

**SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH:
PREPARING SCAR FOR 21ST CENTURY SCIENCE
IN ANTARCTICA**

**A Report to the Scientific Committee on Antarctic Research
by the Ad Hoc Group on SCAR Organization and Strategy**

April 15, 2000

Ad Hoc Group on SCAR Organization and Strategy

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Letter of Transmittal

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Dear Bob:

On behalf of the Ad Hoc Group on SCAR Organization and Strategy, it is my pleasure to forward to you, other officers, and members of SCAR the Group's report, *SCAR: Preparing for 21st Century Science in Antarctica*. The report is a consensus report; all members of the Ad Hoc Group concur fully with the recommendations in the report.

You appointed the 10-person Ad Hoc Group in April 1999. The Group began work immediately via electronic mail. We developed a "Call for Comments on SCAR" to solicit views on SCAR's strengths and ways that its operations might be improved. We sent this circular electronically on June 2, 1999, to national committees and other bodies adhering to SCAR, former presidents of SCAR, chief officers of SCAR Working Groups and Groups of Specialists, and others. We encouraged national Antarctic committees to forward the Call for Comments to the directors of Antarctic national research programs in their countries. The 26 responses were collated and circulated electronically to the Ad Hoc Group, along with relevant background documents from recent SCAR meetings. These documents, and the long experience of the Group's members made our first face-to-face meeting August 16-17, 1999, in Cambridge, England, extremely productive. The Ad Hoc Group also benefited from the telephone conference call with you during the first meeting and the briefing it received from Peter D. Clarkson on the evolution and present-day functions and operations of the Secretariat.

At the Cambridge meeting, the Ad Hoc Group decided to seek additional information from the Chief Officers of the Working Groups and Groups of Specialists. We asked the Chief Officers to respond to seven questions about their group's mode of operation, recent activities, and expected accomplishments over the next three years. Every Chief Officer replied electronically, and the collated responses were circulated to the Ad Hoc Group electronically.

The Ad Hoc Group continued to work intersessionally between its first and second meetings. A sub-group chaired by Fred Davey reviewed a range of issues associated with SCAR's internal and external communication procedures. Drew Clarke chaired a sub-group on the Working Groups and Groups of Specialists that also analyzed the responses from the Chief Officers. Both sub-groups worked electronically and on occasion by telephone.

The Ad Hoc Group held its second and final meeting in Buenos Aires, Argentina, on January 12-13, 2000. The Group reviewed working hypotheses and conclusions reached at its first meeting, discussed the operations of the Working Groups and Groups of Specialists, the results of the survey of Chief Officers, the reports of the sub-groups, and reached agreement on the structure and recommendations of the final report. Between the January meeting and the submission of the final report there were three additional electronic iterations between the Chair and Members to develop the draft report and refine its recommendations.

The Ad Hoc Group would like to acknowledge the assistance of many individuals who helped it in its deliberations. We thank all those who responded to the Call for Comments in June 1999. The Chief Officers gave us detailed and thoughtful responses to the questions we posed. The Chair would also like to thank Alan Hemmings, a member of the Antarctic and Southern Ocean Coalition, for discussing his perspectives on environmental issues in Antarctica and the Southern Ocean. The Group was a guest at Hughes Hall, Cambridge University, for its first meeting. Dr. Carlos Rinaldi and the Instituto Antártico Argentino hosted the Group in Buenos Aires. Peter D. Clarkson gave us much assistance with background papers and financial information about SCAR and helped throughout our work with meeting logistics and information the Group needed. Moira Hassett, SCAR Administrative Assistant, and Rodolfo Sanchez and José Luís Agraz, Instituto Antártico Argentino, assisted the Group at its meetings.

The Chair would like to thank the members of the Ad Hoc Group for their dedicated commitment over the past year. It has been a pleasure to chair this committee, because the task was challenging and important and the Members were totally engaged because of their deep commitment to SCAR's future success. I would observe that the membership of the Group spanned six continents and several members worked on the report at or on the way to and from Antarctic research stations. The fact that bulk of the work of the Ad Hoc Group was done by email before, between, and after the two face-to-face meetings demonstrates how SCAR might work more proactively and effectively in the future.

The Chair is also grateful to the home institutions of the Ad Hoc Group members for their support to the members' work during the year the Group was active.

The Ad Hoc Group on SCAR Organization and Strategy and the Chair recognise the exceptional professionalism of Michael McGeary, staff to the Ad Hoc Group, and thank him for his insights and assistance in every phase of our work.

Sincerely,

Philip M. Smith
Chair
Ad Hoc Group on SCAR Organization
and Strategy

Acronyms

ACMRR	Advisory Committee on Marine Resources of the UN Food and Agriculture Organization
AGONET	Antarctic Geophysical Observatory Network
ANTEC	Group of Specialists on Antarctic Neotectonics
ANTIME	Late Quarternary Antarctic Sedimentary Record of Ice Margin Evolution
ANTOSTRAT	Antarctic Offshore Acoustic Stratigraphy
ASOC	Antarctic and Southern Ocean Coalition
ASPECT	Antarctic Sea-Ice Processes and Climate
ATCM	Antarctic Treaty Consultative Meeting
ATS	Antarctic Treaty System
BIOMASS	Biological Investigations of Marine Antarctic Systems and Stocks
BIOTAS	Biological Investigations of Terrestrial Antarctic Systems
CCAMLR	Convention on the Conservation of the Antarctic Marine Living Resources
CEP	Committee for Environmental Protection
CLIVAR	Climate Variability
COMNAP	Council of Managers of National Antarctic Programs
COSPAR	Committee on Space Research
DVDP	Dry Valley Drilling Project
GAP	Glaciology of the Antarctic Peninsula Project
GIANT	Geodetic Infrastructure for Antarctica Programme
GLOBEC	Global Ocean Ecosystems Dynamics
GLOCHANT	Group of Specialists on Global Change and the Antarctic
GOSEAC	Group of Specialists on Environmental Affairs and Conservation
IABO	International Association for Biological Oceanography
IASC	International Arctic Science Committee
ICSU	The International Council for Science
IGY	International Geophysical Year
IGBP	International Geosphere-Biosphere Programme
IHDP	International Human Dimensions Programme on Global Environmental Change
IOC	Intergovernmental Oceanographic Commission
ITASE	International Transantarctic Scientific Expedition
JCADM	Joint Committee on Antarctic Data Management
JGOFS	Joint Global Ocean Flux Study
LIRA	Lithospheric Investigation in the Ross Sea Area
PAGES	Past Environmental Changes
RiSCC	Regional Sensitivity to Climate Change in Antarctic Terrestrial Ecosystems
RISP	Ross Ice Shelf Programme
SCAR	Scientific Committee on Antarctic Research
SCOR	Scientific Committee on Oceanic Research
SO-JGOFS	Southern Ocean-Joint Global Ocean Flux Study
START	System for Analysis, Research and Training
WCRP	World Climate Research Programme

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Executive Summary

The Scientific Committee on Antarctic Research (SCAR) was created in 1958 to initiate, promote, and coordinate international scientific activity in Antarctica after

the end of International Geophysical Year (IGY) of 1957-1958. The IGY had shown cooperative international research could be very productive, in both understanding Antarctica and surrounding oceans and also as a platform for conducting research on global processes and in astronomy. SCAR proceeded to plan and coordinate a number of international research efforts that have greatly increased our knowledge in many fields of science. At the same time, it became the leading scientific adviser to the intergovernmental Antarctic Treaty System (ATS) responsible for stewardship of the continent.

Today, at the beginning of the 21st Century, science in Antarctica promises to be as exciting and rewarding for scientists and society today as ever. There are new and important scientific problems to investigate, including many that are crucial to understanding the functioning of the Earth System as a whole. New tools for observation, including robotics, space observation and remote sensing, sophisticated instrumentation, and much more powerful computation and scalable analysis, are creating new ways of doing research and leading to new scientific insights. There are increasing demands from the ATS, nongovernmental organizations, and other international scientific organizations for objective scientific information and advice concerning Antarctica, especially its environmental protection and interactions with global change processes. In other words, SCAR's mission—promoting cooperative international science, building the science base for the environmental protection of Antarctica, and providing objective scientific expertise to the ATS and other organizations—is more relevant than ever.

The expansion of opportunities for research advances in and the need for objective scientific knowledge about Antarctica and the Southern Ocean clearly increase the need for an international scientific organization like SCAR. The increasing scale and costs of research in the region also make international cooperation desirable. The proliferation of other Antarctic Treaty-related groups focused on conservation of the region's marine living resources, environmental protection, and management of national programme operations also challenge SCAR, but it provides SCAR as a nongovernmental entity with the opportunity to be an independent source of objective scientific information and advice.

After thorough review of SCAR, the Ad Hoc Group on SCAR Organization and Strategy finds that SCAR must make changes to accommodate its own growth in national membership, adapt to the increasing pace and scale of demands on it, and to ensure the quality of its scientific advice. To maintain its active leadership in research and advice to ATS, SCAR must be more flexible and responsive than ever before. The Ad Hoc Group concludes that SCAR should focus on three major areas of change to enable it to address the challenges and opportunities it faces:

1. Engaging the delegates, officers, and staff more actively in scientific leadership and management of SCAR, including its operating groups.

Although the pace of discovery and demands for advice have accelerated, SCAR meets only biennially. At the same time, the national membership has more than doubled, from 12 to 26, making the Meeting of Delegates much larger. SCAR

must find ways to conduct an increasing amount of business more expeditiously to maintain its effectiveness and leadership.

2. Modernizing internal and external communications strategies and procedures.

Modern information technologies offer a tremendous opportunity for SCAR to function more effectively as an international organization, and to make information accessible to decisionmakers, other scientists, and the interested public.

3. Creating a more flexible and responsive operating structure at the working level of science in Antarctica and surrounding oceans than the existing system of working groups and groups of specialists.

The quickening pace of scientific progress, the growing need for interdisciplinary approaches to new problems, and the increase in demands for objective scientific advice call for a more flexible mode of operation than traditional disciplinary groups. SCAR's operating groups should vary in focus, scientific composition, and duration to fit a variety of needs and opportunities, from quick-turnaround studies to long-term planning and implementation efforts.

The Ad Hoc Group makes twenty recommendations that together would address the three critical areas of change identified above and help prepare SCAR for the 21st Century. These recommendations form an interdependent set of changes that together would renew the mission and reinvigorate the operation of SCAR while preserving the best of its traditions. The recommendations group into eight strategies for the revitalization and renewal of SCAR and form the basis for the organization of the report:

- Revitalise SCAR by making SCAR more proactive and update its mission in four areas.
- Engage SCAR delegates, alternates, and officers more actively in SCAR to accomplish SCAR's mission as the preeminent authority on science in Antarctica and surrounding oceans.
- Create more flexible and responsive mechanisms at the operating level to coordinate and plan science and provide scientific advice.
- Improve the planning and decisionmaking functions in the biennial SCAR cycle.
- Improve SCAR's internal and external communication systems.
- Modernise SCAR's secretariat.
- Engage national Antarctic committees and other adhering bodies to renew their commitment to SCAR.
- Implement change rapidly to maintain and enhance SCAR's position as the authoritative leader for science in Antarctica.

If SCAR is to be scientific leader in research in Antarctica, it must be able to act more quickly to exploit opportunities for international scientific collaboration and to respond to, even initiate, requests for scientific expertise on major issues concerning Antarctica. The recommendations in this report, if implemented, are intended to accomplish this. Moreover, it is feasible to accomplish the

recommended changes in a two-year cycle of self-renewal beginning with XXVI SCAR in Tokyo in July 2000. The Ad Hoc Group has great confidence that SCAR, after careful scrutiny and discussion, will embrace the proposals in this report and put SCAR in the position to be the preeminent organization for science in Antarctica and be considered as an objective adviser on science issues in the decades ahead.

I. Introduction

By any measure the Scientific Committee on Antarctic Research (SCAR) has been a highly successful international scientific organization. Now in its fifth decade, SCAR has played an instrumental role in the planning and conduct of science in Antarctica and in and on the surrounding oceans and pack ice zone. SCAR has a unique heritage. It evolved from the Special Committee on Antarctic Research, one of several international committees established to plan programs for the International Geophysical Year (IGY) spanning 1957-1958. IGY's greatest success was in Antarctica. In addition to completing most of the geographical exploration of the Antarctic continent, the Antarctic research programme yielded a rich harvest of scientific data that increased not only our knowledge of Antarctica but contributed to our understanding of the evolution and dynamics of the entire planet. The IGY demonstrated decisively that research on the Antarctic continent and the surrounding oceans should extend for many years into the future, because research problems were far more complex than had been imagined.

The greatest legacy of the IGY Antarctic scientific effort, however, was the impetus that international collaboration among scientists from many nations gave to diplomatic efforts that resulted in the signing of the Antarctic Treaty in 1959. This same impetus led the 12 academies participating in the Special Committee on Antarctic Research to establish SCAR permanently as a body of the International Council for Science (ICSU). SCAR was founded with the mission to plan and coordinate scientific research in Antarctica and became an adviser to the Antarctic Treaty System (ATS) when it came into being. Four decades later, SCAR's relationship with an international diplomatic instrumentality—ATS—remains a singular feature of a scientific body in ICSU. This advisory relationship remains important today, and will continue in the 21st Century to be critical, as humankind addresses such issues as the causes of global warming and amelioration of its effects and the depletion of living resources in the world's oceans.

