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## Information for U.S. Scientists about Participation in the Inaugural Projects of the International ANDRILL PROGRAM including an overview of the ANDRILL U.S. SCIENCE SUPPORT PROGRAM

ANDRILL-U.S. Steering Committee

ANDRILL Science Management Office

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**Information for U.S. Scientists about Participation  
in the Inaugural Projects of the International  
ANDRILL PROGRAM**

**including an overview of the**

**ANDRILL U.S. SCIENCE SUPPORT PROGRAM**

**Prepared by the:  
ANDRILL-U.S. Steering Committee and  
ANDRILL Science Management Office**

**ANDRILL Contribution 3: Draft (3-23-25)**



**Sponsored by the National Science Foundation – Office of Polar Programs**

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## 1. PURPOSE OF THIS DOCUMENT

This document provides guidance for potential U.S. participants in the two inaugural projects of the ANDRILL Program. It includes information on eligibility, application procedures, proposal review criteria, expected numbers and positions of on-ice and off-ice personnel, staffing decisions, science support levels, participant responsibilities, and project timelines. Information provided in this document (Version 3\_23\_05) may be modified after the U.S. ANDRILL Workshop (April 1-2, 2005). The final version will be posted no later than 4-15-05.

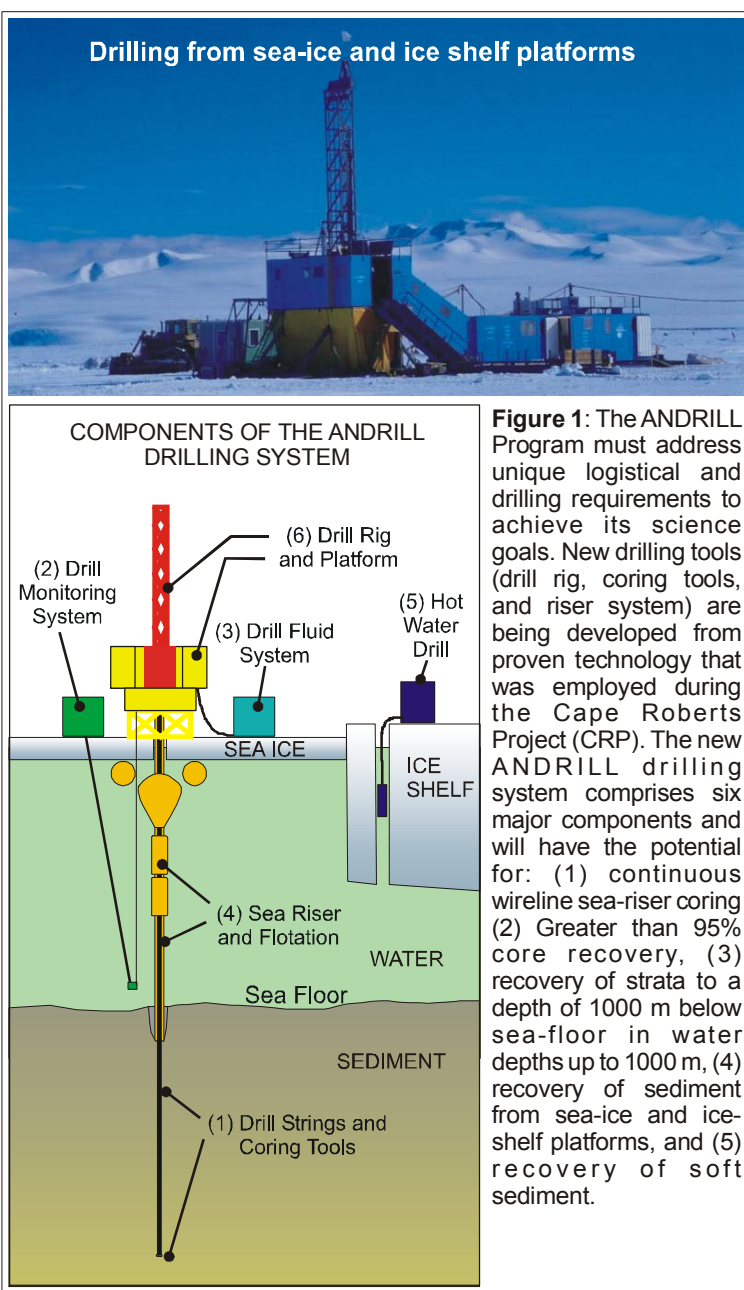
The reader should refer to the Appendices of this document for more detailed information on U.S. and international management of the ANDRILL Program, and for a list of acronyms used throughout the document.

The ANDRILL U.S. Steering Committee (USSC) encourages interested U.S. scientists to apply for participation in the inaugural projects of the ANDRILL Program.

## 2. INTRODUCTION TO THE ANDRILL PROGRAM

ANDRILL (ANtartic DRILLing) is a multinational, multidisciplinary program investigating Antarctica's role in Cenozoic-Recent global environmental change. ANDRILL's integrated science approach will use stratigraphic drilling and multi-proxy core analysis combined with geophysical surveys and numerical modeling to address: 1) the Cenozoic history of Antarctic climate and ice sheets; 2) the evolution of polar biota; 3) Antarctic tectonism; and 4) Antarctica's role in the evolution of Earth's ocean-climate system. Nations contributing funds to the currently supported ANDRILL projects include Germany (GER), Italy (IT), New Zealand (NZ), and the United States (U.S.). U.S. Support for ANDRILL is being provided by the National Science Foundation's (NSF) Office of Polar Programs (OPP). Information regarding the development of ANDRILL and summaries of key science issues and targets is presented in a comprehensive planning document (Harwood et al., 2002), which resulted from an international workshop at Oxford University in 2001. A copy of this document is available at the ANDRILL web site <http://andrill.org> and from the ANDRILL Science Management Office (SMO).

International funding for ANDRILL is supporting the development of a new, dedicated drilling system (nearing completion) and drilling camp to enable



the completion of two science projects (including two seasons of drilling in the McMurdo Sound region of the Ross Sea). The drilling system, based on technology proven during the Cape Roberts Project (CRP), will have the capability to recover strata (including soft sediment and bedrock) up to 1000 meters below sea floor (mbsf) in 1000 meters of water (a total drill string length of 2000m), and with high-percentage core recovery. The ability to use either fast-ice or shelf ice as a drilling platform will allow sampling from a wide range of marine near-shore environments (Figure 1). The anticipated 20-year life span and portability of the drilling rig is expected to enable future drilling in other regions of the Antarctic margin. Future ANDRILL projects will depend on new proposals to national funding agencies. Ongoing and future community involvement and proposal/site development will be encouraged and facilitated by the ANDRILL USSC (see Appendix A).

