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Dr. Peter D Clarkson
Executive Secretary
SCAR Secretariat
Scott Polar Research Institute
Cambridge CB2 1ER
UNITED KINGDOM

Dear Peter,

Subject: Transition of SALEGOS to SALE; a SCAR Research Program

It is the judgment of the SALEGOS membership that the Group's Terms of Reference have been met and the Group of Specialists has served its original intent. Therefore, it is recommended that SALEGOS be disbanded after its current budget period in 2004. However, it is also recognized that SCAR has an interest in further fostering international cooperation to accomplish subglacial environment exploration and possesses the expertise to continue to serve in an advisory role to the developing international program. As such, it is further recommended that SALEGOS transition to a SCAR Research Program entitled "Subglacial Antarctic Lake Exploration (SALE)".

On behalf of the members of SALEGOS, I submit a plan for the transition of the Subglacial Antarctic Lake Exploration Group of Specialists (SALEGOS) to a SCAR Research Program entitled Subglacial Antarctic Lake Exploration (SALE).

This document is being circulated to all members of the SCAR Executive.

Yours sincerely,

John C. Priscu

Professor and Convener of SALEGOS

**Plan for the
Transition of the Subglacial Antarctic Lake Exploration Group of Specialists
(SALEGOS)**

to a

SCAR Research Program

Entitled

Subglacial Antarctic Lake Exploration (SALE)

1.0 Introduction

Pursuant to the reorganization of SCAR agreed to in Tokyo in 2000 and the initiation of implementation in Shanghai in 2002, it is proposed to transition the Subglacial Antarctic Lake Exploration Group of Specialists (SALEGOS) to a SCAR Research Program in 2004. This Transition Plan was prepared by the current membership of SALEGOS:

- J Priscu, USA, Convenor
- M Kennicutt, USA, Secretary
- R Bell, USA
- S Bulat, Russia
- C Ellis-Evans, UK
- V Lukin, Russia
- JR Petit, France
- R Powell, USA
- M Siegert, UK
- I Tabacco, Italy

SALEGOS was duly constituted as a Group of Specialist by SCAR in Tokyo in the year 2000 and the membership agreed. By the time of this application SALEGOS will have held four meetings and produced four meeting reports.

- Meeting 1 - Bologna Italy, November, 2001
- Meeting 2 - New York, USA, May, 2002
- Meeting 3 - Santa Cruz, USA October 2002
- Meeting 4 - Chamonix, France, April, 2003

The terms of reference for SALEGOS are as follows:

- 1) **Refine, expand and embellish the Cambridge 1999 workshop's scientific objectives.**
- 2) **Develop the critical requirements/criteria for lake(s) selection.**
- 3) **Provide scientific guidance and input to COMNAP deliberations on logistics and drilling technologies for subglacial lake entry and sample retrieval.**
- 4) **Develop a set of objectives for technology developments related to the science objectives as opposed to only entry and retrieval.**
- 5) **Consider and recommend organizational strategies/models for managing an international exploration program.**
- 6) **Delineate information gaps and the sequence or timing that is needed to progress toward the ultimate goal of lake entry and sample retrieval - are there milestones along the critical path and what are they?**
- 7) **Consider the environmental ramifications and how the Comprehensive Environmental Evaluation (CEE) and Environmental Impact Assessment (EIA) process needs to be applied for support of subglacial lake exploration and the role of other SCAR and Treaty bodies [Group of Specialists on Environmental Affairs and Conservation (GOSEAC), Committee on Environmental Protection (CEP)].**
- 8) **Devise a series of SCAR activities to facilitate and promote the exploration of subglacial lakes such as targeted workshops.**
- 9) **Be a proponent of subglacial lake exploration with National Antarctic Programs to garner the financial and logistical resources needed for the program.**

It is the judgment of the SALEGOS membership that the Group's Terms of Reference have been met and the Group of Specialists has served its original intent. Therefore, it is recommended that SALEGOS be disbanded after its current budget period in 2004. However, it is also recognized that SCAR has an interest in further fostering international cooperation to accomplish subglacial environment exploration and possesses the expertise to continue to serve in an advisory role to the developing international program. As such, it is further recommended that SALEGOS transition to a SCAR Research Program entitled "Subglacial Antarctic Lake Exploration (SALE)". Membership on the program committee should be open to all SCAR nations, especially those with an interest in subglacial lake exploration. The initial core Science Program membership should draw on the current SALEGOS membership for continuity with a request for each interested National Committee to review its membership on the committee. Appointees should be selected based on a combination of national representation and expertise in relevant disciplines (as outlined below), therefore more than one national from a country may be appointed a member of SALE.