SCAR has grown and changed. It has reached out and established working relationships with other international science organizations, including those formed more recently, for example, the International Geosphere-Biosphere Programme (IGBP) and the World Climate Research Programme (WCRP). Its membership has more than doubled (from 12 member countries in 1958 to 26 full members and 6 associate members today). SCAR has created a number of groups of specialists to address issues requiring timely action and advice. These groups have worked effectively with the ATS as well as other bodies. SCAR has been instrumental in the initiation or coordination of a large number of collaborative scientific programmes in Antarctica and Southern Oceans. These include, among others, the East Antarctic Glaciological Project; DVDP (Dry Valley Drilling Project); airborne radar ice-thickness profiling programmes, and BIOMASS (Biological Investigation of Marine Antarctic Systems and Stocks) (sponsored jointly with the Scientific Committee on Oceanic Research (SCOR), International Association for Biological Oceanography, and Advisory Committee on Marine Resources of the UN Food and Agriculture Organization) in earlier

decades and, more recently, BIOTAS programme on terrestrial ecosystems; GAP (Glaciology of the Antarctic Peninsula Project); ANTOSTRAT (Antarctic Offshore Acoustic Stratigraphy); and Southern Ocean phase of the Joint Global Ocean Flux Study (SO-JGOFS). Thus SCAR is an organization that has evolved over time.

The Ad Hoc Group on SCAR Organization and Strategy undertook its review of SCAR with the underlying conviction that science in Antarctica is as exciting and rewarding for scientists and society today as ever. The future will likely be even more exciting because of the important role of Antarctica and surrounding oceans in large-scale global systems. There are new scientific problems, for example, the hydrology and biology of Lake Vostok and other sub-glacial lakes. Research not contemplated three decades ago, such as the biological effects of increased ultraviolet rays from atmospheric ozone depletion, are now an important aspect of research in Antarctica. There are new opportunities for multidisciplinary syntheses. New tools for observation, including robotics, space observation and remote sensing, sophisticated instrumentation, biotechnology, and much more powerful computation and scalable analysis, are creating new ways of doing research and leading to new scientific insights. The increasing scale and costs of these new research opportunities call for greater international cooperation and cost sharing.

At the same time, the world of research continues to evolve. More scientists are involved in international scientific projects, including research in Antarctica. At the dawn of the 21st Century, there are more nations with increasing research capacity, and some of these will seek out opportunities to conduct research in Antarctica. The number of organizations for science has greatly increased and there is no indication that this trend has reached a plateau. There are more and greatly improved communications. Larger databases and new ways of using them are creating new challenges—and opportunities—for international coordination and cooperation. Nongovernmental advocacy organizations participate in both scientific and diplomatic fora. SCAR can expect that changes such as these will continue that the pace of change will quicken.

The expansion of opportunities for research advances in Antarctica and the need for objective scientific advice about Antarctica and surrounding oceans increase the need for an international scientific organization like SCAR. But as successful as SCAR has been, it cannot remain static while the world changes around it. SCAR must be more flexible and responsive than ever before, while maintaining its high standards of scientific excellence, to continue its leadership in research and in advice to ATS and others. Recognizing many of these opportunities and challenges, it was the judgement of SCAR itself at the XXV SCAR meeting that there is a need for a major self-assessment of SCAR's effectiveness as the principal scientific body for research in Antarctica and surrounding oceans in future years.

II. A SCAR for the 21st Century

In its review of SCAR, the Ad Hoc Group began by asking itself and those who responded to its Call for Comments some strategic questions about SCAR. Is SCAR needed today? Is the mission current or does it need updating? Is SCAR organizationally effective in fulfilling its mission? How well does the governance system work at and between biennial meetings of SCAR delegates? What role does the Executive Committee play? How well has SCAR accommodated growth in membership from 12 to 26? How is SCAR being called upon for advice by other scientific bodies and the ATS, and how has this changed as other advisory institutions to the ATS, such as the Committee on Environmental Protection (CEP), have been put in place? How does SCAR interact with the Council of Managers of National Antarctic Programmes (COMNAP)? How coordinated are SCAR's activities and those of other international scientific organizations working on the causes and effects of global change, e.g., the IGBP, WCRP, International Human Dimensions Programme on Global Environmental Change (IHDP), and SCOR. How should the interactions between the policy and working levels of SCAR be characterised? Why are there working groups in some disciplines of Antarctic research, and not in others? The Group also discussed the fact that, from the perspective of science in Antarctica, many of the most exciting research issues are increasingly at the boundaries of traditional disciplines, suggesting the question of whether there are more flexible and rapid methods of response to address emerging research questions. What are the communication flows within SCAR, and how well does SCAR communicate externally with other organizations, the larger research community, and the public? How well is SCAR taking advantage of Antarctica's potential for educating young scientists and informing the public about the importance of Antarctic science? How is the SCAR secretariat operating compared with those of similar ICSU bodies? These and similar questions occupied much of the Group's early deliberations.

Drawing on extensive experience with the other scientific organizations similar to SCAR as well as with governmental and private sector organizations, the Ad Hoc Group also discussed a number of issues associated with organizational and programmatic review of an organization like SCAR and the process of bringing about change. The Ad Hoc Group considered this issue in the context of the two-year SCAR "cycle," with a biennial plenary as the focal point for decisionmaking, and how this would influence the process of change within SCAR. The Group concluded that, as with many organizations, a series of changes would probably be needed, not one or a few, and that to be successful they probably would have to be implemented together.

Once the Ad Hoc Group agreed that SCAR's mission is still needed, and an organization like SCAR is more important and necessary than ever, the question became: "What is needed to ensure that SCAR remains an important and vital international scientific body in the first part of the 21st Century?"

At the highest level, the Ad Hoc Group concluded that SCAR should address three critical needs:

1. Engaging the delegates, officers, and secretariat more actively in scientific leadership and management of SCAR, including its operating groups.
2. Modernizing internal and external communications strategies and procedures.
3. Creating a more flexible and responsive operating structure at the working level of science in Antarctica and the surrounding ocean than the existing system of working groups and groups of specialists.

The experience of the Ad Hoc Group members with SCAR, the national responses to the Call for Comments, and responses of the chief officers suggest that SCAR has not evolved as fast as the world around it, making it in too many instances a reactive rather than a proactive body.¹ In part, this is undoubtedly related to the growth in the membership of SCAR as larger numbers of individuals at the table make discussion and deliberation more complex and difficult. The rise of new mechanisms such as CEP has changed SCAR's ATS advisory functions in the environmental arena. The creation of COMNAP relieved SCAR of the burden of coordinating logistics between national Antarctic programmes, but introduced the need for SCAR to provide COMNAP with a clear set of scientific programme plans to guide logistical planning. Until recently, the SCAR secretariat has seen its role as reactive rather than proactive. These changes and trends suggest that there is a need—and an opportunity—for SCAR to reshape itself to carry out its key mission, leadership of science in Antarctica, by promoting cooperative international science, building the science base for the environmental protection of Antarctica, and providing objective scientific expertise to the ATS and other organizations.

The findings and conclusions of the Ad Hoc Group also suggest that SCAR must direct substantial effort to improving its internal and external communications. Excellent communication systems within SCAR and with other organizations are essential if SCAR is to be able to respond to the changing global environment in which it operates. National Antarctic committees and their delegates too frequently do not receive information sufficiently in advance of SCAR meetings for the meetings to be as productive as they should be. Trying to conduct the business of the working groups and groups of specialists during the week before the SCAR delegates meeting limits the capacity of SCAR to make decisions as fully considered as they should be. Chief officers and members of the working groups and groups of specialists feel that SCAR delegates meeting biennially are too remote from the science undertaken in Antarctica and the scientific activities of their groups. On the other hand, there is no minimal standard or level of expectation as to the chief officers' responsibility for regular communication with members of a working group or with SCAR other than the reports that are solicited in preparation for a plenary meeting. Chief officers may have active communication with other science organizations and not communicate on such discussions to the SCAR Executive. Until recently, the SCAR secretariat was ill

¹ The Call for Comments from the Ad Hoc Group Chair is found at Appendix C and the Memorandum to Chief Officers of the Working Groups and Groups of Specialists is at Appendix D.

equipped technologically for internal or external communication, for example, through an Internet web site, and much technological improvement is still required in this area.

The scientific structure of working groups and groups of specialists has evolved over time, but in the view of the Ad Hoc Group, the structure does not provide SCAR with a dynamic or flexible way of identifying or responding to challenging new scientific opportunities. Nor does the present system provide a rapid way of rendering advice to SCAR on issues that SCAR should address proactively, such as requests for advice from the ATS. Some working groups made compelling cases for their activities in response to the questions the Group addressed to the chief officers, but others did not. SCAR approves the terms of reference of working groups and groups of specialists at every meeting of SCAR delegates, but the approval is generally pro forma. The Ad Hoc Group concludes that this permits a great deal of inertia in SCAR at the operating group level. Further, if SCAR maintains its present meeting cycle (the Group is not recommending annual SCAR meetings), more ways must be found to respond to requests for planning science in Antarctica and providing advice to the ATS and others between meetings every two years.

The Ad Hoc Group's recommendations address the questions of engaging the delegates, officers, and SCAR secretariat more actively in the scientific activities of SCAR, the modernization of SCAR's internal and external communication systems, and the creation of a more flexible, dynamic, and rapid response set of mechanisms at the operating level of SCAR.

The Group believes that a number of changes must be undertaken by SCAR to respond to these three overarching needs. It is the Group's conviction that all of the suggestions and recommendations presented below in its report need to be undertaken. Together, the Group's recommendations form an interdependent set of changes that together will renew the mission and reinvigorate the operation of SCAR while preserving the best of its traditions. Implementing some of the recommendations, for example, at the operating group level, or making the recommended changes in the SCAR secretariat will not have the hoped for effect unless there are also changes at the level of SCAR. But none of these changes will succeed unless SCAR changes the way it communicates internally and with other organizations and the public.

The Ad Hoc Group makes twenty recommendations that will create a SCAR for the 21st Century. They address the three overarching needs identified above. Strategically, the recommendations cluster in eight strategies (Table One).

The report presents and discusses these eight strategic directions for change and the Ad Hoc Group's specific recommendations in order, beginning with the renewal of SCAR's mission.

TABLE ONE
EIGHT STRATEGIES FOR THE REVITALIZATION AND
RENEWAL OF SCAR FOR THE 21ST CENTURY

- Revitalise SCAR by making SCAR more proactive and update its mission in four areas.
- Engage SCAR delegates, alternates, and officers more actively in SCAR to accomplish SCAR's mission as the preeminent authority on science in Antarctica and surrounding oceans.
- Create more flexible and responsive mechanisms at the operating level to coordinate and plan science and provide scientific advice.
- Improve the planning and decisionmaking functions in the biennial SCAR cycle.
- Improve SCAR's internal and external communication systems.
- Modernise SCAR's secretariat.
- Engage national Antarctic committees and other adhering bodies to renew their commitment to SCAR.
- Implement change rapidly to maintain and enhance SCAR's position as the authoritative leader for science in Antarctica.

A. Renewing SCAR's Mission

SCAR has been and should remain the leading international scientific organization in Antarctica and the Southern Ocean. It should fulfill the vital role of providing expert objective scientific information about Antarctica and science-based advice on issues affecting or affected by Antarctica. SCAR was created to fulfill this role, and others still look to SCAR for information and advice. Most importantly, the Antarctic Treaty Consultative Meetings (ATCM) rely on SCAR for information and objective scientific judgement. At the last ATCM, for example, SCAR submitted two working papers and six information papers. It was asked to respond to the following requests at the next ATCM: to advise on scientific definitions of damage and related matters with respect to the issue of liability for damage to the Antarctic environment, to advise on protection requirements for Antarctic native and migratory species, especially with respect to the list of specially protected species in the Protocol on Environmental Protection to the Antarctic Treaty, to assist in determining the potential for enhanced cooperation to ensure environmental protection in Antarctica; to conduct a "scoping exercise" for the development of a "State of the Antarctic Environment Report;" to advise on the findings of the Workshop on diseases in Antarctic Wildlife; and to attend the Antarctic Treaty Meeting of Experts on Guidelines for Antarctic Shipping and Related Activities.

SCAR also plans and coordinates the Antarctic part of some global scientific programmes. National Antarctic programmes have participated in the planning and implementation of the Antarctic part of the JGOFS (Joint Global Ocean Flux Study) and GLOBEC (Global Ocean Ecosystem Dynamics) programmes of IGBP

and SCOR, and the CLIC (Climate and Cryosphere) Programme of WCRP. GLOCHANT has regional responsibility in START, the global environmental research and capacity building programme cosponsored by IGBP, IHDP, and WCRP. SCAR is a cosponsor with the Past Environmental Changes (PAGES) Programme of the International Trans-Antarctic Scientific Expedition (ITASE) and ANTIME programmes, and also with the Climate Variability and Predictivity (CLIVAR) programme of the Antarctic Sea-Ice Processes and Climate Programme (ASPeCt).

The need for an organization such as SCAR, with its mission of advancing scientific knowledge about Antarctica, is increasing with the growing pressure on Antarctica and surrounding oceans by humans (e.g., tourism, fishing) and growing interest in global climate change as it affects and is affected by Antarctica (e.g., ice cap history, sea ice melting, ocean dynamics). SCAR is also needed to promote and coordinate the expansion of research in Antarctica that builds the scientific knowledge base.

In the beginning, SCAR was the only international scientific body operating in Antarctica. Over the years, it has been joined by other entities created to focus on specific operational and management issues. In 1982, under the Convention on the Conservation of the Antarctic Marine Living Resources (CCAMLR), the Antarctic Treaty Consultative Parties created a commission and scientific committee to oversee the development of an ecosystem-wide management approach to 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 that a Committee for Environmental Protection (CEP) be established to advise the ATCM on the implementation of the Protocol. COMNAP was created in 1988 to coordinate the operations of the national research programmes operating in Antarctica, a function previously carried out by the SCAR Working Group on Logistics.

