SCAR-COMNAP Joint Committee on Antarctic Data Management (JCADM) (described in section 5 above).

The allocation of specific responsibilities to members of the Executive Committee will serve to increase its effectiveness in managing inter-sessional business. For that reason, the Chairs of the two Delegates' Committees will be Vice Presidents of the Executive Committee. As noted

in sections 6 and 7, above, one Vice President shall carry the responsibility for advising the Executive Committee on the development and implementation of plans for Capacity Building and Education, and another will carry the responsibility for Communication. Where feasible, the responsibilities of Vice Presidents will rotate between them during their tenure on the Executive Committee.

8.2 SCAR Secretariat

In order to support SCAR's more proactive stance and expanded communications system, the SCAR Secretariat has been transformed into an executive office. This required the creation of the post of Executive Director within the SCAR Secretariat, so as to provide active and authoritative leadership of SCAR's internal operations, to assist in planning and carrying out SCAR's mission, and to provide the staff resources to make SCAR more effective. The Executive Director will: form a new vision for SCAR and Antarctic science; guide the development and implementation of the SCAR programme of activities; raise additional funding for SCAR's scientific activities; improve SCAR's communications internally and with the outside world; represent SCAR at international meetings; and manage the SCAR Secretariat efficiently and effectively.

The new SCAR Secretariat will consist of the Executive Director, Executive Officer, and Administrative Assistant.

Historically, the SCAR Secretariat has always been housed at the Scott Polar Research Institute (SPRI) in Cambridge, UK. The Institute has expanded the facilities available to SCAR to accommodate the new post of Executive Director, and an agreement has been signed with SPRI to continue housing SCAR for 3 years (2004-07). The Secretariat has the advantage of being housed at no cost, being co-located within a distinguished polar academic institution, and having access to one of the finest polar libraries in the world, which is a distinct asset to the prosecution of the activities of the Secretariat. After 2007 the Secretariat could conceivably be housed elsewhere, provided there are substantial advantages attached to the relocation.

8.3 The Planning Cycle And Meeting Arrangements

SCAR's two-year Planning Cycle comprises:

- The SCAR Science Meeting (of the SSGs), combined with the SCAR Open Science Conference, an Executive Committee meeting, and a meeting between the SCAR and COMNAP Executives; mid-year in even numbered years;
- The Delegates meeting; late-year in even numbered years;
- An Executive Committee meeting in conjunction with meetings of COMNAP and SCALOP; mid-year in odd numbered years;
- Inter-sessional meetings of the SSGs and of the Executive Committee as appropriate.

Separation of the SCAR Science Meeting and the SCAR Delegates' Meeting by about 2-3 months in 2004 was arranged in response to the recommendations of the SCAR Review. This was to provide the SSGs with sufficient time, following the SCAR Science Meeting, to develop and circulate comprehensive plans and recommendations well before the Delegates' Meeting, to give Delegates time for considered review and the preparation of a meaningful work programme and budget. Because this arrangement places a burden on travel budgets, Delegates will keep under review the timing and location of the separate Science and Delegates' Meetings.

At the Delegates' Meeting the Delegates' Committee on Scientific Affairs will meet in parallel with the Delegates' Committee on Outreach and Administration, in the interests of keeping the Delegates' meeting short.

8.4 Results-based Management

A number of administrative changes are required to facilitate the assessment of performance of the organisation.

Each subsidiary group and the Secretariat, will produce a plan indicating the activities is expects to carry out, the results that it expects to achieve, and the time frame in which they should be reached. Progress will be monitored on an ongoing basis so that problems can be identified and corrective actions taken

Action lists indicating the actions required, the person or organisation responsible for carrying them out, and the time frame in which each action is to be discharged, will be produced and published for all meetings of the governing and subsidiary bodies. Progress against actions will be reviewed at subsequent meetings of the relevant bodies, and appropriate actions taken.

Each subsidiary group will be reviewed every five years (or sooner in the case of Action Groups of limited life) to assess its performance against stated targets. The Delegates' Committees should review the need for continuance, reorganisation or phasing out of each subsidiary body. In response to recommendations from the SCAR Review, SCAR should improve the way it manages documentation. Documents for plenary sessions, including financial projections and reports from Chief Officers, should be circulated to Delegates at least one month in advance of the Delegates meeting, to allow time for their consideration at the national level prior to the meeting. Documents should carry a date, name of originator, and response deadline, with a minimum of 'nil' response as a courtesy reply, in each instance copying the document to the SCAR Secretariat.

9. Resources

Another key cross cutting objectives is to increase funding to match requirements, and to maintain a healthy funding stream.

9.1 The financial position at the end of 2004

SCAR's ability to carry out international coordination effectively, and to be an independent source of advice for

Antarctic scientific research, depends in large degree on its overall financial capacity. SCAR's core funding comes from Membership contributions (Annex 2). At present these are assessed on the basis of 5 categories with the following scale for contributions in 2005:

Table 1. SCAR Contributions 2005

Category	Contribution	No.		Subtotals	
A	$18,000	2	=	$ 36,000	
B	$14,000	8	=	$112,000	
C	$11,000	6	=	$ 66,000	
D	$ 8,000	12	=	$ 96,000	
E	$ 5,000	4	=	$ 20,000	Associate Members
Total		32		$330,000	

The annual income raised by Members' contributions was $322,000 in 2003. SCAR's income has stayed at that level since 1995, when income rose by about 25% due to introduction of a new contribution category, and an increase in the number of Members.

From the start of 1995 SCAR has planned to spend 50% of its income on science coordination and 50% on administration of its activities. Most of the administration costs have been in salaries to maintain the Secretariat. The amount budgeted for science averaged $167,000 per year from 1995 to 2003.

During SCAR's history, underspends of various kinds from time to time contributed to the development of a cash reserve that reached $382,000 at the end of 2003.