## **2.1 INTERNATIONAL SUPPORT FOR ANDRILL**

### **2.1.1 International Proposal and Funding**

The ANDRILL International Science Proposal (AISP) was written by proponents of drilling projects, members of National Steering Committees and the ANDRILL Science Committee (ASC) and submitted to National Antarctic Science Program Managers in June 2003. The Program Managers established an International Review Panel, comprised of scientists from Italy, Germany, New Zealand and the United States, which evaluated the AISP and recommended support of two projects of the proposed five-project McMurdo Sound Portfolio - the McMurdo Ice Shelf Project (MIS) and the Southern McMurdo Sound Project (SMS). The successful review led to the support of ANDRILL scientific programs in the partner nations and authorized the contributions toward operational costs in support of ANDRILL, as managed by the ANDRILL Operations Management Group (AOMG). The U.S. funding contribution to ANDRILL logistics and operations is approximately 50%, with New Zealand, Italy, and Germany contributing 25%, 18.5%, and 6.5%, respectively. It is on these proportions that scientific staffing will be based. The MIS Project is scheduled to be drilled in Oct.-Nov. 2006 and the SMS Project for drilling in Oct.-Nov. 2007. The project summary of the international proposal is provided below.

### **2.1.2 Project Summary: ANDRILL - - Investigating Antarctica's Role in Cenozoic Global Environmental Change**

ANDRILL is a multinational, multidisciplinary program representing over 150 scientists from Germany, Italy, New Zealand, the United Kingdom and the United States, designed to investigate Antarctica's role in Cenozoic global environmental change. ANDRILL's goal is to obtain a direct reference record of important Eocene, Neogene and Holocene stratigraphic intervals in the high southern latitudes proximal to the dynamic Antarctic cryosphere. ANDRILL will use an integrated approach involving geophysical site surveys, core recovery and analysis, and numerical modeling to address four scientific themes: (1) history of Antarctic climate and ice sheets; (2) evolution of polar biota; (3) Antarctic tectonism; and (4) Antarctica's role in Earth's ocean-climate system. The program will use new innovations in polar drilling technology, under development with support from NSF and the national research programs of ANDRILL partner nations. Two drilling Projects in the McMurdo Sound region will target stratigraphic records at new locations and previously unrecovered time periods. Results will lead to insights into: (1) the development of the Antarctic cryospheric system (ice sheet, ice shelf, and sea ice); (2) the magnitude and frequency of cryospheric changes on centennial to millennial timescales; (3) the influence of Antarctic ice sheets on Eocene to Holocene climate, the modulation of thermohaline ocean circulation, and eustatic change; and (4) the evolution and timing of major tectonic episodes in Antarctica and the development of sedimentary basins. The results will also contribute to the goals of other international science initiatives such as the Ocean Drilling Program (ODP), the Integrated Ocean Drilling Program (IODP), International Marine Global Changes (IMAGES), and MARGINS. The program will bring together international teams of scientists, educators, and students for each drilling project, and will provide unique opportunities to share aspects of Antarctic Earth science with the global community.

The successful retrieval of cores in Antarctica with better than 95% core recovery and excellent depth of penetration from fast-ice, ice-shelf, and land-based platforms is ensured by the improved ANDRILL drilling system. The ANDRILL program will provide new, seismically-linked and chronostratigraphically well-constrained Cenozoic stratigraphic records from locations proximal to the Antarctic cryosphere. Empirical data garnered from these records will calibrate numerical models, and will allow new and direct constraints to be placed on estimates of ice volume variability, marine and terrestrial temperatures, the timing and nature of major tectonic episodes, and the development of Antarctica's marine, terrestrial, and sea-ice biota. The ANDRILL Program will deliver a unique

dataset that can only be obtained from an ice-based drilling system. The new ANDRILL data will complement the results of parallel international initiatives and enable the global scientific community to begin to fully assess the role of Antarctica in Earth's ocean-climate system. ANDRILL will build upon the strong scientific foundations and partnerships among individual researchers and international institutions developed during the successful CRP (1992-2001).

The NSF broader impacts criteria will be satisfied by: (i) further strengthening collaborations among U.S. academic institutions and international partners from Germany, Italy, New Zealand and the United Kingdom; (ii) including teachers and undergraduate and graduate students as formal members of research teams; (iii) communicating research outcomes at professional meetings, workshops and in peer-reviewed journals; (iv) developing and maintaining an interactive website designed for a broad audience; and (v) providing a range of on-site educational activities and services, including lectures, guided visits to field sites and assistance with interviews and documentary film production. Research outcomes will contribute to the development of strategies to cope with future climate change, provide insight into relationships between ice sheet fluctuations and volcanic and seismic hazards, and improve tectonostratigraphic models of glacially influenced sedimentary rift basins. ANDRILL will foster strong partnerships with established educational programs to develop a broad array of informal and formal activities designed to educate policymakers, K-12 teachers, students, and the community at large.

(Text above modified from ANDRILL Contribution 2 -- ANDRILL International Science Proposal -- U.S. PIs: R. DeConto, D. Harwood, R. Levy, R. Powell, T. Wilson, S. Wise)