These newer organizations, established under conventions of the Antarctic Treaty, are regulatory and operational in function. Although state-of-the-art scientific knowledge is an important input to decisionmaking, their own advisory groups are inevitably influenced by the fact they are political organizations. The need for objective state-of-the-art scientific knowledge from an independent source provides SCAR with the opportunity to focus on its mission of being the leading scientific organization in Antarctica. It also encourages SCAR to be more active in identifying issues emerging from greater scientific understanding that should be brought to the attention of policy makers. Such activities will be in addition to its traditional activities of setting research agendas, fostering cooperative research among national programmes, and providing scientific information and advice to policy makers on request.

Recommendation 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.

As the Antarctic Treaty System has evolved, with the creation of organizations with regulatory and operational responsibilities such as CCAMLR, CEP, and COMNAP, it is possible for SCAR to focus on science. SCAR is not responsible for coordinating national programme operations and regulating natural resources and environmental impacts, and it can concentrate on pursuing cutting-edge scientific research in Antarctica and synthesizing and interpreting the results for nonscientists. As well as advising Antarctic Treaty-related organizations, SCAR should be the first place that other scientists, policy makers, and the interested public think of when they want to know about Antarctica and surrounding oceans, the role of Antarctica in global processes, the impact of global change on Antarctica, and research for which Antarctica provides a unique platform, such as astronomy, astrophysics, and life in extreme environments.

Leadership involves more than reacting to requests for information and advice. As an organization, SCAR should actively bring problems identified by advances in scientific understanding to ATCMs and other appropriate bodies to consider. An example of this proactive approach is SCAR's leadership in addressing the problem of studying Lake Vostok, the large lake under the Antarctic ice cap. If properly sampled in a way that prevents contamination, Lake Vostok may give us a unique way to see historical changes in global change processes, discover new organisms, and result in other insights that only a pristine isolated environment might provide. In this case, SCAR leaders did not wait to be asked for advice; rather they actively put the issue on the table.

To become more proactive, SCAR should revamp its organization and structure. It should be more focused on science, more flexible in addressing research problems, and better able to provide current information internally at all levels, from working scientists and their national programmes to SCAR delegates responsible for governing the organization, and externally to all interested individuals and organizations. These changes are the subject of recommendations that follow in this report. The purpose of Recommendation 1 is to highlight the organizational philosophy that these changes are intended to support: SCAR should be proactive in its leadership of Antarctic science.

Recommendation 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.**

Historically, SCAR's mission has been to: a) initiate, promote, and co-ordinate international scientific activity in the Antarctic with a view to framing and reviewing scientific programmes of circumpolar scope and significance; b) keep under review scientific matters pertaining to the integrity of the Antarctic environment, including the conservation of its terrestrial and marine ecosystems, and c) provide, upon request, scientific and technological advice to the Antarctic Treaty Consultative Meetings and other organizations, both governmental and non-governmental.

The mission of SCAR as stated in the Constitution does not need to be changed. Rather, it needs to be expanded and made more proactive.

First, SCAR has 26 members, up from 12 at its founding in 1958. The Antarctic research programmes of member nations vary greatly and in their size and capacity. Some countries have Antarctic research communities that are large, sophisticated, and long-standing. Other countries have relatively small and new Antarctic research communities that are still developing. It is incumbent on SCAR to foster the research capacity of all of its members, associate members, and nonmember nations. It is especially important to interest young scientists in Antarctic research, and SCAR should support the efforts of national Antarctic committees in reaching out to young scientists.

Second, as the leading authority on Antarctic science, SCAR should provide advice to the Antarctic Treaty System on request and, where warranted by better scientific understanding of Antarctica, actively bring emerging issues to the attention of the ATS and its subsidiary bodies, including CCAMLR and CEP, and also to COMNAP.

Third, SCAR should take the lead in understanding the role of Antarctica and surrounding oceans in global change processes, and in understanding the impact of global change on Antarctica itself. It is critical in these issues to have an objective source of state-of-the-art scientific knowledge to inform policymaking. SCAR should be the premier such source.

Fourth, SCAR should seize upon the opportunities offered by advances in information technology to disseminate advances in scientific knowledge and about SCAR's activities to the world's scientific community, policy makers concerned with global climate change as well as with Antarctica, and interested members of the public.

These four updates of SCAR's mission are in keeping with the more active concept of SCAR's leadership role set forth in the Recommendation 1. Carrying them out will better position SCAR to be successful at the beginning of the 21st century.

B. Accomplishing SCAR's Mission in the 21st Century

At the highest level of revitalization, the Ad Hoc Group believes that the most important change SCAR needs to institute is to consider itself a more proactive body for the representation and coordination of science in Antarctica and surrounding oceans. To do this, the Ad Hoc Group believes that two interlocking actions are needed.

First, SCAR must change its outlook about what it is, and what it could be, which is addressed in Recommendations 1 and 2.

Second, delegates, alternate delegates, Executive Committee, and the secretariat must be more actively engaged in SCAR affairs.

At present, in the Ad Hoc Group's judgement, SCAR does not sufficiently engage all of its membership in the overall direction and leadership of SCAR. Rather, it relies on the Executive Committee (especially the president), executive secretary, and chief officers of operating level groups for the initiation of actions that come before SCAR. While all the aforementioned individuals and groups are important to the effective operation of SCAR, it is SCAR itself that should serve as the authoritative scientific body on science in Antarctica. The plenary meetings should have "more content and less form," as more than one commentator put the matter.

The Ad Hoc Group makes eight recommendations that are designed to increase SCAR-level participation and "ownership" of SCAR. Together these recommendations represent a significant reorientation of the way SCAR delegates and Executive Committee would operate at, and to some extent between, the biennial meetings. The recommendations are designed to engage more actively the delegates and alternate delegates, and provide the officers with specific missions or portfolios. Together the recommendations will renew SCAR as a science organization "at the top," thereby reinvigorating both SCAR and its scientific operating groups.

Recommendation 3: SCAR delegates—at the delegate level—must become more actively engaged in the management of SCAR at SCAR meetings and also intersessionally.

Responses to the Call for Comments, the reports of the chief officers, and the accounts offered by members of the Ad Hoc Group who have participated in recent meetings paint a picture that is partly a portrait of frustration. Delegates frequently do not feel engaged. There are various reasons for this. The size of the deliberative group made for a very large plenary body and one that was exceedingly formal (this was prior to the decision to reduce participation at the table to full delegates at XXVI SCAR). Reports, including SCAR financial reports and projections and some reports from operating groups, are not available in advance. Therefore there is less meaningful study and discussion of SCAR plans than there might be. English, the official language of SCAR, presents problems at times for those delegates who do not have English as their first language. There are other administrative and procedural issues, but these are not the main issues in the view of the Ad Hoc Group.

The main issues, however, may have to do with the evolution of SCAR over the years. At one level SCAR sees itself as the central authoritative scientific body for Antarctica, but at another level it has become passive in the planning and coordination of science. It may over rely on action at the level of working groups and groups of specialists and thus is in a "receiving mode" for much of the time it is in plenary. CEP and the science advisory mechanism for CCAMLR have seemingly delimited SCAR's role in providing independent advice. It is for these reasons that the Ad Hoc Group makes its two recommendations about SCAR's mission. But once the mission is refocused, there must be delegates and alternates who are prepared to carry it out. Therefore the Ad Hoc Group makes its third recommendation: that the delegates—at the delegate level—must become more engaged in the management of SCAR. Many of the recommendations that follow are designed to make it possible for delegates to play an active role (see, for example, Recommendation 18, which urges national Antarctic committees to choose delegates with current scientific expertise).

Recommendation 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

The Ad Hoc Group recommends that SCAR establish four committees of delegates that would meet concurrently for a portion of each SCAR plenary to review matters coming before SCAR and initiatives that it may want to undertake, and advise SCAR on the findings, conclusions, or recommendations. The delegate-level committees would be approximately but not necessarily precisely equal in size.

- **Delegate Committee on Scientific Affairs**

The Delegate Committee on Scientific Affairs will advise SCAR on scientific activities and programmes undertaken by the scientific groups at the SCAR operating level and draw SCAR's attention to new scientific challenges that may be emerging from research in Antarctica or research elsewhere that has implications for research in Antarctica. It will consider the timeliness of proposals for disciplinary or interdisciplinary symposia or conferences and make recommendations to SCAR.

- **Delegate Committee on Outreach and Education**

The Delegate Committee on Outreach and Education will make recommendations to SCAR on the effectiveness of SCAR's communication and outreach both in regard to all SCAR activities and also on information about science in Antarctica. It will seek out and make suggestions to SCAR about educational efforts or programmes that can be undertaken by SCAR, its operating groups, by others or in collaboration with other organizations.

- **Delegate Committee for Scientific Liaison**

The Delegate Committee on Scientific Liaison will make recommendations to SCAR on coordination or communication with other scientific bodies including ICSU committees and unions. It will advise SCAR on recommendations for scientific advice sought by the ATS and others, including advice that may be developed by SCAR operating groups.

- **Delegate Committee for Internal Affairs**

The Delegate Committee on Internal Affairs will advise SCAR on internal matters relating to the SCAR Constitution and Rules of Procedure, and similar matters but will have as a principal responsibility to act as an advisory committee to SCAR in the analysis of SCAR's operating expenses and proposed biennial budget. It will also advise initially and in a continuing way on the ways SCAR can improve its information technology and communication systems. The Committee might also serve as an advisor on certain operating level activities; e.g., Antarctic information and data management or other activities where there is an operating group with a long-term mission.

The Ad Hoc Group recommends that each unit at the operating level of SCAR have a communication channel to and working relationship with a vice president and a Delegate Committee. SCAR should determine the distribution of current working groups and groups of specialists among the Delegate Committees, until replaced by the new operating groups. This arrangement should not be seen as an imposition of a bureaucratic layer. Chief officers will continue to report to SCAR delegates and Executive Committee. Instead, the arrangement should be one in which delegates would be able to learn about operating group activities in more detail and provide advice to the plenary meeting of delegates. The vice presidents chairing the Delegate Committees would be informed about some activities of SCAR in greater detail and thus become more effective members of the Executive Committee. If a Delegate Committee turns out not to be active, the president and Executive Committee will have received the communication from a chief officer and can take appropriate action (this is discussed more fully under C below).

All delegates and alternate delegates, and representatives from ICSU unions (should they choose to participate), will serve on one of the four SCAR Delegate Committees. It is envisioned that the Delegate Committees, each chaired by a SCAR vice president, will be advisory to SCAR at SCAR meetings and, intersessionally, to the Executive Committee. At SCAR plenary meetings, the Delegate Committees will meet concurrently for a portion of the SCAR meeting. The Delegate Committees will review reports and recommendations from SCAR groups at the operating level, consider recommendations to other organizations (including the ATS and other ICSU bodies) that may be taken by SCAR in plenary, and consider internal operations of SCAR including its upcoming biennial budget and other matters. From time to time, a SCAR vice president and his/her corresponding Delegate Committee may take up matters such as reports and recommendations from SCAR operating groups and advise the SCAR Executive Committee of its views. The SCAR Executive Committee could also ask a vice president to seek advice from a Delegate Committee.

The Ad Hoc Group discussed the advantages and disadvantages of limiting membership in the Delegate Committees to delegates only but concluded that, so long as SCAR retains its present system of having alternate delegates, the alternate delegates should be nonvoting members of the SCAR delegate committees. Since the committees are advisory, participation of alternates can add useful perspectives while not changing the current policy of having only delegates at the table which SCAR has adopted for plenary meetings. Members of the Ad Hoc Group observed that the participation of alternates on the committees will broaden the base of experience and knowledge about SCAR operations and provide a way for younger scientists to become acquainted with SCAR and prepare themselves to be SCAR's future leaders.

The Ad Hoc Group discussed various approaches to member selection for the Delegate Committees. In the end, SCAR itself must devise the rules for the nomination and selection processes. The Ad Hoc Group believes that some combination of self-nomination and appointment is in order. National committees could be asked to state their first, second, and third committee preferences for delegates and alternates (with delegates and alternates from the same country proposed for different committees). The Executive Committee would array all national committee proposals and then make appointments through the SCAR president. In so far as possible, national committee preferences would be honored. However, the SCAR Executive would also consider balance of expertise, geographical balance, numbers of members on the four committees, etc., in making appointments to the Delegate Committees.

Recommendation 5: SCAR vice presidents should have titles corresponding to their portfolios, e.g., Vice President for Scientific Affairs.

Except for the vice president who has served as chair of the Standing Finance Committee, those who are elected as vice presidents of SCAR have not had specific duties, other than to serve as members of the SCAR Executive Committee. During its deliberations, the Ad Hoc Group concluded that in addition to a greater engagement of SCAR delegates in the affairs of SCAR, it was also desirable to have the vice presidents more engaged with defined vice presidential roles. In this way they can assist the president in the overall leadership and management of SCAR, and become more effective members of the Executive Committee. Accordingly, the Group recommends assigning each of the four vice presidents a specific portfolio with the portfolio responsibilities being those discussed under Recommendation 4.

Recommendation 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.

The Ad Hoc Group benefited from the participation of a current member and two former members of the Executive Committee. The Group was able to learn first hand of the roles played by the Executive Committee at SCAR meetings and intersessionally. The Group believes that the Executive Committee has

functioned comparatively well, but noted that if the members had specific portfolios of responsibility, the Executive Committee could achieve a new level of effectiveness, especially for its intersessional work.

As the working or operating level of SCAR becomes more active intersessionally, which also is a recommendation of the Ad Hoc Group, from time to time a chief officer, on behalf of his or her operating group, might forward proposals or recommendations for a scientific programme or other matters. Rather than holding these for the next SCAR plenary, the Executive Committee could consider these proposals or recommendations from chief officers along with other matters they take up intersessionally. If in the judgement of the Executive Committee the proposal should be held in abeyance until the next SCAR plenary, it can remand the requested action to SCAR.