9.2 The financial strategy

The financial strategy for the future entails the following key elements:

i. To raise the level of contributions;
ii. To maintain as far as possible an even balance between expenditure on science and administration;
iii. To maintain a cash reserve of around $100,000, so as to ensure that salaries can be paid at the beginning of each year;
iv. To obtain targeted funds from appropriate external funding sources to support selected activities within the SCAR programme, and, if possible, to double by that means the budget obtained from contributions;
v. To levy a small overhead charge on all external funds handled by SCAR, to reflect the cost of administering grants and to provide an additional source of financial flexibility;
vi. To encourage Members to provide additional voluntary contributions to provide extra flexibility and support for science;
vii. To attract new Members (e.g. from among the parties to the Antarctic Treaty);
viii. To save where possible on administrative costs.

The rise in contributions is called for to meet new requirements for SCAR funds that have originated in part from the SCAR's reorganisation and that are causing the cash reserve to be depleted. First of these requirements is the restructuring of the SCAR Secretariat described in section 8.2 (above) and intended to create a more proactive Secretariat to ensure continuity in SCAR operations in the two-year hiatus between SCAR Delegates' meetings. The increase in staff costs of hiring an Executive Director will be offset by a reduction in staff costs of around $30,000 per year when the present Executive Secretary retires in June 2005 and is replaced by the new Executive Officer. The overall annual increase in staff costs from the beginning of 2006 onwards will be $55,000. This cost is being met initially by drawing on the cash reserve. Table 2 shows that the depletion of the cash reserve cannot be sustained beyond 2006, when the reserve will be less than the $100,000 required annually.

Table 2: Depletion of the reserve

Year	2003	2004	2005	2006
science	161,000	179,000	152,000	152,000
admin	175,000	268,000	251,000	241,000
subsidy from reserve	0	142,000	90,000	90,000
reserve	382,000	240,000	150,000	50,000

Delegates at XXVIII SCAR agreed that SCAR's influence and impact would also benefit greatly from an injection of additional funds for science. As shown in Table 2, the budget available for SCAR's science currently continues at around $150,000 to $160,000 per year, roughly the same level it has been since 1995. Yet during the past decade there has been a significant decline in the value of the contributions, reflecting both inflation and the declining value of the dollar. It is particularly important that SCAR's activities are adequately funded at this time, since SCAR will be playing an important role in the International Polar Year (2007–09). Bearing these various points in mind, the Delegates at XXVIII SCAR agreed that $45,000 extra per year should be found to ensure that the new science programmes can work in a fully effective manner.

The net result is that an additional $100,000 per year is required over and above present contributions, in order to support both the new science programmes and the expanded Secretariat, while maintaining a roughly 50:50 balance in expenditure between science and administration.

Some pressure on the budget can be relieved through savings. Savings will be made initially

i. by ending publication of the SCAR Bulletin in the Polar Record (the Bulletin already appears on the SCAR web site), and
ii. by ceasing to support the costs of travel of members

of the Executive Committee to the biennial SCAR Science and Delegates' Meetings.

Delegates at XXVIII SCAR reached consensus that increasing the level of contribution by 30% in each category (apart from that of Associate Member) would be the most appropriate option (Table 3).

Table 3: Suggested new levels of contributions.

Category	Contribution 1995-2005	Contribution from Jan 2006	No.		Subtotals
A	$18,000	$23,500	2	=	$ 47,000
B	$14,000	$18,000	8	=	$144,000
C	$11,000	$14,500	6	=	$ 87,000
D	$ 8,000	$10,500	12	=	$126,000
E	$ 5,000	$ 5,000	4	=	$ 20,000
Total			32	=	$424,000

A one-time increase would mean that funding agencies would only have to consider the topic of raising the contribution once.

As the SCAR reserve will have been exhausted by 2007, it will be prudent to increase core funding by increasing contributions by the beginning of 2006.

Annex 1

ICSU's Requirements of its Environmental Committees including SCAR (as adopted by ICSU's Executive Board at its 88th meeting on 11-12 February 2004).

- Identify emerging issues, including potential problems and solutions, where scientific knowledge and research can make a difference;
- Catalyze and coordinate scientific research programmes in the domain of the environment that:
  i. Expand understanding of the interactions between biogeochemical and physical processes and their social causes and impacts, and
  ii. Underpin environmental protection and conservation, and addresses the need for economic and social development;
- Contribute to the development of monitoring activities that are essential for documenting the state of the global system and its components;
- Ensure that the relevant social sciences are fully integrated into the design and implementation of ICSU's programmes;
- Stimulate collaboration with stakeholders in developing research agendas and communicating results from research of relevance to the development of appropriate policies;
- Contribute to environmental assessments;
- Develop mechanisms to ensure that results from policy-relevant research benefit the governmental and private sectors as well as civil society;
- Catalyze new types of effective collaborations/partnerships within the ICSU family and with others;

and

- Promote the synthesis and communication of the policy-relevant work conducted by ICSU's Scientific Unions, National Members, Interdisciplinary Bodies and Joint Initiatives.