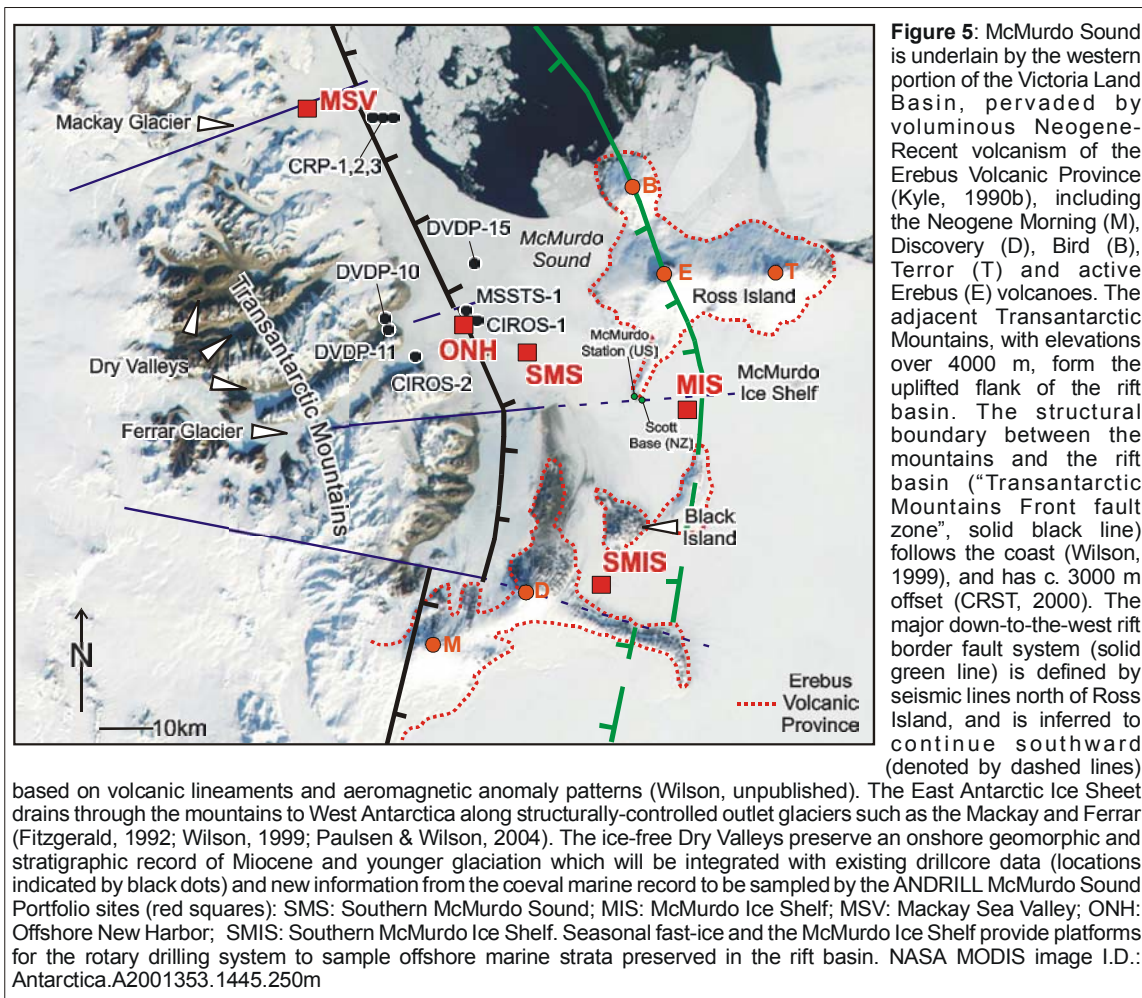
Note: The United Kingdom (U.K.) is a member of the ANDRILL Program (through membership of the ASC), but it is not currently contributing funds toward the two supported ANDRILL Projects. Therefore, U.K.-based scientists are not currently eligible to participate in these projects.

## **2.2 OVERVIEW OF THE INAUGURAL ANDRILL PROJECTS**

The first two seasons of ANDRILL drilling are scheduled for the austral spring of 2006, (McMurdo Ice Shelf Project - MIS) and 2007 (Southern McMurdo Sound Project - SMS). For a detailed overview of the scientific goals and rationale for each project, please refer to the Science Plan in the respective project's Prospectus document.

McMurdo Sound was selected as the site for first ANDRILL Portfolio for scientific and logistical reasons. McMurdo Sound is located at the juncture of several components of the West Antarctic Rift System (WARS), including the Victoria Land Basin (VLB), Transantarctic Mountains (TAM), and Erebus Volcanic Province (Figure 2). The region is currently situated near the confluence of several components of the Antarctic cryosphere including the East and West Antarctic Ice Sheets, local alpine glaciers and sea ice. As proven at Cape Roberts, proximity to the TAM combined with ample accommodation space from tectonic subsidence of the VLB gives the region excellent potential to produce high-quality, time-continuous paleoenvironmental records, during times of both large and small Antarctic ice sheets. In some areas of the sound, Neogene volcanism has produced flexural-moat basins superposed on the Victoria Land rift basin. The flexural moats provide both an ideal setting for sediment accumulation and a means of developing a high-resolution chronology from volcanic detritus. MIS and SMS drill site locations are based on geophysical and seismic surveys combined with knowledge gained at other proximal drill sites. Both sites are located to maximize the potential recovery of new stratigraphic records.

McMurdo Sound is close to existing Antarctic logistical centers, including McMurdo Station (U.S.) and Scott Base (NZ). The Crary Science and Engineering Center (CSEC) at McMurdo Station is a state-of-the-art science facility. The proximity of these facilities to the selected drill sites minimizes logistical difficulties associated with operating a new drilling system in an extreme environment. Furthermore access to CSEC allows ANDRILL to involve a full scientific team to achieve comprehensive on-ice core characterization and analysis.



### 2.2.1 McMurdo Ice Shelf Project (MIS)

The primary target for MIS is 1200 m of Plio-Pleistocene terrigenous, volcanic, and biogenic sediment deposited in a flexural moat basin in Windless Bight, south of Ross Island. The drill site is located in 900 m water depth, under an ice-shelf drilling platform. Multichannel seismic reflection profiling (Melhuish et al., 1995; Bannister and Naish, 2002; Horgan et al., 2003; in press) suggests progressive infilling of the flexural moat basin, associated with at least two phases of volcanic loading (Mt. Terror c. 1.75 Ma and Mt Erebus c. 0.94 Ma (cf. LeMasurier and Thomson, 1990).

The primary scientific objective of MIS is to better understand the past behavior of the Ross Ice Shelf (RIS) and West Antarctic Ice Sheet (WAIS), including their behavior and stability during warm inter-glacial periods (e.g., 400 ka, Marine Isotope Stages 11, 31). Comparison of MIS data with coeval records from other latitudes will assess the role of RIS in ocean circulation and global/bipolar linkages. While the general behavior of the RIS and WAIS is likely to be influenced by the major Quaternary glacial-interglacial cycles, we expect new records of higher frequency variability and abrupt events to be recovered.