Recommendation 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.

Most officers who have served SCAR over the years have enjoyed a modest level of support at their home institutions. The institutions have provided secretarial assistance, assistance with communications, postage, etc. In some instances, the home institutions of officers have contributed to travel. In deciding whether to stand for office as an officer of SCAR, delegates should ascertain that they would receive some level of administrative assistance. However, the Ad Hoc Group does not believe such assistance should be a pre-condition of eligibility for candidacy for office. Such a policy could serve to exclude delegates whose national committee and home institution have modest resources when compared to others. The Ad Hoc Group believes that SCAR should consider budgeting modest funding to support its officers at their home institutions (see Section III, Cost Implications, for details).

Recommendation 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.

The Ad Hoc Group's final area of examination in its review of the operations of SCAR at the level of SCAR was to consider the long-standing practice of having the past president of SCAR serve a four-year term ex officio. This practice means that the past president participates in the SCAR meetings and meetings of the Executive Committee throughout the term of his or her successor. In its experience, the Group found few precedents for such a lengthy transition. Many professional scientific societies provide for a past president to serve a term of a year in that capacity. Most academic institutions have no provision for a former president's continuing role in management nor do most industrial or business organizations.

Because of SCAR's mission, including providing high-level scientific advice to the Antarctic Treaty System and others, the case can be made for some period of transition in which a past president is formally available and a participant in ongoing SCAR deliberations. On balance, however, the Ad Hoc Group

concluded that a four-year transition was too lengthy. The newly elected president must have the freedom and the responsibility to lead SCAR during his or her term of office. Therefore, the Ad Hoc Group recommends that the ex officio service of a former president be shortened to a year or at most two years.

C. Creating Responsive and Flexible Mechanisms at the Operating Level to Plan Science and Respond to Needs for Scientific Advice

Forty years ago, Antarctica was largely unexplored scientifically. The urgent task at hand was to conduct basic scientific research in all relevant fields of science. SCAR began with a system of working groups representing the main scientific disciplines involved in research in Antarctica. In part the disciplinary groups were a carryover from the IGY, which had been planned with disciplinary-oriented committees. Very early on, however, a new kind of organization was needed to address interdisciplinary research, especially research that had regulatory implications, for example, understanding the dynamics of fish populations to inform policies on fishing limits. In 1972, SCAR created a Group of Specialists on Seals to support the Convention for Conservation of Antarctic Seals, and groups of specialists have become a second mechanism for SCAR work. Today the situation has evolved still further. Researchers themselves are much more involved in interdisciplinary research, for example, understanding causes and effects of global climate change or geological processes of plate tectonics, crust-mantle interactions, or convection in the Earth's mantle. There is also rapidly increasing interest in environmental protection of Antarctica and conservation of natural resources on land and in the surrounding oceans.

Today, SCAR faces a range of scientific opportunities and demands for information and advice on matters concerning Antarctica and the Antarctic region's role in global scientific processes. SCAR needs a range of mechanisms to respond in terms of focus, member expertise, and duration. Some issues are basic and long-term and warrant a standing group. Others, such as the planning and implementation of a major international scientific research programme, require a group that lasts for 8 or 10 years to see it through. More and more, groups that can be assembled quickly to address an immediate question or problem will be called for. Given the faster pace of change in scientific research and more rapid changes in the Antarctic policy agenda, SCAR's scientific groups will need to function to a greater degree between biennial meetings of SCAR. The justification for each group should be reviewed periodically for relevance as well as level of activity and effectiveness.

Recommendation 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.

When SCAR began more than 40 years ago, its activities were carried out through committees called working groups representing the main Antarctic scientific disciplines. Currently, there are eight working groups on:

- Biology
- Geodesy and Geographic Information
- Geology
- Glaciology
- Human Biology and Medicine
- Physics and Chemistry of the Atmosphere
- Solid-Earth Geophysics
- Solar-Terrestrial and Astrophysical Research

The main purpose of working groups is to carry out SCAR's mission of initiating, promoting, and coordinating international science in their area of scientific research, especially by developing international science programmes of circumpolar scope and significance. The working groups keep under review matters dealing with the integrity of the Antarctic environment and provide scientific and technical advice on behalf of SCAR. Additionally, they maintain linkages with other international scientific organizations with an interest in science in Antarctica, and encourage exchange of information and scientific personnel and cooperation among national Antarctic programmes.

Each national member of SCAR may nominate a representative to each working group. Only representatives of full members may vote in working group meetings. Most working groups meet during the first week of the two-week SCAR meeting held every two years. At this time, each working group develops its plans and a budget request for activities such as workshops and symposia during the next two years, which is submitted to the Meeting of Delegates for approval.

Many international Antarctic research programmes have come out of scientific workshops held by SCAR working groups, such as BIOMASS and RISP (Ross Ice Shelf Programme). BIOMASS, in turn, was the direct precursor and important input to CCAMLR. Among other important working group accomplishments are ANTOSTRAT, a catalogue of offshore reflection seismic profiling data, development of the Antarctic Digital Topographic Database, publication of the Composite Gazetteer of Antarctica, and establishment of continuously operating international networks of geophysical (AGONET) and geodetic (GIANT) observatories in Antarctica. The BIOTAS programme on terrestrial ecosystems, which examined the effects of increased ultraviolet radiation on terrestrial organisms, among other projects, is being replaced by a new programme, RiSCC (Regional Sensitivity to Climate Change in Antarctic Terrestrial Ecosystems).

The other mechanism for carrying out SCAR's mission is the group of specialists. Groups of specialists are created for specific scientific purposes and usually only last for a limited number of years. Currently there are four groups of specialists on:

- Seals (1972)
- Environmental Affairs and Conservation (GOSEAC) (1988)
- Global Change and the Antarctic (GLOCHANT) (1992)
- Antarctic Neotectonics (ANTEC) (1998)

Other groups of specialists have come and gone over the years, having fulfilled their missions. These included, for example, Groups of Specialists on Southern Ocean Ecology, Structure and Evolution of the Antarctic Lithosphere, Cenozoic Paleoenvironments of the Southern High Latitudes, and Sea Ice.

In addition to being created for a specific purpose and a limited time period (usually ten years), the basis for membership in a group of specialists is different. Members are appointed by the Executive Committee for their expertise. Not all member countries need be represented, there may be more than one member from a SCAR member country, and members may be selected from countries that are not SCAR members. Typically, there are fewer members, approximately 6-8, compared with working groups that may have up to 26 members. Because groups of specialists are created and their members appointed by the SCAR Executive Committee, SCAR rather than national Antarctic committees pays travel expenses for meetings.

SCAR groups of specialists are engaged in a number of international cooperative research activities. The Group of Specialists on Seals is conducting a five-year programme of research on Antarctic pack-ice seals, which is providing key information for administration of the Convention for the Conservation of Antarctic Seals and for other intergovernmental organizations (e.g., CEP, CCAMLR, and International Whaling Commission) and for scientific organizations (e.g., SCOR and GLOCHANT). GOSEAC is supporting environmental protection of Antarctica by providing the scientific basis for environmental monitoring, environmental impact assessment, and management plans, and by reviewing management plans for protected areas.

In 1991, SCAR established a steering committee for the IGBP to plan a regional programme of global change research, which was published in 1993 as *The Role of the Antarctic in Global Change*. GLOCHANT was created in 1992 to coordinate global change research outlined in the plan. GLOCHANT, which is carrying out SCAR's Global Change Programme, has seven programme activities, all of which contribute to the relevant programmes of IGBP and WCRP. Several have been mentioned already—ANTIME, ASPeCT, BIOTAS, and ITASE. The others are EASIZ (Ecology of the Antarctic Sea-Ice Zone), ISMASS (Ice Sheet mass Balance and Sea-level), and PICE (Paleoenvironments from Ice Cores).

There is also a SCAR-COMNAP Joint Committee on Antarctic Data Management (JCADM). JCADM was created to develop a plan for the coordination and management of Antarctic data, taking into account SCAR's programmes and needs of the Antarctic Treaty System. The Group is developing an Antarctic Data Directory System, a metadata system comprising National Antarctic Data Centers linked to an Antarctic Master Directory.

The Ad Hoc Group feels strongly that organizing SCAR's working groups around traditional scientific disciplines is no longer an appropriate structure for encompassing SCAR's scientific work or responding to demands for information and advice from ATCMs or other Treaty-related bodies (e.g., CCAMLR, CEP, and COMNAP). SCAR should replace its structure of subsidiary groups with a set of operating groups that are more varied in purpose, membership, and life

span.² These operating groups would offer SCAR the capacity to respond more quickly and flexibly to new scientific opportunities and problems (e.g., exploration of Lake Vostok, changes in ice sheet mass, rapid retreat of sea ice). Other groups would respond to demands for objective scientific knowledge on important public policy issues (e.g., human impact on the Antarctic environment, periodic review of effects of global climate change on Antarctic, role of the Antarctic ice pack and deep ocean dynamics in global change processes). Other operating groups would have managerial functions, for example, data management.

Some operating groups could be “action groups,” appointed to address a specific need quickly and then disbanded within a few years or months. Others might be created to plan and coordinate a specific international scientific programme and would therefore be expected to last about a decade. Some could be established to oversee long-term scientific activities, such as data management or research in a particular disciplinary or interdisciplinary area in which frontier research opportunities are promising. In all cases, operating groups would be evaluated at regular intervals to ensure that they are still relevant and effective.

The Ad Hoc Group recommends that the shift from the current system of working groups and groups of specialists to the new system of operating groups be undertaken between the XXVI SCAR meeting in 2000 in Tokyo and the XXVII SCAR meeting in 2002. Criteria for establishing new operating groups (discussed below) should be promulgated at or after XXVI SCAR. Existing groups should be permitted to justify their continuation under the new structure during the two-year review cycle. It may be that some of the current groups will be retained in some form. The new operating group structure would be agreed on at XXVII SCAR. Subsequently, however, each operating group should undergo a formal review every six years and an active decision made at the SCAR Meeting of Delegates to continue or disband it.³ At that time, the appropriate Delegate Committee should review the need for the operating group according to the criteria adopted by the Meeting of Delegates and make a recommendation to continue, reorganise, or phase out the group, depending on how relevant, active, and effective it is, and on the quality of its work. The criteria should be updated periodically, as well.

Each national member of SCAR would have the option to nominate a representative to each operating group and be responsible for paying their expenses. In the case of more focused, problem-oriented groups, such as the proposed action groups, it may be necessary to supplement national representatives with additional members based on their expertise. These additional members may be from the same country as a member nominated by a

² These groups could well be called “working groups” except that term is now identified with SCAR’s existing system of groups organized around traditional scientific disciplines. Thus the Ad Hoc Group adopted the term “operating group.”

³ Under the current Rules of Procedure, subsidiary groups such as working groups and groups of specialists are officially approved at the biennial Meeting of Delegates, but this has usually been pro forma. The Ad Hoc Group believes that this process should become more intensive to ensure that SCAR stays up-to-date in a fast-changing organizational environment.

Figure One, New Organisation of SCAR,
goes here.

national member or they may be from a country that is not a SCAR member. In these cases, the authority to make the appointments should rest with the SCAR Executive Committee and SCAR should pay their expenses.

In sum, the new system of operating groups would provide SCAR with a continuum of mechanisms that can be matched to the expected time urgency of each activity, ranging from quick turnaround studies to sustained long-term research and data management programmes. The proposed operating group system should result in science at the cutting edge of research or meeting the key needs of policy makers. This will enable SCAR to respond to opportunities and needs more flexibly, more quickly if needed, and with a strong base of state-of-the-art scientific knowledge and understanding. In this way, SCAR will be in a better position to be the leader in science in Antarctica and the recognised provider of high quality and objective scientific information and judgement concerning Antarctica and surrounding oceans.

The organizational structure that the Ad Hoc Group is recommending, at both the delegate and the operating group levels, is illustrated in Figure One. The Ad Hoc Group believes that the proposed organizational structure offers several advantages when compared to the existing organization. The proposed organization is clear and will clarify the understanding of SCAR as an organization by both those within SCAR and those looking at SCAR from the outside. It increases the engagement of all the delegates and the Executive Committee in scientific leadership and management of the organization. The organization permits flexibility for rapid response by SCAR to scientific opportunities and challenges and to the need for objective, independent scientific advice to the ATS and others.

D. Improving the Planning and Decisionmaking Functions over the SCAR Biennial Cycle

The Ad Hoc Group spent considerable time discussing effective planning and scheduling of SCAR activities over a SCAR Biennial Cycle. In stating the problem in these terms, the Ad Hoc Group wants to call attention to the inadequacies of current practices and describe its vision of how the SCAR biennial cycle might flow more effectively in the future.

Recommendation 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 well-informed decisions.

At present, there are too frequent disconnects in the SCAR cycle, that is, points at which information needed for informed decisionmaking is not available or arrives too late for meaningful review. For example, a working group depends on its meeting during the first week of the two-week SCAR meeting to have substantive discussions about programme plans. The working group's discussion may include a proposal for a symposium it wishes to sponsor or a scientific problem that could be ripe for more concentrated scientific planning by SCAR. Thus proposals and plans for scientific work are just completed when the Meeting of Delegates begins to consider them. This gives the standing

committee on finance a limited opportunity for analysis prior to final preparation and submission of a proposed consolidated budget to the SCAR delegates. And the finance committee cannot present its financial recommendations to SCAR until the second week of the SCAR meeting, when the plenary is beginning, thus depriving delegates the opportunities to review the proposals with their respective national committees, or of having much time to consider them before voting on them. If there were a cogent case for a significant change in the SCAR operating budget, the chances of its being adopted are less, because there would be limited time for review, and in the case of some delegates, at least, consultation at home.