Annex 2

Membership of SCAR 2005

Full members (27)	*(Associate Membership)*	*Full Membership*	*Category*	*Contribution*
Argentina		3/2/ 1958	B	14,000
Australia		3/2/ 1958	B	14,000
Belgium		3/2/ 1958	D	8,000
Chile		3/2/ 1958	D	8,000
France		3/2/ 1958	E	14,000
Japan		3/2/ 1958	B	14,000
New Zealand		3/2/ 1958	C	11,000
Norway		3/2/ 1958	C	11,000
Russia*		3/2/ 1958	A	18,000
South Africa		3/2/ 1958	C	11,000
United Kingdom		3/2/ 1958	B	14,000
United States of America		3/2/ 1958	A	18,000
Germany **		22/5/ 1978	B	14,000
Poland		22/5/ 1978	D	8,000
India		1/10/ 1984	B	14,000
Brazil		1/10/ 1984	D	11,000
China		23/6/ 1986	C	11,000
Sweden	(24/3/1987)	12/9/ 1988	D	8,000
Italy	(19/5/1987)	12/9/ 1988	C	14,000
Uruguay	(29/7/1987)	12/9/ 1988	D	8,000
Spain	(15/1/1987)	23/7/ 1990	D	8,000
Netherlands	(20/5/1987)	23/7/ 1990	C	11,000
Korea, Republic of	(18/12/1987)	23/7/ 1990	D	8,000
Finland	(1/7/1988)	23/7/ 1990	D	8,000
Ecuador	(12/9/1988)	15/6/ 1992	D	8,000
Canada	(5/9/1994)	27/7/ 1998	D	8,000
Peru	(14/4/1987)	22/7/ 2002	D	8,000
Switzerland	(16/6/1987)	4/10/ 2004	D	8,000
Associate Members (4)				
Pakistan	15/6/1992		E	5,000
Ukraine	5/9/1994		E	5,000
Bulgaria	5/3/1995		E	5,000
Malaysia	4/10/2004		E	5,000

*(assumed representation of USSR) **(formerly DDR and BRD individually)

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

Annex 3

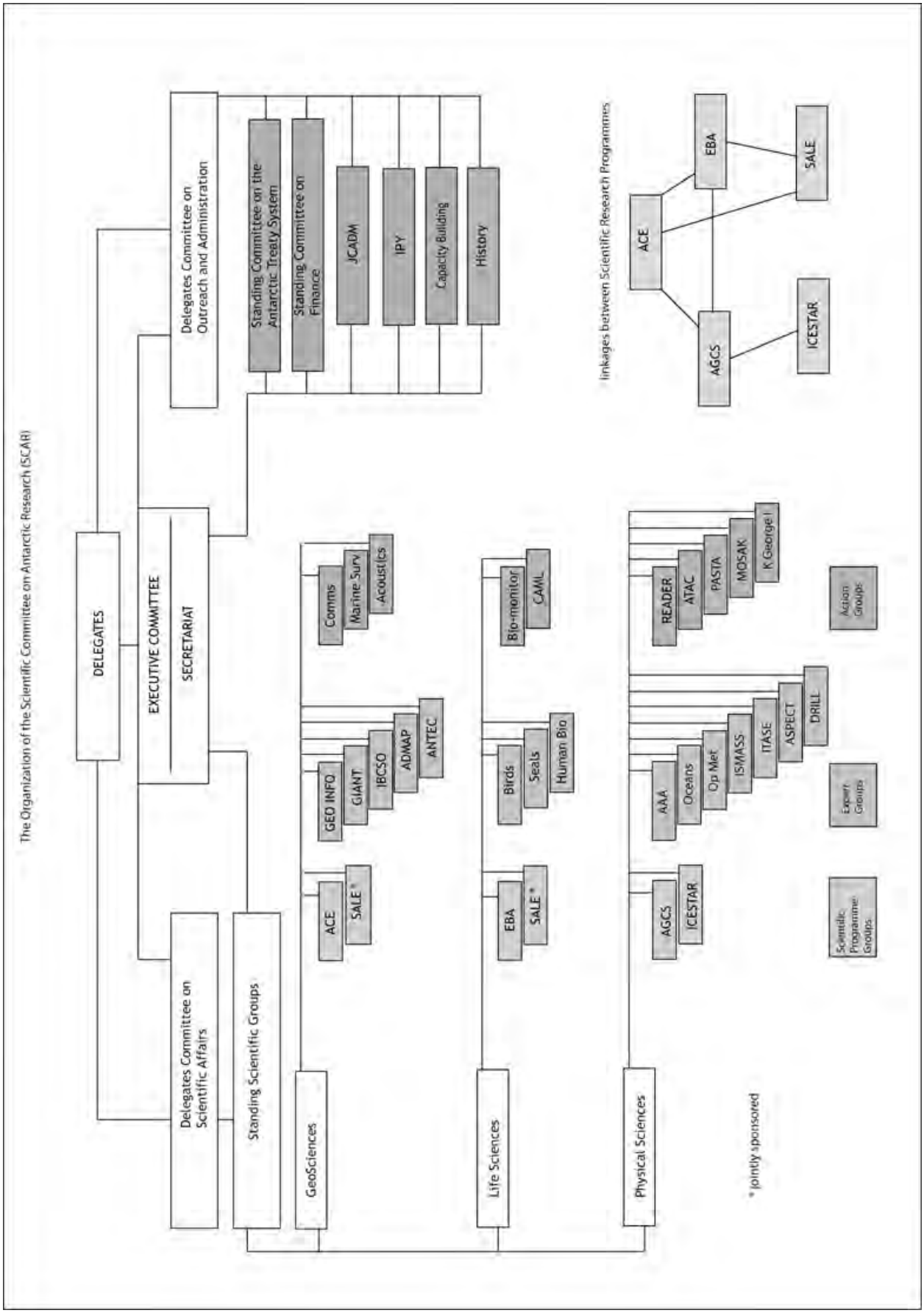
Recommendations of the SCAR Review 2000

[the extent to which these recommendations have been met is addressed in the "Review of Progress in Implementing the Recommendations of the SCAR Review" submitted under agenda item 6.2 at the 28th meeting of the SCAR Delegates, Bremerhaven, 3-8 October 2004]