*Paleoclimatic, paleoceanic, and tectonic objectives at MIS are to investigate the:*

- timing of RIS-WAIS development relative to major ice expansion of northern hemisphere ice sheets c. 3.0 to 2.5 million years ago

- nature of grounding-line and calving-line variability during both the last glacial cycle and the Plio-Pleistocene climate cycles
- RIS behavior during the past interglacial warm climatic optima (e.g. Marine Isotope Stages 5e, 11, 31), and interstadial warm periods
- sedimentological and biological evidence for RIS collapse and their correspondence to melt-water discharge
- effect of RIS collapse on the global thermohaline ocean conveyor
- phase relationship between RIS collapse, or partial collapse and northern hemisphere climatic events
- detailed history of the Ross Island volcanic complex
- flexural response of continental lithosphere to loading
- history of Pliocene faulting
- temporal relationships between volcanism, ice volume, local sea level, and eustasy
- regional stress regime

### **2.2.2 Southern McMurdo Sound Project (SMS)**

The primary target of the SMS Project is to recover an interval of middle to upper Miocene strata in two drillholes that will build on the composite stratigraphy recovered at the Cenozoic Investigations in the Western Ross Sea (CIROS)-1 (upper Eocene to lower Miocene) and CRP (uppermost Eocene to lower Miocene) drillholes. Two drill sites are located in 400 and 200 m water depth, respectively, and sit beneath a fast-ice platform. Drilling is expected to recover 700 and 400 m sections spanning intervals of time throughout the past 17 m.y. Seismic stratigraphic correlation to the CIROS-1 and CRP drillholes (Figure 2) indicates the targeted section is < 17 Ma in age. Stratigraphic records from this interval are likely to encompass a wide range of climatic conditions on Antarctica, including the relative climatic warmth of the middle Miocene climatic optimum 15-16 Ma, prior to presumed cooling and ice volume increases between ~14-10 Ma. Comparison of upper Miocene and Pliocene marine drillcore data from SMS sites with existing records in Dry Valley Drilling Project (DVDP) and CIROS-2 drillcores, as well as nearshore and terrestrial outcrops in the Dry Valley Region, will provide a more complete picture of the character and behavior of the Neogene East Antarctic Ice Sheet (EAIS) and its implications for the wider Antarctic and global climate. SMS drillcore will provide chronostratigraphic control of regional seismic surfaces, facilitating interpretations of regional stratal architecture and Neogene fault history.

*Paleoclimatic, paleoceanic, and tectonic objectives at SMS are to investigate the:*

- onset and subsequent history of sea-ice presence/absence
- Middle Miocene-recent history of the McMurdo sector of the RIS
- evolution of terrestrial vegetation during the Neogene
- the history of Late Neogene sea level
- events of meltwater discharge from the EAIS through Dry Valley outlet glaciers/fjords
- history of regional glacial-interglacial cycles
- characteristics of regional glacial regime/ice sheet
- history of Neogene subsidence in the VLB
- provenance and exhumation proxies within Neogene sediment from the TAM
- history of Neogene faulting determined by fracture logging
- regional stress regime



### **3. OVERVIEW OF UNITED STATES CONTRIBUTIONS TO ANDRILL**

#### **3.1 LOGISTICAL and OPERATIONS CONTRIBUTIONS**

The National Science Foundation – Office of Polar Programs will contribute approximately 50% to the logistical and operations costs of this first phase of the ANDRILL Program. NSF provided support for the purchase and integration of a new drilling rig for ANDRILL from awards through the Major Research Implementation (MRI) Program to Northern Illinois University (NIU) and University of Nebraska-Lincoln (UNL), with contributions from NIU and ANDRILL partner nations.

#### **3.2 SCIENCE FUNDING**

The National Science Foundation has established a Cooperative Agreement with the UNL to manage U.S. science contributions to the ANDRILL Program. Key institutional partners include UNL, NIU, Florida State University (FSU), The Ohio State University (OSU), and University of Massachusetts-Amherst (UMass). U.S. science contributions include the following components:

- 1) ANDRILL Science Management Office – UNL
- 2) ANDRILL U.S. Science Support Program (AUSSP) – UNL and the Joint Oceanographic Institutions (JOI)
- 3) Site Survey – UNL and NIU
- 4) Curatorial Facility – FSU
- 5) Downhole Experiments and Whole Core Scanning (equipment and technical support) – OSU and Utah
- 6) Modeling – UMass and Penn. State
- 7) Education and Public Outreach Program – UNL
- 8) Publications – ANDRILL SMO - UNL

### **4. ANDRILL U.S. SCIENCE SUPPORT PROGRAM**

#### **4.1 OVERVIEW**

The ANDRILL U.S. Science Support Program (AUSSP) was developed by the USSC and the SMO to facilitate: participation of U.S. scientists in ANDRILL projects; production of high quality scientific results; and dissemination of results to the broader U.S. community. The AUSSP supports participation of the U.S. Antarctic scientific community in all aspects of ANDRILL, from initial planning activities through post-drilling dissemination of results. Components of the AUSSP include:

- (1) U.S. Scientist Support
  - Project Staffing
  - Research Support for the Core Characterization Phase
  - Research Support for the Science Documentation Phase
  - Graduate Student Support
  - Travel
- (2) Graduate Student Fellowships
- (3) Research Experience for Undergraduate Students
- (4) Support for USSC activities

The AUSSP is managed by the ANDRILL Executive Director (UNL) under advisement of the USSC. USSC procedures are found in Appendix A, and current members in Appendix B. Other components of the ANDRILL management structure are outlined in Appendix C.

One of the primary concerns of the USSC has been to formulate procedures and policies for U.S.-ANDRILL staffing and funding. These policies are presented in this document. Joint Oceanographic Institutions (JOI), a non-profit

corporation with experience in managing scientific drilling programs for NSF, will implement review of staffing applications and review of science documentation proposals for the U.S. ANDRILL community. A panel convened by JOI will evaluate the scientific merits of proposal and budget justification. JOI will discuss budget levels with participating scientists and request revised budgets, if necessary, before making recommendations to the SMO regarding sub-awards to support post-drilling science documentation activities by Science Team Members.