The Ad Hoc Group believes that a number of the present problems arising from the current programme planning process would be solved if SCAR would work electronically and on a schedule that circulated information well in advance of the point of decision. For example, operating groups should meet electronically or face-to-face four to six months before the biennial SCAR meeting of delegates to develop their biennial programmes. This would enable chief officers to submit their plans with budgets to the SCAR staff and the Vice President for Internal Affairs several months prior to the SCAR meeting. The Vice President for Internal Affairs would then work with the Delegate Committee on Internal Affairs electronically and have a draft budget ready for general review and circulation at least one month prior to the SCAR meeting.

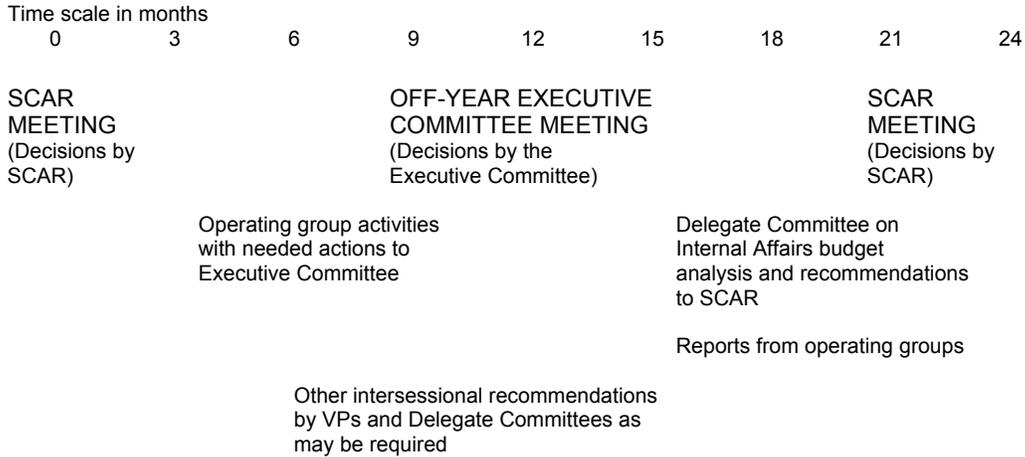
If an operating group believes that it needs to have a face-to-face meeting of its members to prepare its report to SCAR, that meeting should not take place the week just prior to the SCAR meeting but instead be held four to six months in advance. However, in many instances, the operating group could work electronically and not have to hold a separate face-to-face meeting in advance of the SCAR meeting. If an operating group works electronically to develop its biennial plans and budget request, it could still have a face-to-face meeting in conjunction with the SCAR meeting. In any case, the chief officer should be required to submit a report and a budget several months prior to a SCAR meeting.

It is not the intention of the Ad Hoc Group to increase the number or length of face-to-face meetings and thus the expenses borne by SCAR or national committees, but instead to plan effectively the schedule of meetings so that information needed for SCAR decisionmaking is available in a timely way. An improved planning cycle would have benefits at the SCAR meeting. It should leave more time for discussions of science at the meeting of delegates as well as by operating groups, a day-long meeting of the chief officers with the Executive Committee, and a longer meeting of SCAR with COMNAP, to name a few.

SCAR must work out the details of a revised planning process for the two-year cycle of activity between meetings of Delegates. And it must then consider and develop a new agenda for the two-week biennial meeting, because it would be possible to restructure—perhaps dramatically—the meetings of SCAR, its operating groups, with COMNAP, and between the Executive Committee and the chief officers. This would make the two-week biennial session richer and more productive. In general, as the Ad Hoc Group envisions the planning process, the two-year cycle would be approximately one that is illustrated by Figure One.

If a planning process and informational flow along these general lines were adopted, the Ad Hoc Group believes SCAR would be a much more robust and effective committee. Members of SCAR and its operating groups would see more clearly the need for planning, recommendations, and the SCAR decision cycle.

Figure Two: The Two-Year SCAR Planning Cycle



E. Modernizing SCAR's Internal and External Communication Systems

Responses received to the Call for Comments, the chief officers' responses to the request to them for information about the working groups and groups of specialists, and a few discussions with those outside of SCAR but knowledgeable about SCAR had several common and frequently recurring themes related to communications. Poor communications, in short, has been identified as one of the major problems in the effectiveness of SCAR as an international science coordination organization and as the major advocate for Antarctica and its benefits to society. The internal flows of information among the elements of SCAR are weak and sporadic. Documents for plenary sessions, including financial projections for the upcoming biennial cycle, are not circulated very far in the advance of a plenary, if at all. Reports from chief officers are not routinely received on a time cycle that permits circulation to delegates and national committees well in advance of a plenary. Communications with other scientific organizations are not seen strategically as serving to maintain SCAR's preeminence as the principal scientific body for science in Antarctica and the surrounding oceans. Unless one is on the "inside" it is difficult to find out about SCAR and its activities because this information is not consistently presented through Internet posting, or, in printed form. Moreover some of the material is outdated when it does appear. These observations concerning inadequate communications were supported by first-hand experiences of members of the Ad Hoc Group.

Excellent communications systems within SCAR and between SCAR and external organizations are essential if SCAR is to be able to respond to the changing environment in which it operates. The main issues in communications confronting SCAR at present fall into two major areas: 1) internal communication within SCAR, and 2) SCAR's external relations and communications with a wide range of organizations with Antarctic interests. The communication systems and protocols for these two areas have a number of common issues. Five stand out:

- Utilisation of electronic-based communication (E-mail and web) and protocols for using these tools;
- Procedures for encouraging rapid action/response for SCAR business;
- Balance between formal communication style compared with direct simple English (largely a case of words and expressions used);
- How to accommodate the use of English-only when for many SCAR members it is a second language; and,
- A more positive and aggressive mode of communicating about SCAR activities and Antarctic science in general to the external community.

The Ad Hoc Group spent considerable time on ways to improve internal and external communications.⁴ Strategically, effective flows of information are essential to the overall revitalization of SCAR so that it is positioned to be a leader in today's world of rapid and essentially universal communication.

Recommendation 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.

The Ad Hoc Group recommends that, as a matter of high priority, the Vice President and the newly formed Delegate Committee for Internal Affairs give immediate attention to issues of SCAR internal communications and make recommendations to SCAR on ways to improve the effectiveness of internal communications.

The Group discussed a variety of issues that need SCAR's attention. Some of these are best described as development of protocols as to what is expected by way of communication. For example, ensuring that all documents and messages have a date, name of originator and response deadline with a minimum of a "nil response" as a courtesy reply with these documents in each instance copying the SCAR Executive Office. Or ensuring that E-mail is formatted at the highest level that members of a group can handle. Other issues have to do with strategies for *increasing* the interaction between SCAR, chief officers, and among chief officers. Several of the chief officers felt that a longer meeting *among* the chief officers at the time of the SCAR plenary could be productive as a means of sharing practices and discussing common issues. Additionally it was suggested

⁴ It should be noted that this discussion of internal and external communication systems refer to the strategy *of and for* communication, protocols for communications, timeliness of information, English as the SCAR language, etc. The Groups' discussion of information technology and networks, etc., is summarized in Recommendations 14 and 15.

to the Ad Hoc Group that the SCAR meeting offers a unique opportunity for more interaction between the chief officers and the Executive Committee.

Another issue to be explored is the question of formal communication style compared with direct simple communication. The Ad Hoc Group believes that communication in many instances is too formal or stilted. Simple direct language would better convey objective and also the dynamic and exciting aspects of coordinating science in Antarctica and the Southern Oceans. Formal communication, e.g., SCAR recommendations, should be in the style expected by external organizations, e.g., ICSU or national committees. SCAR should, however, undertake a review of this requirement and suggest modifications as appropriate to facilitate its own work.

The Vice President and Delegate Committee for Internal Affairs should explore these and many similar issues and make recommendations to SCAR.

Recommendation 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.

The Ad Hoc Group recommends that as a matter of high priority the Vice President and Delegate Committee for Scientific Liaison be assigned the task of thinking out and making recommendations to SCAR on ways to improve its external communications. The objectives should include: making SCAR and science in Antarctica much more known and transparent among comparable scientific organizations and creation of improved communication strategies for working with other bodies concerned with the Antarctic, including ATS (CCAMLR and CEP), COMNAP, and ASOC. A third objective is creating an informational site on the worldwide web where the public can access information about science in Antarctica and the surrounding oceans and SCAR.

Some starts have been made by SCAR toward improved external communications. Four of the working groups/groups of specialists have their own web sites and home page. The SCAR web site has recently been improved, although much more work is needed. Should all operating groups have web sites on the SCAR web site or hyper-linked to it from other sites, e.g., sites maintained by GLOCHANT and JCADM? Should a list-serve mailing list be created and maintained so interested subscribers could receive late breaking news about research findings, conferences, symposia, etc.?⁵ Should SCAR identify an active liaison person for each major organization having an interest in Antarctica and encourage that individual to maintain better two-way communication? What is the most desirable way to maintain more continuous

⁵ The Ad Hoc Group was briefed on the operations of a web site and list serve communications system for the Arctic research community. While maintained by the Arctic Research Consortium of the U.S., it serves the international Arctic research community. The web site and list serve messaging system is an example of what SCAR could do to serve the Antarctic research community, organizations interested in science in Antarctica, and the interested public.

contact with COMNAP? Should COMNAP or a few national programmes be asked to assist SCAR financially for this purpose? These and other issues of external communications should be examined by SCAR.

As is the case of the Vice President and Delegate Committee on Internal Affairs, the Vice President and Delegate Committee on Scientific Liaison should have as an early assignment to examine the issues of improved external communications, and should make recommendations to the Executive Committee and SCAR.

Recommendation 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.

In its operation, the Ad Hoc Group was itself a microcosm of SCAR in that half its members did not have English as their native first language. The remaining members had several varieties of English as a first language. The Group's mission dealt with management principles, organizational and communication theory, and the way professional scientific societies and international scientific organizations function. At times the Ad Hoc Group was discussing terminology unfamiliar in the first instance to some of its members and in the second instance difficult for those who did not have English as a first language to understand. The work of the Ad Hoc Group—in its meetings and electronically—provided a constant reminder that effective use of English as a common language requires work and commitment to ensure that all understand documents, agenda items being discussed, prospective recommendations, etc. and are fully participating in the meeting discussions.

Effective communication within SCAR and by SCAR to other organizations requires participation by all members if SCAR is to be the 21st Century leader the Ad Hoc Group visualises. Members must understand proposals and be supportive, based on a clear understanding, not a partial understanding or impression of what has been discussed. The onus is on English as-the-first-language members of SCAR and its operating groups to insure that all understand transactions taking place in English. . Chairmen of meetings, for example, chief officers, should have guidelines on how best to ensure all participants fully understand what is being discussed and have an opportunity to participate.

The Ad Hoc Group recommends that SCAR establish a temporary working group or action group of its members who do not have English as their first language to make recommendations on ways to maximise the effective use of English as the SCAR language. The group should be established at XXVI SCAR, for one year, after which time it would report its recommendations on ways to make SCAR meetings more effective. The action group's recommendations should also provide guidance to the operating groups on the ways they can improve effectiveness of the use of English at their meetings.

F. Creating a SCAR Executive Office for the 21st Century

The changes that are proposed for the renewal of SCAR's mission and strengthening of its operating mode must be strategically linked to a transformation of the secretariat into an Executive Office able to support SCAR's more proactive stance and expanded communications systems. The Executive Office must be a more active and authoritative leader in SCAR's internal operations, which is key in making SCAR a stronger organization overall, and the Executive Office also must be more active in SCAR's relations with other scientific bodies, ATS organizations, and the public.

Recommendation 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.

The purpose of this recommendation is to give SCAR the staff capacity it needs to be a strong and proactive leader of research in Antarctica in the future. The staff of SCAR should be, and already is, more than a passive reporter of SCAR activities and keeper of its records. It is now time to formally acknowledge the need for an energetic Executive Director and Office to assist in planning and carrying out SCAR's mission and provide the staff resources to make SCAR more effective.

SCAR's secretariat dates from 1959, when Gordon Robin, Director of the Scott Polar Research Institute, Cambridge, UK, was elected Secretary of SCAR and engaged a part-time secretary to assist him. The secretary position became full-time in 1963. Meanwhile, in 1962, SCAR hired a part-time Assistant Secretary to assist Dr. Robin, who was re-elected SCAR Secretary until 1970, when he was elected president of SCAR. The Assistant Secretary position was changed to Executive Secretary in 1972, but the position only became full-time in 1989. The secretary position was upgraded to Administrative Assistant in 1998. This staff of two—an Executive Secretary and an Administrative Assistant—performs between them all the staff functions of SCAR. The secretariat has evolved over the years as the scope and size of SCAR's activities have expanded. In the beginning the main activity of the Secretariat was to organise and record SCAR meetings, publish bulletins and reports on these and other meetings and activities of SCAR (e.g., reports of working groups and groups of specialists, reports on ATCMs, etc.), and manage the financial accounts. Over time, the Executive Secretary has come to represent SCAR at international meetings and has taken on development of a web site for internal and external communications.

The next step in the evolution of SCAR staffing -- the one needed at this time -- is upgrading the activity from secretariat to Executive Office. This is required to enable SCAR to carry out its mission in today's environment. Such a move may be seen by some as merely symbolic, because the current secretariat has been expanding its executive functions along these lines for some time. The Ad Hoc Group believes, however, that implementation of its recommendations will require enough additional expansion of the role of the staff to justify re-titling the office and staff director to indicate clearly what they should be, and staffing the Executive Office accordingly. The Group also notes that most organizations

comparable to SCAR have already taken this step for similar reasons, for example, SCOR and COSPAR.