1. SCAR'S mission remains valid and SCAR continues to play an important role in fostering and coordinating science in Antarctica and in advising the Antarctic Treaty System and other organizations concerned with the Antarctic and Southern Ocean, but SCAR must take a more active and assertive leadership position in all matters related to science in Antarctica.
2. SCAR should update its mission in four areas by:
   - Increasing emphasis on the scientific capacity of all national groups working in Antarctica and on outreach to younger scientists;
   - Taking a more proactive stance with the Antarctic Treaty System in providing the highest level independent advice on scientific aspects of issues affecting the governance and management of Antarctica and the Southern Ocean;
   - Taking a more proactive position in the analysis of the impact of global change on the Antarctic region and in the contribution of science in Antarctica to the overall understanding of global change; and,
   - Increasing the dissemination of knowledge about Antarctica and about SCAR and its activities to scientists, national leaders, and the public.
3. SCAR delegates—at the delegate level—must become more actively engaged in the management of SCAR at SCAR meetings and also intersessionally.
4. Four delegate-level committees should be established, each chaired by a SCAR vice president, with the following portfolios: Scientific Affairs, Outreach and Education, Scientific Liaison, and Internal Affairs
5. SCAR vice presidents should have titles corresponding to their portfolios, e.g., Vice President for Scientific Affairs.
6. The SCAR Executive Committee should be retained. In addition to processing business that comes before it presently, the Executive Committee should act intersessionally on advice or recommendations of the Delegate Committees or refer such recommendations to SCAR's next plenary session.
7. All SCAR officers are encouraged to seek a greater level of support at their home institutions through a greater level of in-kind and other administrative assistance but SCAR should also increase its budget for these purposes.
8. The past president of SCAR should serve ex-officio for one but no more than two years instead of serving a four-year term ex-officio.
9. While the scientific-level structure of working groups and groups of specialists has served SCAR effectively in the past, this structure should be replaced by a system of operating groups that can respond quickly and flexibly to emerging scientific opportunities in Antarctica and to changing demands on SCAR.
10. SCAR must adopt practices that create a timely circulation of documents and reports and must plan a meeting schedule that improves its ability to make informed decisions.
11. The Delegate Committee on Internal Affairs must give immediate attention and high priority to the increased efficiency and effectiveness of internal communications in SCAR.
12. SCAR must greatly improve its external communications with other scientific organizations, ATS, national committees or other adhering bodies and the public so that science in Antarctica and the Southern Ocean and the activities of SCAR are more widely known.
13. SCAR should appoint an ad hoc group of SCAR delegates who do not have English as a first language to make recommendations to SCAR to maximise the effective use of English as the SCAR language of record and communication.
14. The SCAR secretariat should be upgraded to an Executive Office headed by an Executive Director with duties comparable to Executive Directors of similar international scientific organizations.
15. SCAR must improve its infrastructure and capability to use information technology for internal and external communication.
16. A more proactive SCAR Executive Office will require larger facilities and upgraded support services.
17. SCAR should expand its financial resources by actively seeking philanthropic funds for some activities.
18. Recognizing that they must weigh many factors in the selection of SCAR delegates, national Antarctic committees and other bodies adhering to SCAR should appoint delegates with current scientific expertise in Antarctic research.
19. National Antarctic committees and other bodies adhering to SCAR should continue to give more attention to participation of younger scientists both in research in Antarctica and in SCAR's scientific operating groups.
20. In order to proceed expeditiously with the implementation of the changes recommended in this report, SCAR should consider waiving appropriate parts of its present Constitution and Rules of Procedure for two years, during which time the new structure will be put in place. After the structure and procedures evolve, the Constitution and Rules of Procedure should be amended as necessary.

Annex 4

The New Structure of SCAR



Annex 5

The SCAR Scientific Research Programmes

Subglacial Lake Exploration (SALE)

SALE serves as the international focal point of SCAR's activities to promote, facilitate, and champion cooperation and collaboration in the exploration and study of subglacial environments in Antarctica.

The overarching scientific objectives of SALE are:

1. to understand the formation and evolution of subglacial lake processes and environments;
2. to determine the origins, evolution and maintenance of life in subglacial lake environments; and
3. to understand the limnology and paleoclimate history recorded in subglacial lake sediments.

To explore the complex interplay of biological, geological, chemical, glaciological, and physical processes within subglacial lake environments an international, interdisciplinary plan for coordinated research and study is essential. The three objectives can only be accomplished by integrated and coordinated phases of discovery and hypotheses driven research over at least a ten-year period.

Major areas of research will be:

1. Functional Genomics and Phylogenetics (e.g. to determine the genetic diversity in the water columns and benthic sediments of subglacial lakes);
2. Limnology (e.g. to establish the geochemical and isotopic composition of selected lake water constituents to determine their role in biological processes, water column stability, and to establish the age of subglacial lake water);
3. Geophysics (e.g. to understand the tectonic and ice sheet setting of subglacial lakes through geological analysis of geophysical data);
4. Glaciology (e.g. to understand the interrelation between ice sheet processes and lake water circulation);
5. Geology and Cenozoic Paleoclimate (e.g to use paleoenvironmental data to determine lake and ice sheet histories, and evaluate temporal changes in Cenozoic paleoclimate relative to those histories determined from Antarctic marginal sequences and global Cenozoic proxy records).

The technological challenges and environmental stewardship issues of under ice drilling cannot be underestimated, so SALE will also advise the international community not only on scientific issues but also on technology issues relevant to subglacial lake exploration, including environmental concerns and safeguards.

Antarctica and the Global Climate System (AGCS)

AGCS will investigate the nature of the atmospheric and oceanic linkages between the climate of the Antarctic and the rest of the Earth system. The linkages between the different elements of the Antarctic climate system are highly non-linear and it is necessary to understand the behaviour of and interactions between the atmospheric, oceanic and cryospheric elements of the system if past change is to be explained and we are to have confidence in future predictions. A study of this kind has only recently become feasible with the advent of sufficient high-resolution in-situ data and ice core records, and the development of numerical modeling tools to the point where they can represent realistically the closely coupled atmosphere-ocean processes that control long-term climate variability.

The work requires a combination of modern, instrumented records of atmospheric and oceanic conditions, and the climate signals held within ice cores, to understand fully past and future climate variability and change in the Antarctic as a result of natural and anthropogenic forcing. AGCS will focus on the last 6,000 years, since the mid-Holocene warm period, and will develop forecasts to 100 years in the future. Records that capture abrupt climate change over the past few glacial/interglacial cycles will also be studied, in association with the ACE programme (see below).