2.0 Scientific Justification for SALE

Beneath the thick East Antarctic ice sheet, water has accumulated over the millennium forming sub-glacial environments ranging in size and form from Lake Vostok, an expansive body of water the size of Lake Ontario, to shallow frozen swamp-

like features the size of Manhattan. Although similar in size to these more familiar landmarks, sub-glacial environments in Antarctica remain virtually unexplored and unknown. Over 100 lakes, shallow and deep, have now been identified suggesting that the subglacial environment is an immense interconnected, hydrologic system that has been previously unrecognized. While the full areal extent and the interconnectedness are not yet fully known, the potential drainage system identified is larger than that of the Mississippi River basin. These environments have formed in response to the complex interplay of tectonics and topography with climate and ice sheet flow over millions of years. These subglacial lake environments may contain a previously unrecognized global reservoir of organic carbon. Sealed from free exchange with the atmosphere for 10 to 35 million years, sub-glacial environments are analogues to the icy domains of Mars and Europa that hold the greatest promise for the presence of life beyond earth.

Tantalizing evidence from studies of the overlying ice sheet indicates that it is very likely that locked within these sub-glacial environments are unique life-supporting ecosystems. Such sub-glacial life must be adapted to the temperatures and pressures akin to the deep ocean coupled with the tortuously slow delivery of nutrients from the overriding ice sheet. These settings are probably the most oligotrophic on the planet and may harbor specially adapted organisms and ecosystems. Seismic, geochemical and genomic studies point toward the influence of local tectonics in setting boundary conditions under which these sub-glacial systems have evolved.

Approximately 35 million years ago, the climate of Antarctic shifted the entire continent from a tree-covered region into a region locked beneath three to four (3 to 4) kilometers of ice. Recovering a record of this major climatic shift has remained elusive. The subglacial lake region rings the nucleation point of the East Antarctic ice sheet and has tremendous potential for containing paleo-records of these major shifts in climate. Numerous, targeted drilling efforts around the perimeter of the continent have consistently failed to recover these crucial paleo-climatic records that are essential for understanding the evolution of global and regional climate.

Over the last decade a series of international workshops and a group of specialists have been convened to develop an interdisciplinary scientific and technological plan for the exploration and study of sub-glacial environments. These planning efforts have been supported by the National Science Foundation (NSF), the National Aeronautic and Space Administration (NASA) and the International Science Union's (ICSU) Scientific Committee on Antarctic Research (SCAR). These plans are extensive, well advanced, and detailed in scope and content. SALE also has elements and objectives that will compliment two other major research programs that will be proposed to SCAR, Evolutionary Biology in Antarctica (EBA) and Antarctic Climate Evolution (ACE).

In order to understand the complex interplay of biological, geological, chemical, glaciological, and physical processes within sub-glacial environments an interdisciplinary approach to research and study is essential. The overarching scientific objectives for subglacial environment exploration are to:

- **understand the origin of subglacial environments and their impact on the origins, evolution and maintenance of life beneath ice sheets;**
- **determine the form, distribution, and functioning of biological, chemical and physical systems in subglacial environments including the sediments, the water, and the overlying ice; and**
- **recover and decipher the climatic information contained in the sediments in lakes and the ice sheet sealing the lakes.**

These aims and objectives can only be accomplished by an integrated and coordinated series of interlocking phases of discovery and exploration over at least a ten-year period. The overall scientific plan is described as a series of research portfolios that form comprehensive research programs for various aspects of the exploration of subglacial environments. Each research portfolio has its own scientific objectives, requirements for logistics and technology needs, and advances the overall program toward its ultimate aims and objectives. The portfolios are developed as inter-related, but standalone, projects so that they can be implemented in the most effective manner given the resources and technological developments available at the time. These steps are not necessarily sequential and may be pursued in parallel. However, some later objectives are dependent on the information, results, and technological advances provided by earlier phases of research.

3. Approach to Implementation

It is initially proposed that the SALE science committee include the currently active members of SALEGOS but provide an opportunity for other countries with interests in subglacial environment exploration to nominate members. It is envisioned that the final committee size would be 10 to 12, which will be large enough to cover the range of disciplines, scientific and technical expertise, and experience necessary for the successful conduct of the program. Each member will have a significant and clearly identified role related to a critical discipline and/or technological challenge supportive of the overarching scientific objectives of subglacial environment exploration and research. Subglacial environments have attracted sufficient interest among scientists worldwide to easily draw this number of members. At the inaugural SALE meeting a Convener, Deputy Convener, and Secretary will be elected by the members. The committee would meet once a year and conduct the rest of its business electronically. Members would serve for a 4-year term, with the possibility of extension for a second term depending on contribution and performance. The committee membership should ensure a breadth of knowledge to adequately address all relevant thematic/disciplinary topics and provide the expertise needed to provide advice on technological/logistical issues. This core of experts will be supplemented as needed by invitation of guest scientists and technologists to SALE meetings, regular review of SALE membership, and through liaison relationships with other organizations such as COMNAP, AEON, and others as appropriate. SALE will also actively interact with EBA and ACE as they develop to promote synergy and

common interests. If appropriate, SALE will designate representatives to these other programs to ensure communication and collaboration.