#### **4.2 COMPOSITION OF U.S. SCIENCE TEAMS**

As described in subsequent sections and appendices, the MIS and SMS projects include a drilling phase, during which initial core characterization will occur at both on-ice and off-ice locations, downhole experiments, curation of the cores at FSU, a core sampling workshop, additional off-ice sampling and analyses, data synthesis, and dissemination of results. The number of participating scientists from each partner nation will be roughly proportional to that nation's financial contribution to ANDRILL operational costs. The U.S. funding contribution to ANDRILL will allow the participation of roughly 20 senior scientists and post docs, 8 graduate students, and 8 undergraduates from U.S. institutions in each project.

At least 20 senior scientists from the U.S. will be invited to become Science Team Members for each of the supported ANDRILL Projects (one Co-Chief Scientist and 19 senior, research, and post doctoral scientists). Applications will be accepted from scientists and engineers (e.g. professors, research scientists, technologists, graduate students) affiliated with U.S. institutions (e.g. universities, government agencies, corporations). In addition, up to 8 graduate students and 8 undergraduate students could participate for each project. Science Team Members will be assigned to either the on-ice or off-ice group. On-ice team members will travel to, and work in Antarctica (primarily at McMurdo Station) during the drilling operations, while off-ice personnel will remain at their home institutions. Both groups will work at their home institutions to complete the core characterization phase.

A general breakdown of U.S. participants for each drilling project for budgetary purposes is presented below. The actual complement of U.S. scientists on any project Science Team will depend on the U.S. applicant pool and integration of U.S. and international scientists, and will be established at the time of staffing.

##### On-Ice U.S. participants:

- One U.S. Co-Chief Scientist
- Twelve Senior, Research, and Post-Doctoral Scientists
- Four Graduate Student Assistants
- Two Graduate Student Fellows

##### Off-Ice U.S. participants:

- Seven Senior, Research, and Post-Doctoral Scientists
- Two Graduate Student Assistants
- Eight Undergraduate Research Students (NSF REU Program)

#### **4.3 STAFFING PROCEDURE**

U.S. staffing recommendations will be made through a joint consultation procedure involving a proposal submission and review process managed by the ANDRILL Executive Director, the USSC and JOI (see Section 7.1). This process will be accomplished during the summer of 2005. U.S. staffing recommendations will be forwarded for consideration together with other national submissions by project Co-Chief Scientists and the McMurdo Sound - ANDRILL Science Implementation Committee (M-ASIC) for final approval and invitation of Science Team Members. This staffing procedure will result in an integrated Science Team chosen to meet the scientific objectives of each project, balanced by national affiliation as outlined in ANDRILL staffing agreements.

#### 4.4 RESPONSIBILITIES OF THE SCIENCE TEAM MEMBERS

Drilling seasons for the MIS and SMS projects are scheduled for October-December of 2006 and 2007, respectively. Applications will be accepted during April and May, 2005, for both projects. Commitment to the project begins when invitees sign an agreement with the M-ASIC elaborating their responsibilities and their acceptance of all the rights, privileges and obligations of a member of the Science Team, as defined by ANDRILL policy. Each project will run for approximately two and a half years. Invitees will be assigned a specific role in the Science Team. On-ice Science Team Members will travel to Antarctica for the drilling season. Drilling season lengths can vary, but two months is a typical duration. On-ice Science Team Members will be expected to stay for the entire length of the expedition. Off-ice Science Team Members will receive samples delivered from Antarctica while drilling is underway, and will work on these samples at their home institution and report results to the Co-Chief Scientists in Antarctica.

Initial scientific data and core logs will be included in an On-Ice Report produced and circulated on-line at the conclusion of drilling operations. Following the completion of the drilling phase of each project, Science Team Members will continue research activities at their home institutions and publish initial scientific results in an Initial Results Volume, which will be produced as a compilation of results presented at the Core Sampling Workshop (4 months post-drilling). Projects will be considered complete following acceptance of a manuscript for a Scientific Results Volume or other mainstream scientific journal approximately 24 months after drilling ends.

#### 4.5 FINANCIAL SUPPORT

Financial and logistical support will be provided to U.S. scientists for their participation in an ANDRILL Project. Research activities for each ANDRILL Project will occur in two phases: (1) *Core Characterization* (which includes all on-ice and off-ice activities that occur during drilling and prior to the core workshop) and (2) *Science Documentation* (all post-core workshop research activities). Separate awards will be made to U.S. scientists for each research phase. Requests for support will be peer-reviewed by a panel convened by JOI to determine whether the proposed work is appropriate and necessary to meet the scientific objectives of the project. Actual award values will be determined by specific costs at each institution and salary grades of individual scientists and students. **Note: the numbers of individuals and value of research awards are tentative and target values only, pending final award from NSF and future decisions regarding the number of U.S. scientists per project.**

##### 4.5.1 U.S. Scientist Support for Core Characterization

This phase involves a six-month period of study (3 months during drilling and 3 months immediately following drilling) on initial samples taken from the drillcore by curatorial staff working in Antarctica. During drilling, the core characterization phase research will be conducted by project scientists working in Antarctica, as well as by others working at home institutions. Once drilling ends, both groups of scientists will continue to work on initial samples at their home institutions. A Core Sampling Workshop at the curatorial facility (FSU) will mark the end of the core characterization phase. Prior to drilling, the Research Offices of NIU or UNL will make a sub-award to home institutions of the scientists and students selected as Science Team Members of each drilling project to support research activities, subject to continued funding from NSF.

##### On-Ice U.S. participants:

###### One U.S. Co-Chief Scientist

- Three months salary + fringe and IDC (Indirect Costs at an off-campus rate) for pre- and post-drilling work and 3 months salary for the core characterization phase.
- Funds for pre-deployment medical and dental exams (up to \$460 per person + IDC at off-campus rate)
- Travel to include per diem while in New Zealand on the way to Antarctica (up to five nights at \$150 + IDC at off-campus rate).
- Initial research support for Co-Chief Scientist will be used to cover research costs (supplies, analyses, etc.) for the core characterization phase (\$5000 on average per person + IDC at off-campus rate).