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 emphasize synthesis and integration of existing data sets and model outputs, although some new ice core and oceanographic data will be collected.

AGCS will contain four closely linked themes reflecting significant gaps in our knowledge:

1. Decadal time scale variability in the Antarctic climate system, to investigate ocean-atmosphere coupling and the role of the El Niño-Southern Oscillation in modulating the Antarctic climate;
2. Global and regional climate signals in shallow and deep ice cores, to establish better quantitative relationships between ice core data and measures of tropical, mid- and high latitude climate variability;
3. Natural and anthropogenic forcing on the Antarctic climate system, including the production of regional-scale estimates of expected climate change over Antarctica during the next 100 years, to be able to distinguish natural variability from anthropogenic activity and to understand how global climate change will be expressed in the Antarctic; and
4. The export of Antarctic climate signals, to examine how climate changes in the Antarctic can influence conditions at more northerly latitudes

The research will be carried out in an interdisciplinary

way through a close collaboration between meteorologists, climatologists, glaciologists, oceanographers and ice chemists, who will integrate observational and modelling activities.

A key deliverable will be the production of regional and Antarctic-wide climate predictions covering the next 100 years.

AGCS will incorporate several former Action and Expert Groups, including:

- The Action Group on "Reference Antarctic Data for Environmental Research" (READER)
- The Action Group on "Antarctic Tropospheric Aerosols and their Role in Climate" (ATAC)
- The Expert Group on the "International Trans-Antarctic Scientific Expedition" (ITASE)
- The Expert Group on "Antarctic Sea-Ice Processes and Climate" (ASPeCT)

Antarctic Climate Evolution (ACE)

ACE will use paleoclimate and ice sheet modelling investigations, integrated with terrestrial and marine geological and geophysical evidence, to study the climate and glacial history of Antarctica. Over the past 34 million years changes in climate have led to considerable spatial and temporal fluctuations in ice volume that have driven significant changes in global sea-level. Determining the scale and rapidity of the response of ice masses and associated sea ice to climate forcing is essential to understand the processes of climate change in the region, and to underpin estimates of the likely magnitudes and directions of future change.

ACE will promote the exchange of data and ideas between research groups focusing on the evolution of Antarctica's climate system and ice sheet. It will encourage scientific exchange between modellers and data gatherers, facilitating the development of relevant projects and the testing of hypotheses. The main function of the programme is to acquire and compile "ground truth" geoscience data and to use these to develop a suite of paleoclimate models for significant periods of climate change throughout Cenozoic times up to and including the Holocene. Data access and data sharing will be encouraged to facilitate the data syntheses needed for enhancing paleoclimate models. Numerical modelling is an essential component, and will address:

1. ice sheet modelling;
2. coupled ice-sheet, climate and ocean modelling; and
3. coupled ice sheet and sediment modelling to address the interaction between ice sheets, water and deformable sediment at the interface between ice and bedrock.

The broad outcomes will be:

1. a quantitative assessment of the climate and glacial history of Antarctica;
2. identification of the processes that govern Antarctic climate change and those that feed back around the globe;
3. improvements in the ability to model past climate changes in Antarctica; and
4. documented case studies of past changes against which models of future change can be tested.

ACE will promote new drilling programmes to expand the necessary database. These will include the activities of the International Program for Ocean Drilling (IPOD) in deep water, the shallow drilling (SHALDRIL) programme on land, and the ANDRILL programme on the ice shelves. Among other things the programme will examine the terrestrial record of landscape evolution; the influence of tectonics on the behaviour of the ice sheet; and the influence of paleo-seaways, such as the opening of the Drake Passage, on climate.

ACE and AGCS have complementary interests in Quaternary studies of Antarctica, so a joint Action Group manned by both programmes will be established to run a Quaternary sub-programme.

Evolution and Biodiversity in the Antarctic (EBA): the response of life to change.

A major challenge facing humankind is the management of the Earth System to ensure a sustainable human future. Managing the environment requires understanding the functioning of all parts of the Earth System in the context of both natural and anthropogenic change. That understanding must encompass Antarctica and the Southern Ocean and their biota, including knowledge of the way in which life has evolved in those environments, and the ways in which it is likely to change, which in turn demands an integrated, interdisciplinary investigation of the structure and functioning of living systems in the region.

EBA will provide a platform for the kinds of interactions amongst disciplines and researchers that are essential to understand the evolution of biodiversity in the region and the responses and contributions of that biodiversity to the Earth System. By doing so, it will fill a major void in understanding of the role of biodiversity in the Earth System.

The overall aims of EBA are to understand the evolution and diversity of life in the Antarctic, to determine how these have influenced the properties and dynamics of present Antarctic and Southern Ocean ecosystems, and to make predictions on how organisms and communities will respond to current and future environmental change. EBA will integrate work on marine, terrestrial and limnetic ecosystems in a manner never before attempted, covering an entire biome. By comparing the outcomes of parallel evolutionary processes over a range of Antarctic environments, fundamental insights can be obtained into evolution, and the ways in which life responds to change, from the molecular to the whole organism level and ultimately to biome level. EBA will be complementary to many ongoing national programmes that cannot attempt an ambitious study individually.

Antarctic ecosystems offer unique examples of how both structure and function have evolved, and the likely

responses of species and ecosystems to change induced by a wide variety of natural and anthropogenic processes, as well as the ways in which their responses feed back to influence these processes.

EBA will use a range of modern techniques and a multidisciplinary approach to explore the evolutionary history of the modern Antarctic biota, examine how modern biological diversity in Antarctica influences how present-day ecosystems function, and attempt to predict how the biota may respond to future environmental change. It will integrate the major realms of Antarctic biology into a cohesive picture for the first time, and contribute to evolutionary theory and understanding of global ecology and biological diversity. More specifically, EBA will examine:

1. The evolutionary history of the Antarctic biota.
2. Evolutionary adaptations to the Antarctic environment.
3. Patterns of gene flow within, into and out from the Antarctic, and their consequences for population dynamics.
4. Patterns and diversity of organisms, ecosystems and habitats in Antarctica, together with the ecological and evolutionary processes that control these.
5. The impact of past, current and predicted environmental change on biodiversity and the consequences for Antarctic marine, freshwater and terrestrial ecosystem function.