The initial distribution of members should attempt to cover the following areas: 1) thematic and disciplinary members – biology/genomics/ecology, geophysics and survey techniques, glaciology, geology/tectonics, geochemistry/limnology, and paleoclimate and 2) technological members – ice drilling techniques/access; observatories, remotely operated and autonomous vehicles, sample recovery and processing, specialized analytical techniques, and clean technologies. Recognizing the budgetary limits on membership, guest observers will be invited to address the committee as needed when expertise beyond that of the committee is needed to address an issue.

4. SALE Terms of Reference

The Designation of SALE as a SCAR Research Program will provide a focus for the following activities:

1. Encouraging and facilitating communication and collaboration between scientists and technologists world-wide involved in subglacial environment exploration. This would be achieved by organizing workshops and symposia to present new results, exchange of ideas, sharing and compilation of information, assistance in the coordination/planning of activities, and maintenance of a web site.
2. Advising the international community on all facets of scientific and technology issues relevant to subglacial lake exploration including environmental concerns and safeguards.
3. Promoting collaboration, data access and data sharing to facilitate and expedite data syntheses needed for developing and revising the science and technology agenda for subglacial environment exploration.
4. Summarizing and reporting the results of these efforts for the scientific and wider community on an ongoing basis.
5. Encouraging adherence to the agreed guiding principles of subglacial environment exploration of international partnering, interdisciplinary emphases and focus, and minimal disturbance and stewardship of the environment.
6. Be an advocate for subglacial environment exploration in all venues including National Committees, scientific communities, and the public.

It should be noted that SALE would not oversee or manage national or international field or laboratory projects or facilities other than to help guide their development as requested.

5. Time-line and Milestones

It is proposed that an orderly transition from SALEGOS to SALE occur over the next two years.

- Submission of the transition plan to the SCAR Executive, May 2003.
- Transition plan considered by the SCAR Executive Committee, July 2003, Brest, France.
- SALEGOS Meeting 5 October 2003, location to be determined.
- Revision of Transition plan based on SCAR Executive Committee response, October 2003.
- SALEGOS Meeting 6, first quarter 2004 (as needed and within budgetary constraints).
- Submission of the transition plan to the three SCAR SSGs with the budget request, Bremen, July 2004.
- SCAR Executive Committee and SSG recommendations to SCAR Delegates Meeting, Bremerhaven, Germany, October 2004 – Final program approval/decline.
- First SALE meeting 2005 subject to SCAR approval.

Workshops and symposia, and special sessions at major conferences, are important for fostering collaboration, exchange of ideas and further planning and will be a primary mission of SALE. The SALE committee will develop and maintain a schedule of meetings on a continuous basis for 3 years into the future.

6. Estimated Budget

A program of this scale will require a significant time commitment from the committee members that will be covered by them personally on agreement with their home institutions. The budget request is for basic operational costs to allow the committee to meet once a year and to provide seed funding for two workshops and/or symposia each year. The annual estimated budget request from SCAR for SALE is as follows:

• Travel and accommodation for committee members	
\$ 1800/person for 10 persons	\$ 18,000
(assuming the host country can fund local needs)	
• Seed funding for workshop/symposia expenses, \$10,000/event.	
(e.g., publication of report, some travel assistance)	\$ 20,000
• Costs for website and newsletter	\$ 2,000
TOTAL	\$ 40,000

7. Summary

The exploration of subglacial environments will be a major focus of Antarctic science over the next decade. SALEGOS has recommended that subglacial environment

exploration and research be one of the foci of the frontiers in science component of the 2007/2008 50th anniversary of the IGY/IPY. In the attempt to make SCAR more relevant to its stakeholders, SALE can serve as an example of how SCAR can make a real difference. The primary purpose of SALE will be to promote the exploration of subglacial environments, provide a focus for international planning and cooperation, and assert scientific leadership. It is expected that the program will propose major sessions on subglacial environment for the biennial SCAR scientific congress and promote subglacial environment exploration and research in general.

Literature Cited

Report of the Subglacial Antarctic Lake Exploration Group of Specialists (SALEGOS): Meeting – 1. Bologna, Italy, 29-30 November 2001. 69 pp.

Report of the Subglacial Antarctic Lake Exploration Group of Specialists (SALEGOS): Meeting – 2. Lamont-Doherty Earth Observatory, USA, 23-24 May, 2002. 39 pp.

Report of the Subglacial Antarctic Lake Exploration Group of Specialists (SALEGOS): Meeting – 3. University of California at Santa Cruz, USA, 2-3 October, 2002. 19 pp.