#### Twelve Senior, Research, and Post-Doctoral Scientists

- Up to 3 months salary + fringe and IDC (off-campus rate).
- Funds for pre-deployment medical and dental exams (up to \$460 per person + IDC at off-campus rate)
- Travel to include per diem while in New Zealand on the way to Antarctica (up to five nights at \$150 + IDC at off-campus rate).
- Initial research support for scientists will be used to cover research costs (supplies, analyses, lab assistants, etc.) for the core characterization phase (\$5000 on average per person + IDC at off-campus rate).

#### Off-Ice U.S. participants:

#### Seven Senior, Research, and Post-Doctoral Scientists

- No salary will be provided (for most cases) because these scientists will be working at their home institutions. Scientists who receive most of their salary from soft-money sources may request a stipend to support off-ice research efforts during the core characterization phase.
- Initial research support for off-ice Science Team Members will be used to cover research costs (supplies, analyses, etc.) for the core characterization phase (\$5000 on average per person + IDC at on-campus rate).

### **4.5.2 U.S. Scientist Support for Science Documentation**

This phase involves an 18-month period of study on supplementary samples requested at the Core Sampling Workshop. Results obtained during the science documentation phase will be integrated with that of other Science Team Members during the Science Integration Workshop to be held ~16 months after the Core Sampling Workshop. U.S. Science Team Members will submit a supplementary research proposal for the science documentation phase. Science Documentation proposals will go through a merit-review process that will be implemented by JOI. Although the nature and amount of the work and the costs involved may vary widely between disciplines, on average ~ \$21,000 + IDC at on-campus rate per scientist has been budgeted (includes all Co-Chief, Senior, Post-Doc/Research scientists, and Graduate Fellows) to cover costs of supplies, analyses, salaries, etc. Other scientists who are not Science Team Members may, by invitation or approval of the Co-Chief Scientist, submit a research proposal to the SMO to request samples and research funds. These proposals, which require endorsement of both Co-Chief Scientists and the M-ASIC, will be evaluated by the USSC and JOI.

Post-doctoral and Research Scientists are able to request additional funds to include up to 6 months of salary + fringe and IDC at on-campus rate.

### **4.5.3 Graduate Student Fellowships**

ANDRILL Fellowships will be awarded to two graduate students on a competitive basis. These students will develop their own research program and will not necessarily work at an institution from which a Science Team Member has been selected. However, each ANDRILL Fellow will have the opportunity to travel to Antarctica to work as a U.S. Science Team Member. Applications for fellowships will follow procedures for senior scientists (see Section 6). Each ANDRILL Fellowship will include:

- A salary stipend for up to 24 months, fringe benefits, tuition, and IDC at on-campus rate.
- Initial research support for Graduate Student Fellows will be used to cover research costs (supplies, analyses, lab assistants, etc.) for the core characterization phase. (\$5000 average per person + IDC at off-campus rate).
- Funds for pre-Antarctic medical and dental exams (up to \$460 per person + IDC at off-campus rate)
- Travel support to include per diem while in New Zealand on the way to Antarctica (up to five nights at \$150 + IDC at off-campus rate).
- Research funds may be requested to support research activities during the science documentation phase, as described under “Science Documentation” above.

#### **4.5.4 Graduate Student Assistantships**

Based on scientific justification, awards will be made to selected senior scientists to support **six graduate students** for the life of each ANDRILL Project (approximately 24 months). Four of these students will travel to Antarctica; two will work at home institutions. Each award includes a stipend for up to 24 months, fringe, tuition and IDC at on-campus rate. In addition, students who join the Science Team as on-ice members will receive:

- Funds for pre-Antarctic medical and dental exams (up to \$460 per person + IDC at off-campus rate).
- Travel support to include per diem while in New Zealand on the way to Antarctica (up to five nights at \$150 + IDC at off-campus rate).

Funding for research by graduate student assistants during the core characterization and science documentation phases must be covered by awards to the supervising senior scientist

A request for graduate student support should be made by senior applicants during the application period for Science Team Membership. These requests will be peer-reviewed by a panel convened by JOI to determine whether the proposed work is appropriate and necessary to meet the scientific objectives of the project.

#### **4.5.5 Research Experience for Undergraduates (NSF- REUs)**

Up to eight awards of approximately \$6000 each will be offered to support undergraduate student research for each ANDRILL Project. These REU funds will be awarded to Science Team Members on a justification/needs basis as determined through a merit-review process administered by the USSC, the U.S. Co-Chief Scientists and JOI. A request for undergraduate student support should be made by senior applicants during the application period for Science Team Membership.

#### **4.5.6 Travel to Workshops**

Support for travel to attend the Core Workshop and Science Integration Workshop will be provided to U.S. Science Team Members by the ANDRILL SMO, which will provide tickets and a mechanism to reclaim travel costs.

## 5. TIMELINE FOR U.S. PARTICIPATION IN ANDRILL PROJECTS

Year	Key dates	Event
2005	March	Prospectus documents for MIS and SMS Projects are available to the public.
	April 1, 2	U.S. ANDRILL Workshop, Denver.
	April 1	Application for science participation in the MIS and SMS Projects opens. Scientists may request support for graduate student and undergraduate student support with their application.
	June 1	Application for science participation in the MIS and SMS Projects closes.
	October	Applicants will be notified of final staffing decisions for MIS and SMS Projects.
	November 1	Acceptance of staffing offer to be sent to the ANDRILL SMO.
2006	March 15	MIS Project Science Team Members to submit research equipment and materials requirements (support information package [SIP]) to the SMO.
	June	MIS Project Science Team Members can expect to receive salary awards; undergo medical and dental exams for Antarctic deployment clearance; submit travel request documents to SMO.
	October	MIS Science Team Members - deploy to Antarctica.
	December	Production of the MIS On-Ice Science Report.
		MIS Science Team Members - depart Antarctica.
2007	Jan-March	MIS Science Team Members continue analysis of samples collected during drilling operations at their home institutions.
	March 15	SMS Project Science Team Members to submit research equipment and materials requirements (support information package [SIP]) to the SMO.
		MIS Project Science Team Members to submit papers or extended abstracts for inclusion in the MIS Project Initial Results Volume and preliminary supplementary sample request.
	April (date TBD)	MIS Project Core Sampling Workshop, Florida State University, Tallahassee, FL.
	April – May (date TBD)	MIS Project Science Team Members to submit Science Documentation proposal with final supplementary sample request (if required) to Co-Chief Scientists. [U.S. participants will submit a supplementary budget request to JOI].
	May - July	MIS Project Science Team Members receive supplementary samples.
	June	SMS Project Science Team Members can expect to receive salary awards; undergo medical and dental exams for Antarctic deployment clearance; submit travel request documents to SMO.
	October	SMS Science Team Members - deploy to Antarctica.
	December	Production of the SMS On-Ice Science Report.
		SMS Science Team Members - depart Antarctica.
2008	Jan-March	SMS Science Team Members continue analysis of samples collected during drilling operations at their home institutions.
		SMS Project Science Team Members to submit papers or extended abstracts for inclusion in the SMS Project Initial Results Volume and preliminary supplementary sample request.
	April (date TBD)	SMS Project Core Sampling Workshop, Florida State University, Tallahassee, FL.
	April-May (date TBD)	SMS Project Science Team Members to submit Science Documentation proposal with final supplementary sample request (if required) to Co-Chief Scientists. [U.S. participants will submit a supplementary budget request to JOI].
	May – July	SMS Project Science Team Members receive supplementary samples.
	June-Aug (date TBD)	MIS Science Integration Workshop
	Sep - Nov (date TBD)	MIS Project Science Team Members to submit papers for inclusion in the MIS Scientific Results Volume
		MIS Project Science Team Members to submit synthesis papers to relevant science journals.
2009	June-Aug (date TBD)	SMS Science Integration Workshop
	Sep - Nov (date TBD)	SMS Project Science Team Members to submit papers for inclusion in the SMS Scientific Results Volume.
		SMS Project Science Team Members to submit synthesis papers to relevant science journals.