The programme will integrate research across a wide variety of fields, from functional genomics and molecular systematics to ecosystem science and modelling, and will draw on and contribute information to a wide rage of related fields, such as climate modelling and tectonics.

Interhemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR).

ICESTAR will address some key questions about the interaction of the solar wind with the Earth's outer atmosphere, so as to quantify the key mechanisms of indirect coupling between the Sun and the Earth at high latitudes; to determine how solar variability is amplified through those couplings; and to determine the temporal evolution of atmospheric change caused by solar coupling. Much remains to be learned about how the solar forcing can affect the atmosphere, especially at high latitudes where the solar wind-driven processes are most influential. ICESTAR will also investigate possible influences of the changing Sun (i.e., its irradiance and magnetic moment) and the geospace environment on polar climate and weather. ICESTAR addresses the fact that important gaps remain in our understanding of the solar wind-magnetosphere-ionosphere interaction. We do not know enough about the changes and dynamics of the Earth's magnetosphere under extreme solar wind conditions, i.e., during strong geomagnetic storms and as a consequence of solar activity such as coronal mass ejections.

In order to obtain a deep understanding of the mechanisms responsible for energy transfer from the solar wind into the geospace environment, simultaneous consideration is needed of various geophysical phenomena occurring over both the northern and southern polar regions. ICESTAR will both enable and conduct focused scientific research on the upper atmosphere above the Antarctic and on how that region of space ties in with the global system. The programme will strive for international coordination of interhemispheric research in the areas of solar-terrestrial physics and polar aeronomy, promoting exchange of research ideas, and sharing experimental data from various arrays of geophysical instrumentation deployed over the polar regions and in near-Earth space.

ICESTAR aims

i. to identify and quantify various mechanisms that control interhemispheric regional differences and commonalities in the electrodynamics and plasmadynamics of the Earth's magnetosphere-ionosphere coupling system, and in the aeronomy of the upper atmosphere over the Arctic and Antarctic; and
ii. to create a data portal that will link together a large number of geophysical databases including both data serving applications and visualization tools, so as to enable a systems view of the polar upper atmosphere. Creation of the ICESTAR data portal to facilitate the sharing and interpretation of global geospace datasets will encourage the collaboration of researchers by sharing data and the interpretation of the results.

ICESTAR will incorporate several former Action Groups and Expert Groups of SCAR, including:

- The Action Group on "Middle Atmosphere Dynamics and Relativistic Electron Precipitation" (MADREP)
- The Action Group on "Antarctic Peninsula Tropospheric-Ionospheric Coupling" (APTIC)
- The Expert Group on: "Solar-Terrestrial Processes and Space Weather" (STEPS)

Annex 6

SCAR's Action and Expert Groups

Geosciences SSG

- Action Group on "Communication and Outreach" (COG): to provide information on Antarctic geoscientific research to the scientific and community and the wider public.
- Action Group on "Acoustics in the Marine Environment": to consider the effects on marine mammals of noise created by marine scientific activities (such as echo-sounding and airgun surveys).
- Action Group (Cross-SSG) on "Antarctic Treaty and Committee for Environmental Protection (CEP)": to communicate with SCAR representative at the CEP and ATCM to bring matters of concern to the CEP and Treaty to the Geoscience SSG for advice and to identify areas of concern in geosciences and geospatial information, raise them in Antarctic Treaty System (ATS) fora, and provide scientific advice.
- Action Group on "Marine Survey Coordination": to develop mechanisms for improved communication about planned marine surveys within the Antarctic community.
- Expert Group on "Geographical Information" (EGGI): to create an Antarctic Spatial Data Infrastructure (ANTSDI) by: providing Antarctic fundamental geographic information products and policies in support of all SCAR science programs and operations management and the global user; integrating and coordinating Antarctic mapping and GIS programs; 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.
- Expert Group on "Permafrost and Periglacial Environments" (EGPPE): to provide coordination, communication and exchange of data amongst Antarctic permafrost researchers within SCAR and 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.
- Expert Group on "Geodetic Infrastructure of Antarctica" (GIANT): to provide a common geodetic reference system for all Antarctic scientists and operators; to contribute to global geodesy for the study of the physical processes of the earth and the maintenance of the precise terrestrial reference frame; to provide information for monitoring the horizontal and vertical motion of the Antarctic.
- Expert Group on "Antarctic Neotectonics" (ANTEC): 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.
- Expert Group on "Antarctic Digital Magnetic Anomaly Project "(ADMAP): to produce a coordinated effort for: compiling the existing magnetic data acquired by various institutions; coordinating protocols for data distribution; serving as a reference for future survey planning; archiving and maintaining the magnetic anomaly data base of Antarctica.
- Expert Group on "International Bathymetric Chart of the Southern Ocean" (IBCSO): to act as the steering group for production of a revised chart of the bathymetry of the Southern Ocean, in conjunction with the IHO and GEBCO.

Life Sciences SSG

- Action Group on "Global International Waters Assessment" (GIWA): to provide the information required for a Global Waters Assessment for Area 66: Antarctica.
- Action Group on "Best Practices for Conservation": to review and establish current best practises for conservation in an Antarctic context.
- Action Group on Biological Monitoring: to organize a workshop on this topic, in order to produce a (set of) protocol(s) for biological monitoring activities for environmental management purposes.
- Action Group for the "Census of Marine Life" (CoML): to act as a scientific steering committee for the Southern Ocean component of the global CoML programme.
- Expert Group on: "Birds": to provide long-term data on avian populations in the region; to encourage,

coordinate and support research on seabirds; to contribute to their conservation; and to provide scientific advice to SCAR.