In particular, the new planning cycle (see Part D above) will function much more effectively if staff assists the Executive Committee in analyzing the proposed programme plans and budget requests from operating groups in preparation for SCAR meetings. Staff should also have the capacity to assist SCAR operating groups, for example, Action Groups responding to requests for scientific advice from ATS bodies and other organizations, in synthesizing relevant knowledge and/or identifying and analyzing options (see Part B above). Staff will play a key role in developing the internal and external communications systems needed to make SCAR the recognised leader in research matters concerning the Antarctic region (see Part E below). The Executive Director will also be called on to seek funding from philanthropic sources for expanded and new activities of SCAR (see Recommendation 17 below).

The new Executive Office should consist of three positions: Executive Director (upgraded from the current Executive Secretary position), Programme Officer (a new position), and Administrative Assistant (an existing position).

The qualifications and duties of the Executive Director should be:

The SCAR Executive Director serves as the organization's chief staff officer and is responsible for managing its activities. Working with the president, other officers, and chief officers of operating groups the Executive Director is responsible for planning SCAR's biennial cycle of activity and ensuring the timely flow of information, preparation of reports, and preparations for SCAR meetings. He/she represents SCAR at meetings of operating groups and in other scientific fora, including ICSU where appropriate. The Executive Director, working with the Vice President for Internal Affairs, prepares budgets, and is responsible for SCAR expenditures. He/she supervises the work of the programme officer and administrative assistant and manages the Executive Office. Qualifications include background in an area of research that is carried out in Antarctica, experience with international scientific organizations, and demonstrated leadership and administrative capability.

The duties and qualifications of the Programme Officer should be:

The Programme Officer will assist the Executive Director in implementing the policies established by SCAR delegates and Executive Committee. Duties include programme coordination, analysis of scientific issues concerning the Antarctic region, proposal preparation, project administration, publications and reports, and organizing meetings and workshops. The Programme Officer should have an advanced degree, preferably in a scientific discipline relevant to research in Antarctica and the Southern Ocean, plus experience or interest in international scientific research and collaboration. He/she should also have excellent communication and organizational skills.

Recommendation 15: SCAR must improve its infrastructure and capability to use information technology for internal and external communication.

The Ad Hoc Group believes that modern communications technology will enable SCAR to function much more effectively as well as efficiently and respond more quickly to opportunities and needs. For example, SCAR will be able to conduct its work between the biennial face-to-face meetings through electronic means—email and the web site. Externally, SCAR will be able to reach a far greater audience of researchers, policy makers, and the public (including students who might become interested in careers in Antarctic research). A much more aggressive information technology programme is needed and the use of technology must permeate SCAR's operations.

The information technology (IT) capacity of members of the SCAR community—national Antarctic programmes, delegates, members of operating groups, Antarctic researchers—is currently uneven, but it is clear that in the near future, everyone will be on the Internet. Although regular mail may be necessary in some cases for some time to carry out SCAR business, SCAR should begin to develop the infrastructure to exploit the opportunities offered by the Internet today and in the future. This will depend in large part on the Executive Office capacity to maintain the SCAR web site and to expand it to include additional capabilities, for example, list-serve mailing lists and information that supports SCAR's increased efforts in outreach and education.

Currently, the secretariat has two desktop computers purchased in 1995. Although they have been upgraded, they are still slow and limited in capacity. The computing capabilities of the Executive Office should be analyzed by a consultant to determine what is needed for the degree of electronic communication, web site development, and electronic publications envisioned in this report. The expanded communications programme will also take more staff time, especially of the Programme Officer and Administrative Assistant.

The goal of expanded information technology capability is the improvement of information flows internally within SCAR and externally to other scientific organizations, the ATS, other organizations, and the public. The Ad Hoc Group believes SCAR and its operating groups could transact much more business electronically today than is being presently conducted. However, at every step in the meeting of this goal, a balance must be struck between the capacities of SCAR members, what is possible technologically today, and what will be possible in the future when technologies such as videoconferencing become more ubiquitous.

Recommendation 16: To enable the Executive Office to be more proactive, larger facilities will be required and support services for the Office will need to be upgraded.

The SCAR secretariat was originally located at the Scott Polar Research Institute (SPRI), because that was where the elected Secretary of SCAR was based in the early years. This location has other advantages: it is in a university rather than a government institution, which reinforces the nonpolitical image and nature of SCAR. SCAR does not have to pay rent for office space or use of the facilities

of the Institute. It is also in the same building as one of the finest polar libraries in the world.

The upgraded and expanded Executive Office will need more space and an adequate IT infrastructure. Hopefully, this can be provided by SPRI, so that SCAR can benefit from its co-location in a distinguished academic polar research institution. The web site could be hosted offsite. If, however, there is no more space for staff at SPRI, other office space will need to be secured.

Recommendation 17: SCAR should expand its financial resources by actively seeking philanthropic funds for some activities.

SCAR should actively seek outside funding for its activities. In 1967, the Ford Foundation gave a grant to SPRI to help fund a major renovation and expansion of its building, which had a proviso that there be space for SCAR. More recently, a few programmes have had outside support. Philanthropic and national programmes are not as likely as they once were to provide on-going general support for an organization like SCAR. They prefer to fund activities for which they can see specific results. SCAR should be able, however, to find support for particular scientific programmes, for example, in the environmental area. The planning and/or synthesis phase of research programmes might attract support from governmental research funding agencies. Life in extreme environments, a major new interdisciplinary theme, might be of interest to national space agencies looking for terrestrial models analogous to conditions found elsewhere in the planetary system. Another activity that might attract one-time philanthropic or governmental funding would be creating the public education component of the SCAR web site, or an outreach component aimed at creating interest in Antarctic research careers among students and younger scientists. This effort to raise more outside funds for SCAR-related activities will also call for additional staff resources.

G. Renewing Commitment to SCAR at the National Committee Level

At the end of the day, SCAR will be effective only if the national Antarctic committees or other bodies which are SCAR members are committed to creating a SCAR for the 21st Century. National committees, among other responsibilities, must nominate well-qualified delegates and alternate delegates. They must also reflect a commitment to SCAR's future by encouraging a new generation of scientists to become engaged in research in Antarctica and the surrounding oceans. And national committees must encourage younger scientists to become engaged in SCAR and SCAR operating groups.

Recommendation 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.

National delegates constitute the governing body of SCAR. As a group, they approve SCAR policies and programmes. If SCAR is going to be the leader in research in Antarctica and recognised source of objective scientific advice on

matters concerning Antarctica, its leadership should be scientifically qualified and active in a field of research concerned with Antarctica. At present, many but not all delegates are scientists. Some of the recommendations in this report aimed at strengthening SCAR's scientific mission call for greater participation of delegates—through the new Delegate Committees—in reviewing and evaluating the programmes and proposals of the scientific operating groups and other activities of SCAR. This responsibility in turn places even greater emphasis on choosing delegates for their scientific backgrounds among other qualifications, preferably current experience in research in Antarctica.

Recommendation 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.

Continued progress in science in Antarctica ultimately relies on the energy and creativity of young new scientists who choose to make their careers in research in or on Antarctica. The major responsibility for encouraging entry of new scientists lies with the national programmes. National programmes and academies or other adhering SCAR bodies may also expose their young scientists to international science by involving them in SCAR operating groups where the science is planned and coordinated. This will not only add to the operating groups, it will enrich the careers of these scientists and also ensure that there is a cadre of scientists qualified to ascend to leadership roles in national programmes and in SCAR. National committees in their own activities, and in their work with those responsible for national research programmes in Antarctica, should continue to give attention to the participation of younger scientists in research in Antarctica and in SCAR and its operating groups.

H. Implementing Change during a Two-year Reorganization Period.

The Ad Hoc Group's eighth strategy for revitalization concerns the process of change within SCAR. The Group believes that SCAR must act quickly to renew its mission and its activities in order to maintain its relevance as the authoritative organization for science in Antarctica or run the risk of losing relevance.

Recommendation 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.

The Ad Hoc Group deliberated at length about the options SCAR confronts as it reviews and adopts the recommendations of the Ad Hoc Group. Based on their experience in various settings, Group members understand the tensions associated with organizational change. There are two compelling considerations that led the Group to make this recommendation. First, there is the urgent need to put a structure in place at the level of SCAR that engages delegates, alternate delegates, and vice presidents more fully in the work of SCAR. Second, using

the new structure at the SCAR level to begin the process of reviewing and reorganizing operating groups at the scientific working level of SCAR will be a re-energizing force for SCAR.

Some may argue that change should follow a considered review and rewriting of the Constitution and Rules of Procedure. Until these constitutional provisions have been achieved, change should not go forward. Others believe that "form should follow function." The revised Constitution and Rules of Procedure will have greater likelihood of endurance over some years if they are drafted after the new operating modes are in place and the new organizational units have begun to function. The Group considered these alternative approaches. The critical need is to begin a timely process of change in an organization that meets on a biennial basis. A measured, or "constitutional approach" could conceivably take four or even six years to put in place fully. In a protracted cycle of even four years, the Group believes SCAR is in danger of losing relevance. The Ad Hoc Group was also mindful that ICSU must be consulted about the "suspension" of the Constitution and Rules of Procedure and that revisions ultimately must be consistent with ICSU procedures. The Group thinks, however, that the early initiation of change is the most critical issue for SCAR.

Therefore, on balance, it is the Ad Hoc Group's judgement that SCAR, if it chooses to adopt many or most of the organizational and other recommendations proposed by the Ad Hoc Group, should go ahead with the reorganization at the SCAR level quickly. The then newly organised SCAR Delegate Committees led by vice presidents with portfolios can begin to function. SCAR, with the advice of the SCAR Delegate Committees, would participate in the review of SCAR units at the operating level and consider the by-law changes it needs to adopt during the two-year cycle between the XXVI SCAR and XXVII SCAR meetings. SCAR should advise ICSU that it is in the process of organizational change and seek consent to waive some of its present rules and procedures and proceed with the implementation of the reorganization it wants to adopt.

III. Cost Implications of the Recommendations

If adopted, the recommendations in this report will have an impact on SCAR's budget. Some will increase costs; others will decrease them. The net effect will be to increase the annual level of operating costs somewhat but also annual revenues, from approximately US\$300,000 a year to US\$370,000 a year.⁶ It will not be necessary to increase the annual contributions of members at this time.

Increased Costs

Creation of the Executive Office will increase administrative costs. The Ad Hoc Group believes that this investment in an adequate Executive Office is well worthwhile because it will greatly increase SCAR's effectiveness in fulfilling its mission. It will also enable SCAR to actively seek outside funding for some activities, which will help offset higher staffing costs (see below). The upgrade of the staff director position to Executive Director would cost about \$12,000 more a year in salary and benefits (e.g., pension fund). Hiring a Programme Officer will cost about \$54,000 a year for salary and benefits. This would increase the overall administrative costs from approximately \$110,000 a year to \$173,500 (this includes lower postage costs—see below). This amount also includes \$10,000 for computer and other office equipment, which will be needed to build the increased communications capacity recommended in this report over the next several years. This also will be money well spent.

The other new cost will be travel expenses for some members of operating groups. This expense is difficult to forecast, because it remains to be seen how many operating groups there will be and what the need for support will be. In the short run, it should be approximately what SCAR is spending on groups of specialists—\$39,000 in SCAR meeting years, \$30,000 in alternating years.⁷

Offsetting Reductions

Currently, SCAR is contributing \$26,000 a year to support the Global Change Programme Office in Hobart, Tasmania. It would be more effective, as well as cheaper, to consolidate SCAR's administrative functions in one location.

If the recommendations on improving SCAR's internal and external communications are implemented, the need to print and distribute large numbers of reports, bulletins, and newsletters should be greatly reduced. Some print publications will still be necessary for some time for those countries that do not yet have well developed electronics communications systems. In most cases, however, SCAR reports and bulletins could be made available through the web site, and newsletters could be usefully converted into list servers, and end up reaching a larger audience interested in research in Antarctica. This would reduce the printing and postage bill by at least half, from about \$26,000 to \$12,500 a year.

⁶ All financial numbers in this report are expressed in US dollars.

⁷ GOSEAC and GLOCHANT meet annually; Seals and ANTEC normally meet biennially but not necessarily in conjunction with SCAR meetings.

The budget for scientific meetings and workshops should not be affected. They cost about \$87,000 in 1998 (not counting the Global Change Programme Office). The Ad Hoc Group believes that this level of funding should be maintained, if not increased, although it will mean finding additional sources of revenue including the accumulated balance in SCAR's accounts (the accumulated balance is discussed below). It should be possible to provide \$90,000 for meetings and workshops in 2001 and \$100,000 in 2002.

Increased Revenues

In this analysis, it is assumed that revenues from annual contributions of members and miscellaneous sources will continue to be about \$300,000 a year. With actual expenditures increasing to about \$335,000 in 2001 and \$370,000 in 2002, additional revenues will be needed. One source would be foundations and other external sources of funding, including ICSU. A primary duty of the expanded Executive Office staff should be support of fundraising for SCAR scientific projects, which would help pay for meetings and workshops. The Ad Hoc Group is confident that a conservative estimate of outside revenues would be \$25,000 the first year and \$35,000 the second year.

SCAR should also look into the possibility of securing a one-time grant from ICSU for implementing the restructuring and modernization of SCAR, as recommended by this in-depth self-review.