## **6. RESPONSIBILITIES OF U.S. SCIENTISTS**

U.S. scientists will be responsible to the ANDRILL Program as well as to NSF through its Cooperative Agreement with the UNL.

### **6.1 RESPONSIBILITIES OF SCIENTISTS TO THE ANDRILL PROGRAM**

Responsibilities of members of an ANDRILL Project Science Team will be described in the letter of invitation to participate. The M-ASIC will send this invitation and request a formal acceptance of terms for involvement. The following describes the activities required of Science Team Members through the course of a drilling project. Refer to the Timeline (Section 5) for tentative schedule for the activities.

#### **6.1.1 Pre-Drilling activities**

All Science Team Members must propose anticipated sample requirements for the core characterization phase of the project. This sample request should be made to the SMO at the time of acceptance of a position on the Science Team, and will be considered by the Co-Chief Scientists and Curators and approved by the M-ASIC. On-ice Science Team Members will submit research equipment and materials requirements and travel-related information to the SMO, and must successfully complete medical and dental examinations for deployment to Antarctica.

#### **6.1.2 Drilling activities**

On-ice and off-ice Science Team Members will complete initial analysis and characterization of recovered materials, contribute openly to scientific discussions with other team members, and provide results for inclusion in (1) periodic science reports that will be distributed to all Science Team Members, the M-ASIC, AOMG and National Antarctic Program Managers; and (2) the on-line data integration system that will store all project data and render this accessible to on-ice and off-ice Science Team Members. In addition, team members will contribute text, figures and tables, and data as appropriate, to the Co-Chief Scientists, Staff Scientist and Discipline Team Leader (DTL) (see Appendix C.) for inclusion in the On-Ice Science Report and initial publications to *EOS*, *Geotimes*, etc.

#### **6.1.3 Post-Drilling activities**

Science Team Members will attend a Core Sampling Workshop at FSU, Tallahassee, FL, where on-ice and off-ice Science Team Members meet and share results approximately 4 months following conclusion of the on-ice phase. Each member will submit papers or extended abstracts and figures/tables for distribution at the Core Sampling Workshop and inclusion in the Initial Results Volume. Proposals for the science documentation phase (additional samples and funding) will be submitted for review by the Co-Chief Scientists and JOI. Receipt of additional samples and science documentation funding is contingent on submission of a report for the Initial Reports Volume. Additional samples will be distributed upon approval of supplemental funding. At the Science Integration Workshop, Science Team Members will submit draft manuscripts for inclusion in a Scientific Results Volume or will circulate draft manuscripts prepared for submission to a mainstream science journal. Science Team Members also will be encouraged to contribute to synthesis and thematic papers submitted to relevant science journals. An annual report, and a final report, of research, educational activities and expenditures must be submitted to the SMO by sub-awardees for reporting to NSF.

### **6.2 RESPONSIBILITIES OF AWARDEES TO NSF and UNL**

U.S. scientists selected as Science Team Members in either of the currently supported projects should read the ANDRILL science proposal “Project Summary” located in the Introduction section of this document, and be prepared to work with other team members to meet the stated project objectives for both ‘intellectual merit’ and ‘broader impacts’, as described in NSF’s Grant Proposal Guide and as outlined in contract agreements with UNL.

## 7. HOW TO APPLY TO PARTICIPATE IN ANDRILL

Application to participate as a Science Team Member in ANDRILL projects is restricted to individuals affiliated with scientific institutions from nations that are contributors to logistical and operational costs of ANDRILL projects. A standard application procedure has been implemented for interested scientists from each contributing nation, however initial screening of applicants falls within the jurisdiction of each national program. In addition to the standard application, U.S. applicants are also required to complete a budget and a budget justification. All applications will be submitted and managed through a web-based interface (<http://andrill.org/application.htm>).

All interested U.S.-based scientists are encouraged to apply. The U.S. program is particularly interested in seeking a broad range of applicants with diverse skills, in an effort to bring new expertise to Antarctic research. No prior Antarctic experience is required. U.S. applicants must hold an affiliation with a U.S. University or research institution at the time of application submission. Senior level scientists may include in their application a request for a research support position. These positions are intended for skilled technical support by a graduate or advanced undergraduate student from their lab. A competitive ANDRILL Graduate Fellowship program has been established for highly qualified graduate students to participate as full research members of each project's Science Team. Detailed information on U.S. science support can be found at <http://andrill.org/us.htm> and in section 4 of this document.

Applications for Science Team membership, including Graduate Fellowship applications, will be accepted during the period April 1st to June 1st, 2005 for the MIS Project, to be drilled in October-December, 2006, and the SMS Project, to be drilled in October-December, 2007. If you plan to apply for both projects, please clearly indicate and justify your preference, as you will likely be selected for only one. Requests for research support for a graduate or undergraduate assistant should be submitted as part of your application for Science Team membership.