- Expert Group on "Seals": to provide information on the status of seal stocks as required by the Convention for the Conservation of Antarctic Seals (CCAS); to encourage research and information exchange on this group of animals; and to provide advice to SCAR.
- Expert Group on "Human Biology and Medicine": to provide a forum for medical, physiopathological, behavioural, clinical, and biological scientists; to promote high quality research in polar human biology in association with appropriate international scientific organizations; to encourage cooperation in the continued evolution of high quality healthcare and the prevention of injury and disease in the Antarctic; and to promote the full use of the unique environment of the Antarctic to allow understanding of major health problems in extreme environments in particular, and in mankind in general.

Physical Sciences SSG

- Action Group on: "Plateau Astronomy Site Testing in Antarctica" (PASTA): to coordinate the efforts to properly characterize the conditions available at various sites on the Antarctic plateau, delivering and compiling the required site testing data.
- Action Group on "Modelling and Observational Studies of Antarctic Katabatic Winds" (MOSAK): to analyze, understand and model katabatic wind events, and to develop a new map of katabatic wind distribution and strength over the Antarctic ice sheet.
- Action Group (Cross-SSG) on Coordination of Scientific Activities on King George Island: to encourage different national groups on King George Island to share information about their research plans, so as to avoid unnecessary duplication of costly activities.
- Expert Group on "SCAR and Oceanography": to facilitate coordination between the physical oceanographic research groups currently active and those planning research in the Southern Ocean; 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 identify historical and reference data set of value to researchers, focusing initially on physical oceanography data; to encourage the exchange of information with operational agencies.
- Expert Group on "Antarctic and Astronomy and Astrophysics" (AAA): to coordinate efforts to explore the potential for astronomical observations in the Antarctic;
- Expert Group on "Operational Meteorology in the Antarctic": to liaise with WMO over observing standards, the use of new data/model fields and weather forecasting in the Antarctic; to maintains links with COMNAP/SCALOP; and to provide scientific advice to WMO on Antarctic meteorology.
- Expert Group on "Ice Sheet Mass Balance and Sea Level" (ISMASS): to understand the relationship between Ice Sheet Mass Balance and Sea Level, by determining the present accumulation rate over the entire ice sheet and measuring ice thickness and velocities at the grounding zone of the ice sheet and glaciers.
- Expert Group on Ice Drilling Technology: to facilitate communication among international ice drilling communities; to create an international forum for development of new ice drilling and borehole testing concepts and technologies and continued improvement of existing technologies; to provide a pool of expertise to address SCAR issues related to ice drilling and coring; and to enhance international cooperation and communication on large- and small-scale ice core recovery projects.

Annex 7

SCAR Databases

READER:

Under the Action Group on REference Antarctic Data for Environmental Research project (READER), digitization of the surface meteorological data has been essentially finished, with the monthly mean data online and the data set being updated periodically. The main emphasis now is on the digitization of the Russian upper air data The data and meta data can be accessed at: http://www.antarctica.ac.uk/met/READER/.

Antarctic Digital Topographic Database:

The Antarctic Digital Database (ADD) is the premier source of vector topographic data for Antarctica. Published on CD-ROM in 1993, and regularly updated, it is available on the Web at www.add.scar.org/add_main.html. This site also provides access to maps of Specially Protected Areas, Historic Sites and Monuments, and the Seal Reserves of the Convention on the Conservation of Antarctic Seals.

The Antarctic Biodiversity Database:

The Australian Antarctic Data Centre has established an Antarctic-wide database of biodiversity data (http://www.aad.gov.au/). The UK and New Zealand are major contributors, and Belgium is in the process of developing a significant contribution. The contents of this web-accessible database are also made available to the Global Biodiversity Information Facility (GBIF).

Composite Gazetteer of Antarctica:

The SCAR Expert Group on Geospatial Information recognised the increasing problem with duplicated place names, when attempting to map Antarctica. Italy agreed to coordinate the work on this Composite Gazeteer, and established a database (at www3.pnra.it/SCAR_GAZE), which now contains 35103 official names, corresponding to 17547 features. This is now the de facto international gazetteer for Antarctica. Many names described at present have significant errors in their positional information, something that needs attention to make the Gazetteer yet more useful to Antarctic science and tourist operatives.

Seismic Data Library System (SDLS):

The Geoscience Standing Scientific Group (GSSG) oversees the Seismic Data Library System (SDLS) that makes Compact Disc copies of seismic data over 4 years old available for joint projects and distributes them to regional libraries. The SDLS operators are working towards making data available via the Internet. The GSSG has established an Action Group to improve communications at the survey planning stage.

Master index for Antarctic positional control:

SCAR Geoscience Standing Science Group maintains this index, which can be accessed via (http://www.geoscience.scar.org/geodesy/giant.htm#controldb).

Geophysical and geodetic observatories:

Information on permanent observatories is listed in web-accessible form at (http://www.geoscience.scar.org/geodesy/perm_ob/sites.htm).

Geodectic Control Database:

The SCAR Geodetic Control Database provides a repository for high precision positional data from 7 countries, some collected more than 30 years ago. This information is useful for many aerial photography, mapping and satellite imaging projects, and can be viewed at: http://www.geoscience.scar.org/geodesy/giant.htm#controldb.

The Antarctic Map Catalogue:

Information on all maps published by SCAR Members is available through a web-accessible database from the Australian Antarctic Data Centre (http://www.aad.gov.au/), which can be updated by SCAR Members when new maps are produced.

Antarctic Bedrock Mapping (BEDMAP):

Data collected on surveys undertaken over the past 50 years, and describing the thickness of the Antarctic ice sheet, have been brought together into a single database, allowing the compilation of a suite of seamless digital topographic models for the Antarctic continent and surrounding ocean. The suite includes grids representing:

i. ice-sheet thickness over the ice sheet and shelves;
ii. water-column thickness beneath the floating ice shelves;
iii. bed elevation beneath the grounded ice sheet;
iv. bathymetry to 60°S including the areas beneath the ice shelves (see http://www.antarctica.ac.uk/bedmap/).