TABLE TWO COST IMPLICATIONS OF THE RECOMMENDATIONS (US Dollars)		
ACTIVITIES	2001	2002
Meetings/Workshops	\$90,000	\$100,000
Operating Groups	30,000	39,000
SCAR Meeting		28,000
Executive Committee Meeting	16,000	
Publications	10,000	10,000
Administration	173,500	178,500
Contingency	15,000	15,000
TOTAL EXPENDITURES	\$334,500	\$370,500
Member Contributions (Current and Arrears)	275,000	275,000
Other revenues	25,000	25,000
External Funds (e.g., Foundation Grants)	25,000	35,000
From Accumulated Balance	9,500	35,500
TOTAL REVENUES	\$334,500	\$370,500

The other source of increased funding is SCAR's own bank balance. At the beginning of 1998, SCAR had accumulated nearly \$370,000 through conservative budgeting practices. Some of that was spent during 1999, but the current estimate is that it will be at least \$250,000 by the time of SCAR XXVI. It

is prudent to have a cash reserve, but if it is too large, it is difficult to approach funding sources with any credibility. Moreover, having a large balance has a "scientific opportunity cost," that is, it could be funding SCAR's scientific mission. SCAR should have a large contingency fund, say 25 percent, because contributions of members are not always on time or forthcoming at all. The rest could be devoted to scientific work. Accordingly, the Ad Hoc Group would use about \$10,000 of the accumulated balance in 2001 and \$35,000 in 2002.

IV. Conclusion

The Scientific Committee on Antarctic Research is an organization with a rich tradition. It has made many valuable contributions to the planning and coordination of science in Antarctica and surrounding oceans. SCAR is unique among ICSU organizations for being a scientific adviser to an intergovernmental organization—the ATS. The scientific and advisory missions of SCAR are more important today than ever. The understanding of many global processes requires continued expansion of the scientific knowledge base about the Antarctic region. As global change, increased tourism in Antarctica, depletion of the fisheries, and similar issues confront society in the decades ahead, SCAR will be called on frequently to provide its best scientific judgement about these questions.

Maintaining SCAR's tradition of leadership as the preeminent scientific organization concerned with Antarctica, however, requires that SCAR change its mode of operation as it enters the 21st Century. Delegates and officers must be more engaged in the work of SCAR. Internal and external flows of information must be greatly improved. There must be more flexible and dynamic ways of working at the operating level so that SCAR can identify and exploit scientific opportunities and problems more quickly and respond to requests for scientific information and advice on a timely basis. This report lays out a road map that will enable SCAR to make the changes it must make to maintain a position of leadership. The recommendations are an interlocking series of proposals. Implemented together, they will equip SCAR to be an effective leader in the decades ahead. Moreover, it is feasible to accomplish the recommended changes in a two-year cycle of self-renewal beginning with XXVI SCAR in Tokyo in July 2000.

The Ad Hoc Group recognises that its recommendations involve substantial change, but major changes in the way SCAR operates are necessary to prepare it for the future. Research opportunities are multiplying. Other international scientific organizations, for example, for oceans, weather, global change, are taking the role of Antarctica into account. Advances in information technology are opening up new ways of international collaboration. The need for objective expertise on issues affecting Antarctica and on Antarctica's role in global change processes is growing. SCAR must move to ensure that it is the scientific leader in research in Antarctica or become increasingly irrelevant. This in turn means that SCAR must be able to act more quickly to exploit opportunities for international scientific collaboration and to respond to, even initiate, requests for scientific expertise on major issues concerning Antarctica. The recommendations in this report, if implemented, will accomplish this.

Above all, SCAR needs the enthusiasm and commitment of individuals, with the support of their national Antarctic organizations, to put these recommendations into practice and make the rejuvenation of SCAR a reality. The Ad Hoc Group has great confidence that SCAR, after careful scrutiny and discussion, will embrace the proposals in this report and put SCAR in the position to be the preeminent organization for science in Antarctica and be considered an objective adviser on science issues in the decades ahead.

Appendix A. List of Recommendations

Recommendation 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.

Recommendation 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.

Recommendation 3: SCAR delegates—at the delegate level—must become more actively engaged in the management of SCAR at SCAR meetings and also intersessionally.

Recommendation 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

Recommendation 5: SCAR vice presidents should have titles corresponding to their portfolios, e.g., Vice President for Scientific Affairs.

Recommendation 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.

Recommendation 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.

Recommendation 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*.

Recommendation 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.

Recommendation 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.

Recommendation 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.

Recommendation 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.

Recommendation 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.

Recommendation 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.

Recommendation 15: SCAR must improve its infrastructure and capability to use information technology for internal and external communication.

Recommendation 16: A more proactive SCAR Executive Office will require larger facilities and upgraded support services.

Recommendation 17: SCAR should expand its financial resources by actively seeking philanthropic funds for some activities.

Recommendation 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.

Recommendation 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.

Recommendation 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.

Appendix B. Biographical Sketches of the Members and Staff of the Ad Hoc Group on SCAR Organization and Strategy

J.M (TITO) ACERO is a biologist, graduated at the University of Buenos Aires. Between 1986 and 1989 he worked for the Research Group on Regional Ecology at the Exact and Natural Sciences College of the University of Buenos Aires, on research projects related with the environmental impact produced by agricultural activities in the NW region of Argentina. In 1989, he began work at the Instituto Antártico Argentino as head of the Environmental Management Programme. He has participated in many research projects related with the evaluation of the impact produced on the environment by different human activities in Antarctica. He has been a full member of GOSEAC (SCAR Group of Specialists on Environmental Affairs and Conservation) since 1993. At the XXIII SCAR, he was the Argentine delegate to the SCAR Biology Working Group. In 1996, he became a member of the Steering Committee of the AEON (COMNAP Antarctic Environmental Officers Network). At present he is also the Environmental Officer of the Argentine Antarctic Programme and he is the Argentinian representative to the CEP (Committee of Environmental Protection) of the Treaty Meeting.

KRZYSZTOF (KRIS) BIRKENMAJER is Professor Emeritus at the Institute of Geological Sciences, Polish Academy of Sciences, in Cracow, Poland. From 1956 actively engaged in geological research in polar areas, including 12 expeditions to Spitsbergen, 2 expeditions to East Greenland, 7 expeditions to West Antarctica. Other scientific interests: geology of the Carpathian Mountains and Eastern Alps. More important polar organizations, functions: National Delegate to SCAR (1984-1999); member of the SCAR Working Group on Geology (1980-1999); GOSEAC (1988-1998); GOSC (1986-1991); SCAR Scientific Secretary (1992-1996); IASC Council Member (1990-), member/chairman/vice chairman of Polish Delegations to ATCM (1977-). Chairman of the Polish Committee on Polar Research (1984-1999) (presently Honorary Chairman). Member of the Polish Academy of Sciences (Warsaw); Polish Academy of Sciences and Letters (Cracow); Honorary Member of the Romanian Academy of Sciences (Bucharest). Honorary Fellow: Geological Society of America; Geological Society of Poland; Geological Society of Austria. Visiting Professor: Copenhagen University (Denmark); 1976-1977. Several foreign grants, e.g., Royal Norwegian Council for Scientific and Industrial Research (1969-1971); Polar Office, National Academy of Sciences (United States). Member of ICSU General Committee (1992-1998). Author of approximately 500 scientific papers (geology).

ARNOLDUS SCHYTTÉ BLIX received a cand. real. degree from the University of Oslo in 1973, his doctor philosophy degree from the University of Tromsø in 1975, and graduated from the Royal Norwegian Defense College at Oslo in 1987. He has been director of the Department of Arctic Biology at the University of Tromsø from 1979, where he was appointed Professor of physiology in 1980, after being Associate Professor at the University of Alaska at Fairbanks in 1977-78. He has been the leader and/or participant in more than 30 polar expeditions to Alaska, Canada, Greenland, Svalbard, and Antarctica, including several sealing and whaling expeditions in the North Atlantic. He is a member of the

Norwegian (National) Academy of Science and Letters, the Royal Norwegian Society of Sciences and Letters, chairman of the Norwegian National Committee for Polar Research, and delegate to the Scientific Committee for Antarctic Research (SCAR), the European Polar Board, and he has served on the International Arctic Science Committee (IASC), the Scientific Committee on the International Whaling Commission, Norwegian Royal Commissions on Sealing and Legislation for Environmental Protection in Svalbard, and numerous other committees. He has received the Fram Committee Nansen Award (1985) and both the Nansen Award (1994) and the Nansen Medal (1996) of the Norwegian Academy of Science and Letters, and the U.S. Antarctic Service Medal (1995). He has published more than 150 full papers in international journals mainly on physiological adaptations in arctic mammals and birds. He has also been instrumental in establishing the Polar Museum at Tromsø (1986) and the new Department of Arctic Biology at the University of Tromsø (1993).

DREW CLARKE commenced his professional career 25 years ago as a surveyor, leading mapping surveys in Australia and Antarctica. His tertiary qualifications include a Bachelor of Applied Science (Royal Melbourne Institute of Technology) and a Master of Science (Ohio State University). He has extensive experience in Australian and international organisations involved with geographic information standards, policies, and programme coordination. He has been Chief Officer of the SCAR Working Group on Geodesy and Geographic Information since 1992, is Secretary of the UN-based Asia-Pacific geographic information systems committee, and is a member of the Australia New Zealand spatial data Council. Drew has held a number of senior management positions in the Australian Government over the last eight years, including General Manager of AUSLIG, Australia's national mapping agency, and General Manager of the Australian Government Analytical Laboratories. He currently heads a Division within the Australian Department of Industry, Science and Resources, where he is responsible for four agencies administering a wide range of science and industry programmes, and is a member of the Industry Research and Development Board.

FRED DAVEY was awarded a BSc (Honours) in Physics at Leeds University, UK, followed by a Diploma of Imperial College in Applied Geophysics and an MSc in Geophysics from Imperial College, University of London, UK. He obtained a PhD in marine geophysics studies from the University of Birmingham, UK, in 1970, working in the Antarctic Peninsula and Scotia Sea region. He then moved to the Geophysics Division of the New Zealand Department of Scientific and Industrial Research, where he set up initially the marine geophysics research programme and latterly the crustal structure research programme, both of which focused on the southwest Pacific Ocean and Ross Sea, Antarctica. In 1985, he was appointed Director of Geophysics Division for five years before deciding to return to active research. In 1997 he was appointed Research and Strategy Leader for the NZ Institute of Geological and Nuclear Sciences. He has been active in SCAR, including NZ representative on the Working Group for Solid Earth Geophysics since 1977 and its Chief Officer for 6 years. He has served as the NZ Alternate Delegate or the NZ Delegate to SCAR since 1990, SCAR Secretary from 1996-1998, and Vice President of SCAR since 1998. He is the

Chair of the NZ National Committee for Antarctic Research, and has been a member of NZ delegations to Antarctic Treaty meetings. From 1988 to 1996 he was a member of the Ross Dependency Research Committee, and is currently on the Antarctic Heritage Trust. He was a member of the Board of the Carter Observatory, New Zealand's national astronomical observatory, for eight years and its Chairman from 1995-97. He has been a member of several NZ national committees in the earth, marine and antarctic sciences, and has contributed to the restructuring of government science in NZ in the early 90s, and to the development of NZ national science strategies.

ZHAOQIAN DONG is the leading founder and professor of Polar Research Institute of China and has been the Director of the Institute since 1989. He was one of the first two Chinese scientists sent to Antarctica by the Chinese government and one of the founders of Chinese Antarctic undertakings. Active in international research cooperation with many countries, he has received awards of a Third-Class Merit, Model Worker and First-Class Merit for his contributions to international and national Antarctic management, cooperation, and science. Since 1979, he has participated three times on Australian and Argentine national Antarctic scientific expeditions in physical oceanography in the Southern Ocean. He has been a major organiser in planning, coordinating, and organizing scientific programmes of the Chinese Arctic, Antarctic, and Southern Ocean Expeditions. He has also led three Chinese national Antarctic research expeditions to Antarctica and the Southern Oceans, as a chief scientist, station leader, scientific team leader, and expedition leader. As a scientist, his research has resulted in many publications (21 papers, 30 reports and 7 monographs written and edited). He has been involved in SCAR affairs since 1984 as Chinese Alternate Delegate/Delegate to SCAR. During the years of 1992-1996, he was Vice President of SCAR. He is now a member of the Councils of the China Ocean Society, China Ocean Environmental Society, and China-SCOR to SCOR, ICSU, as well as a member of the Standing Council, China Society of Oceanography and Limnology.

ANDERS KARLQVIST has a professional background as a technical physicist from the Royal Institute of Technology, Stockholm, where he continued with a dissertation in mathematics. He has been adjunct professor in systems analysis at several Swedish universities and at present at the Royal Institute of Technology. During a period 1994 -1996 he was deputy secretary to the Minister of Education responsible for the Research Policy Unit at the Ministry. Karlqvist has been director of the Swedish Polar Research Secretariat since it was founded in 1984 and led several research expeditions to the Antarctic and the Arctic. He is a member of the Committee of Managers of National Antarctic Programmes since its start, serving as chairman from 1995 to 1997. He is a member of the regional board of the International Arctic Science Committee since its start, and chairman of the regional board for some years. He is a member of the European Polar Board and member and chairman of the Nordic Committee for Polar Research (1998-2000). Karlqvist has extensive international experience and has been a visiting scholar at MIT (1971-72), CSIRO, Melbourne Australia (1975-76), International Institute of Applied Systems Analysis, Vienna (1978), Santa Fe Institute (1995), and Stanford University (2000).

DENZIL G. M. MILLER has a PhD from the University of Cape Town and is a Senior Specialist Scientist at Marine and Coastal Management which is part of the South African Department of Environmental Affairs and Tourism. His research interests focus on Antarctic marine living resources, ecosystem management of marine fisheries and acoustic assessment of Antarctic krill aggregations. Denzil was awarded the South African Antarctic Medal (Gold) in 1996 and has served as Chair of the 23-nation Scientific Committee for the Conservation of Antarctic Marine Living Resources since 1997. He has also served as an adviser to many national Antarctic programmes as well as on numerous other Antarctic committees at both national and international level. He was a Member and ultimately Convener of the SCAR Group of Specialists on Southern Ocean Ecology (1985-1997) and was a Ministerial alternate at the recent "Ministers on Ice." Denzil is heavily involved in many negotiations on high seas fishing and gave the Key Note Address to the Year of the Oceans Forum in November 1997. He manages the South African Patagonian Toothfish Fishery, has lead more than 10 research cruises to the Antarctic and has published more than 80 peer-reviewed papers on the Antarctic. His greatest Antarctic achievement is "just being there."

CHRIS G. RAPLEY studied Physics at Jesus College Oxford, UK, where he was awarded a B.A (Honours) and M.A (Honours). He obtained an M.Sc. in Radioastronomy at the Victoria University of Manchester, Jodrell Bank and a PhD in X-ray Astronomy from the University of London. Following a number of years working in experimental space astronomy, including solar flare studies both in the UK and the USA, he became interested in satellite borne Earth Observation. He started and built up the Earth Remote Sensing Group at University College London's Mullard Space Science Laboratory and was appointed Professor of Remote Sensing Science and Associate Director of the Laboratory. He specialised in the use of space radar altimeters for the study of polar ice and other aspects of Global Change. In 1994 he was appointed Executive Director of the International Geosphere-Biosphere Programme, located in the Royal Swedish Academy of Sciences, Stockholm. On his return to the UK in 1998, he was appointed Director of the British Antarctic Survey. He is an Honorary Professor at University College London and at the University of East Anglia, and is a Fellow of St Edmund's College, Cambridge. He is the Chair of the UK National IGBP Committee, a member of the UK Global Environmental Research Committee, a member of the UK Antarctic Research Committee, UK delegate to the Scientific Committee on Antarctic Research, a Board member of the UK Marine Biology Association, a member of the UK Natural Environment Research Council's Senior Executive Group, UK Delegate to the European Science Foundation's Executive Board, a member of the Executive of the European Polar Board, a member of the European Space Agency's Earth Science Advisory Committee, and a Principal investigator on the NASA Jet Propulsion Laboratory's Cassini Radar instrument to study Titan.

PHILIP M. SMITH (*Chair*) is a science organization executive, science and technology policy analyst, consultant, and author. He chairs the External Advisory Council, National Computational Science Alliance, a consortium of 50 U.S. university national laboratory and industry groups developing terascale

computing technologies. He is a member of the Advisory Board of *Science's* Next Wave and a director of two high-tech start-up companies. In 1998-99, he served as a member of the U.S. National Research Council Committee on Science, Technology and Health Aspects of U. S. Diplomacy. He has been an adviser to the Committee for Economic Development and the Mexican Academy of Sciences. From 1981 to mid-1994, Smith was Executive Officer of the U. S. National Academy of Sciences and National Research Council in Washington, DC. His previous experience includes more than twenty years in government in research management and science and technology policy making with the White House Office of Science and Technology Policy (OSTP), Office of Management and Budget, and National Science Foundation. In 1957-58, Phil Smith was a member of the staff of the U.S. National Committee for the International Geophysical Year at the National Academy of Sciences and was involved in glaciological research on the Ross Ice Shelf in Antarctica. He joined the National Science Foundation in 1958 and directed research, procurement, and logistical support for global scientific programmes in polar and ocean research until 1972. In the various positions he has held, Dr. Smith has written and spoken about science and technology policy issues in testimony in Congress, articles in professional journals, and appearances before many organizations. He holds B.Sc. and MA degrees from The Ohio State University and a Doctor of Science degree (*honoris causa*) from North Carolina State University.

MICHAEL MCGEARY (*Staff Director*), a political scientist, has been an independent consultant to government agencies and nonprofit organizations on issues related to science and technology since 1995. His areas of expertise include funding of research and development; research priority setting; graduate education, training, and employment of scientists and engineers; merit review systems; and the role of research in industrial innovation. He was at the U.S. National Academy of Sciences from 1981 to 1995, where he was the staff director of many committees that studied and reported on a variety of science issues, programmes, and organizations. His most recent work has focused on analyses of trends in U.S. government funding of research and their impact on fields of science and on universities and other research institutions, and on priority setting in biomedical research.

Appendix C. Memorandum from the Chair of the Ad Hoc Group on SCAR Organization and Strategy to the National Committees and Others, June 2, 1999

Philip M. Smith
464 M Street, SW
Washington, DC 20024 USA

Tel: 1-202-554-5715
Fax: 1-202-554-8918
pmsmith@nas.edu

June 2, 1999

MEMORANDUM

TO: SCAR DELEGATES AND NATIONAL PROGRAM LEADERS
FROM: Philip M. Smith, CHAIR, AD HOC GROUP ON SCAR'S
ORGANIZATION AND STRATEGY
SUBJECT: CALL FOR COMMENTS ON SCAR

The XXV Delegates Meeting of the Scientific Committee on Antarctic Research (SCAR) in 1998 agreed that a review should be conducted to explore SCAR's organization and strategy. At the request of Dr. Robert H. Rutford, President, SCAR, I am chairing a ten-person committee he has appointed to conduct this review. The members of the committee and its staff are listed in Attachment One.

There have been one or two reviews of SCAR over its history, including one initiated by the International Council of Scientific Unions (ICSU) Executive early in the 1990s, but it has been many years since there has been a comprehensive assessment. Our committee will undertake such a comprehensive review during the next eight months. We will re-examine SCAR's mission, review its governance, look at the structure and operating procedures for its subsidiary groups (e.g., working groups and groups of specialists), and assess its relations with others such as the Antarctic Treaty Consultative Meetings. SCAR's current organization is appended as Attachment Two.

Our objective is to make recommendations on how to position SCAR to be an effective organization in the decade ahead. The Ad Hoc Group's report will be a major agenda item at SCAR XXVI, Tokyo, July 2000. The Ad Hoc Group will have its first meeting in England in August. We will hold a second meeting later in 1999, or in January 2000, also in England. The Ad Hoc Group is working electronically in preparation for the first meeting, and will work continuously using E-mail and facsimile technologies.

The purpose of this memorandum is to invite you, as a delegate to SCAR, to have an early opportunity to give the committee your own thoughts about SCAR's current operations and suggest ways that SCAR could be most effective in the years ahead. Secondly, as the SCAR delegate from your nation, we would ask you to give the national program leader a copy of this memo and encourage him/her to respond so the Ad Hoc Group has the benefit of these important perspectives.

We would like comments from each delegate and each national program leader on the following questions:

1. Mission and Goals:

--Is SCAR still needed, and why?

--How well is SCAR meeting its principal mission and goals as stated in the SCAR constitution? These are: a) to initiate, promote, and co-ordinate international scientific activity in the Antarctic with a view to framing and reviewing scientific programmes of circumpolar scope and significance; b) to keep under review scientific matters pertaining to the integrity of the Antarctic environment, including the conservation of its terrestrial and marine ecosystems; c) to provide, upon request, scientific and technological advice to the Antarctic Treaty Consultative Meetings and other organizations, both governmental and non-governmental?

--Should the mission and goals be modified now to position SCAR to be effective in the next decade and if so, how?

--What is your vision of SCAR five years from now? In ten years?

2. Governance and Organization:

--Is the governance structure for making policy and program decisions effective, and if not, how would you change the governance structure to make it more effective?

--Is the organizational structure of working groups and groups of specialists effective, or would a different structure of scientific groups would best serve SCAR's missions over the next decade?

--Do SCAR Delegates Meetings take place frequently enough to fulfill SCAR's mission and goals?

--Should there be more science in SCAR's own activities, for example, scientific symposia, a journal or annual research review, etc.?

--Should SCAR more aggressively utilize videoconferencing and other electronic technologies to facilitate its work and that of the subsidiary groups?

--Is the budget about at the right level, too small, too large?

--Is the proportional assessment structure for dues appropriate now or should it be modified?

--Does the financing of programs and projects adequately satisfy your national participation in them?

--Is the Executive Secretariat in Cambridge, England, effective, should it be improved, and if so how?

3. External and inter-organization Relationships:

--SCAR has been the principal scientific advisor to the Antarctic Treaty Consultative Meetings. Could this role be carried out more effectively, and how? What is your understanding of SCAR's role vis a vis other Antarctic Treaty advisory bodies, such as the Committee on Environmental Protection (CEP) and the Commission and Scientific Committee for the Conservation of Antarctic Marine Living Resources (CCAMLR), should it be different, and if so why?

--Does the interface between SCAR and the Council of Managers of National Antarctic Programmes (COMNAP) work well, what should it do, and how could it be improved, if necessary?

--Is SCAR's work with other international scientific organizations with a broader geographic scope (such as the oceans, atmosphere, and geology) effective, should it be improved, and if so how?

--How should SCAR work with the International Arctic Science Committee (IASC)?

--How should SCAR work with non-governmental groups such as environmental organizations in the years ahead?

4. SCAR's Data and Information Systems:

--In your view are the SCAR scientific data repository systems working effectively?

--Many data repositories are being partially or fully converted to digital form to make them more useful for the scientific community. Do you have recommendations for SCAR in this area?

--In addition to data systems, there is the question of information about SCAR? How in your view should SCAR communicate with other organizations and with the public about its activities?

--What suggestions do you have concerning information to be included in SCAR's internet website?

In addition to responding to these questions, you are invited to give the Ad Hoc Group your views on any other matters relevant to SCAR. However, by having comments from most delegates and national program leaders addressed to the questions above, the Ad Hoc Group will have an excellent framework for the beginning of its study and deliberations.

To be useful for the first meeting of the Ad Hoc Group, I would be grateful if you would respond to this call for comments by July 1, 1999. Your responses should be sent directly to me and Michael McGeary, who is staffing the Ad Hoc Group. You may respond by E-mail to us at:

pmsmith@nas.edu
mmcgeary@nas.edu

Comments can also be sent by facsimile to Phil Smith at: 1-202-554-8918

In the interest of time, we do not recommend response by letter.

My own association with SCAR dates from its establishment in 1958. As an active participant in the International Geophysical Year and a leader in the US Antarctic Research Program in the 1960s, I have many vivid memories of SCAR meetings and international scientific programs planned under the aegis of SCAR. I am looking forward to working with the Ad Hoc Group and with you in this assessment of ways SCAR can be made ready for the years ahead.

Philip M. Smith

Attachments:

One: Ad Hoc Group membership
Two: SCAR's Current Organization

Cc: Peter D. Clarkson
Robert H. Rutford
Members of the ad hoc group

Appendix D. Memorandum from the Chair of the Ad Hoc Group on SCAR Organization and Strategy to the Chief Officers of SCAR Working Groups and Groups of Specialists, September 22, 1999.

Philip M. Smith
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pmsmith@nas.edu

September 22, 1999

MEMORANDUM

TO: CHIEF OFFICERS OF SCAR WORKING GROUPS AND GROUPS OF SPECIALISTS

FROM: Philip M. Smith, CHAIR, AD HOC GROUP ON SCAR'S ORGANIZATION AND STRATEGY

SUBJECT: REQUEST FOR INFORMATION CIRCULAR

This request concerns the review of SCAR's Structure and Strategy and requests that the Chief Officer of each Working Group and Group of Specialists prepare responses to a small number of questions of interest to the Ad Hoc Group that is reviewing SCAR.

Most Working Group and Groups of Specialists submitted responses to the "Call for Comments on SCAR" that I circulated to SCAR Delegates, the Chief Officers, and Heads of National Antarctic Programs on June 2, 1999. The responses were extremely helpful and formed the basis for some of the discussions of the Ad Hoc Group on SCAR's Structure and Strategy at its first meeting in Cambridge, England, August 16th and 17th. The Chief Officers' comments gave the Ad Hoc Group good insights on present relationships with SCAR at the SCAR level (Delegates Meetings, Officers, Secretariat) and suggested some points where changes by SCAR at its level might be in order. They also reminded us that the Working Groups and Groups of Specialists are different in their operations, and missions, and that recommendations from the Ad Hoc Group on SCAR's structure and strategy must be informed about this diversity.

The Ad Hoc Group will hold its second meeting January 12-13th in Buenos Aires, Argentina. In the interim, members will be in intersessional discussion on a number of issues discussed in Cambridge. The Ad Hoc Group determined that it wanted each Chief Officer to assist it by succinctly responding to a few questions that will help it understand recent accomplishments and plans. In short paragraphs of six to ten lines length, we would appreciate hearing from you on the following questions:

1. Describe how your Group functions. How often does it meet? How many national representatives (Working Groups) or members (Groups of Specialists) attended your last two meetings (not counting observers)? How is the meeting agenda prepared and how long before the meeting is it distributed to participants?
2. How do you work intersessionally (for example, frequency of contact and mode of communication)?

3. What contacts and linkages does your Group have with other SCAR bodies (other Working Groups, Groups of Specialists, Secretariat, Executive) and with non-SCAR bodies or programs?
4. What are the major accomplishments of the Group? Describe three major highlights, more if you wish, during the past several years.
5. What are the Group's goals in the next several years? Describe what you hope to accomplish.
6. How will science or policy in Antarctica be different five years from now as a result of the Group's program?
7. What changes in SCAR would facilitate the work of the Working Groups and Groups of Specialists?

Your responses to these questions, on behalf of your Working Group or Group of Specialists, should be sent directly to me and to Mike McGeary, staff of the Ad Hoc Group. We are best reached electronically at:

pmsmith@nas.edu

mmcgeary@nas.edu

Your response could also be faxed to:

Phil Smith
Fax Number +1-202-554-8918

To be useful in the Ad Hoc Working Group's deliberations, I am requesting that your response be in by Friday, November 12, 1999.

As chair of the Ad Hoc Working Group on SCAR's Structure and Strategy, I have prepared a short report on our activities for The SCAR Executive Committee meeting in late September in Goa. Shortly after the Executive Committee meeting, the report will be posted to the SCAR website.

In advance, thank you for your response to these seven questions. I look forward to hearing from you.