Tide gauge data:

Tide gauge data on sea level measured around Antarctic are managed by the Global Sea-level Observing System (GLOSS), and archived by the Permanent Service for Mean Sea-level (PSMSL) (http://www.pol.ac.uk/psmsl/).

Antarctic Master Directory

The Antarctic Master Directory (AMD) is a directory containing data descriptions that is currently hosted by the Global Change Master Directory. Its aim is that all Antarctic scientific data will be described, including historical data, environmental monitoring data, and data for which access restrictions may apply. There are no restrictions on access to the directory but access to the actual data will is the responsibility of data custodians. The AMD can be accessed at: http://gcmd.nasa.gov/Data/portals/amd/

Annex 8

List of Acronyms

AAA	Antarctic and Astronomy and Astrophysics
ACC	Antarctic Circumpolar Current
ACE	Antarctic Climate Evolution
ADD	Antarctic Digital Database
ADDS	Antarctic Data Directory System
ADMAP	Antarctic Digital Magnetic Anomaly project
AGCS	Antarctica in the Global Climate System
AGONET	Antarctic Geospace Observatory Network
AMD	Antarctic Master Directory
ANDRILL	Antarctic Geological Drilling Project
ANTSDI	Antarctic Spatial Data Infrastructure
AABW	Antarctic Bottom Water
ANTEC	Antarctic Neotectonics
ANTOSTRAT	Antarctic Off-shore Stratigraphy Programme
APTIC	Antarctic Peninsula Tropospheric-Ionospheric Coupling
ASPeCT	Antarctic Sea-Ice Processes and Climate
ATAC	Antarctic Tropospheric Aerosols and their Role in Climate
ATCM	Antarctic Treaty Consultative Meeting
ATS	Antarctic Treaty System
BEDMAP	Antarctic Bedrock Mapping
BIOMASS	Biological Investigations of Marine Antarctic Systems and Stocks
CAWSES	Climate and Weather of the Sun
CCAMLR	Convention on the Conservation of Antarctic Marine Living Resources
CCAS	Convention on the Conservation of Antarctic Seals
CD-ROM	Compact Disc – Read Only Memory
CEP	Committee for Environmental Protection
CliC	Climate and Cryosphere Programme
CLIVAR	Climate Variability Programme
COG	Communication and Outreach
CoML	Census of Marine Life
COMNAP	Council of Managers of National Antarctic Programmes
DROMLAN	Dronning Maud Land Air Network
EASIZ	Ecology of the Antarctic Sea Ice Zone
EBA	Evolution and Biodiversity in the Antarctic
EC	European Commission
EGGI	Expert Group on Geographical Information
EGGPE	Expert Group on Permafrost and Periglacial Environments
FAO	Food and Agriculture Organization of the United Nations
GBIF	Global Biodivsrsity Information Facility
GCMD	Global Change Master Directory
GCOS	Global Climate Observing System
GEO	Group on Earth Observations
GIANT	Geodetic Infrastructure for Antarctica
GIS	Geographic Information Systems
GIWA	Global International Waters Assessment
GLOBEC	Global Ocean Ecosystems Dynamics project
GLOCHANT	Global Change and the Antarctic
GLOSS	Global Sea-Level Observing System
GOOS	Global Ocean Observing System
GPS	Global Positioning System
IASC	International Arctic Science Committee
IBCSO	International Bathymetric Chart of 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
IGU	International Geographical Union
IGY	International Geophysical Year
IHO	International Hydrographic Office
IMBER	Integrated Marine Biogeochemistry and Ecosystem Research
IOC	Intergovernmental Oceanographic Commission
IODE	International Ocean Data and Information Exchange Programme
IPAB	International Programme of Antarctic Buoys
IPCC	Intergovernmental Panel on Climate Change
IPOD	International Ocean Drilling Program
IPY	International Polar Year
ISMASS	ice sheet mass balance and sea-level
ITASE	International Trans-Antarctic Scientific Expedition
IUBS	International Union of Biological Sciences
IUCN	International Union for the Conservation of Nature (World Conservation Union)
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
JGOFS	Joint Global Ocean Flux Study

MADREP	Middle Atmosphere Dynamics and Relativistic Electron Precipitation
MarBIN	Marine Biodiversity Information Network
MEXT	Ministry of Education, Sports, Science and Technology (Japan)
MOSAK	Modelling and Observational Studies of Antarctic Katabatic Winds
NADC	National Antarctic Data Centre
NASA	National Aeronautical and Space Administration
NERC	Natural Environment Research Council
NGO	Non-Governmental Organisations
NOAA	National Oceanic and Atmospheric Administration
NODC	National Ocean Data Centres
NSF	National Science Foundation
OBIS	Ocean Biogeographic Information System
ODIN	Ocean Data and Information Network
ONR	Office of Naval Research
PAGES	Past Global Change programme
PASTA	Plateau Astronomy Site Testing in Antarctica
PSMSL	Permanent Service for Mean Sea-Level
READER	Reference Antarctic Data for Environmental Research
RISP	Ross Ice Shelf Project
SALE	Subglacial Lake Exploration
SCALOP	Standing Committee on Antarctic Logistics and Operations
SCAR	Scientific Committee on Antarctic Research
SCOR	Scientific Committee on Oceanic Research
SCOSTEP	Scientific Committee on Solar-Terrestrial Physics
SDLS	Seismic Data Library System
SHALDRIL	Shallow Drilling
SPRI	Scott Polar Research Institute
SSG	Standing Scientific Groups
STADM	Steering Committee for Antarctic Data Management
STEPS	Solar-Terrestrial Processes and Space Weather
UN	United Nations
UNEP	United Nation's Environment Programme
URSI	Union Radio Scientifique Internationale
WCRP	World Climate Research Programme
WDC	World Data Centres
WMO	World Meteorological Organisation
WWW	World Weather Watch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