### 7.1 U.S. APPLICATION EVALUATION and SELECTION PROCESS

The ANDRILL SMO will forward submitted applications from U.S. participants to the relevant Co-Chief Scientists and to the JOI Office for evaluation by a review panel comprised of experts drawn from the ocean drilling and polar geologic research communities. At least one representative of the USSC and the ANDRILL Staff Scientist will participate in this review process in an advisory capacity to the panel, to answer questions, provide nominations for the review panel, and to summarize U.S. national priorities as established by the community at U.S. workshops. The JOI panel will evaluate the applications using criteria established by the USSC. These criteria include:

- What are the applicant's level of skills, training, and experience?
- Is the field of expertise essential to the Project Science Plan?
- Does the field of expertise provide new or innovative approaches to advance the Project Science Plan?
- Is the scientist's effort required on-ice?
- Does the applicant have sufficient institutional resources to undertake the research?
- Based on the applicant's record of past achievement and the proposal quality, what is his/her/their potential to deliver timely, high-quality scientific papers?
- Is the budget request appropriate?

Prioritized recommendations regarding applicants will be distributed by JOI to the SMO, the USSC, Co-Chief Scientists, and the U.S. National Representative for review prior to forwarding to M-ASIC by the SMO. This list of U.S. scientists recommended for on-ice and off-ice positions likely will exceed the maximum number of positions actually available in the U.S. quota. This overcapacity is intended to provide backup, as well as some flexibility in final staffing decisions. Co-Chief Scientists will consider staffing recommendations from each contributing nation to formulate an initial staffing plan for each project. Staffing recommendations will be based on science needs, national logistical contributions, and identified areas of national scientific focus. Based on U.S. community interests demonstrated at ANDRILL workshops and through applications, the USSC will recommend U.S. priority areas to the U.S. Co-Chief Scientists and the U.S. National Representative to the M-ASIC. Co-Chief Scientists will forward the initial staffing plan to the M-ASIC for consideration. The M-ASIC will meet in September, 2005 to decide on the Staffing Plan for both the MIS and SMS projects.



*The SMO will notify successful applicants before the end of October, 2005.*

## **7.2 APPLICANT RESPONSIBILITIES**

By submitting an application to the SMO you will register an official request to become a Science Team Member in one of the current ANDRILL projects. Your application is an implicit, non-transferable agreement to participate (if selected), unless circumstances develop that would prevent your participation. The application process is competitive, and decisions are based on a variety of criteria, including scientific program needs, qualifications, availability of appropriate research facilities, and national and international priorities and constraints. If selected, applicants will be asked to agree to the “Responsibilities of US Science Team Members” given in the previous section of this document, and specific responsibilities in the participation agreement from the M-ASIC.

## **7.3 APPLICATION for SUPPLEMENTAL SAMPLES and FUNDS for SCIENCE DOCUMENTATION**

Following core recovery and prior to the Core Workshop, Science Team Members from ALL nations will be required to submit a modified research plan based on the post-drilling project Science Plan (as revised by the Co-Chief Scientists) to request additional samples. In addition, U.S. based scientists will have the opportunity to request supplemental funding to support research during the science documentation phase. A review panel convened by JOI will evaluate the U.S. proposals based on the following criteria:

- Is the research central to meeting the science goals identified post-drilling?
- What is the potential of the proposed research to deliver high-quality and innovative science?
- Is the research budget appropriate?

JOI will inform the Science Team Member of the results of the review, discuss any budget modifications recommended by the review panel, and call for a revised budget and work statement as appropriate, before advising the SMO of the panel’s recommendations for sub-awards. Sub-awards will be made from the Research Offices of NIU or UNL to the applicant’s institution.

## **8. REFERENCES**

Bannister, S. and Naish, T.R., 2002. ANDRILL Site Investigations, New Harbour and McMurdo Ice Shelf, Southern McMurdo Sound, Antarctica. *Institute of Geological & Nuclear Sciences Science Report* 2002/01, 24p.

Harwood, D.M., Lacy, L.L., Levy, R.H. (editors), 2002. *Future Antarctic Margin Drilling: developing a science plan for McMurdo Sound*. ANDRILL SMO Contribution 1. University of Nebraska-Lincoln, Lincoln, NE., 301pp.

Horgan, H., Bannister, S., Naish, T., Wilson, G., Pyne, A., Clifford, A. and Finnemore, M., 2003. ANDRILL Site Investigations/Seismic Surveys, McMurdo and Southern McMurdo Ice Shelf, McMurdo Sound, Antarctica. *Institute of Geological and Nuclear Sciences science report* 2003/05.

Horgan H., Naish T., Bannister S., Balfour N. and Wilson G., in press. Seismic stratigraphy of the Plio-Pleistocene Ross Island flexural moat-fill: a prognosis for ANDRILL Program drilling beneath McMurdo-Ross Ice Shelf. *Global and Planetary Change*.

LeMasurier, W.E., and Thomson, J.W., eds. 1990. Volcanoes of the Antarctica Plate and southern oceans. American Geophysical Union, Washington, D.C.

Melhuish, A., Henrys, S.A., Bannister, S. & Davey, F.J., 1995. Seismic profiling adjacent to Ross Island: Constraints on late Cenozoic stratigraphy and tectonics. *Terra Antarctica* 2(2), 127-136.

## **APPENDIX A: TERMS OF REFERENCE OF ANDRILL U.S. STEERING COMMITTEE (USSC)**

### **1. Duties**

**1.1. Overview.** This committee shall formulate scientific and policy recommendations for the U.S.-ANDRILL Science Program regarding staffing and funding; on contributions to and development of proposals related to ANDRILL projects; and additional activities as it relates to the ANDRILL Science Plan (ASP). The recommendations of the USSC will be presented through U.S. National Representatives to the ASC and M-ASIC, and will be presented to the ANDRILL Executive Director on behalf of the U.S.-ANDRILL science community. The USSC will formulate policies for the U.S. Science Support Program Plan (USSP) and, in cooperation with the Executive Director, will evaluate and assess the Program's accomplishments compared to long-term goals and objectives. The committee shall stimulate and coordinate wide participation by the U.S. scientific community.

### **1.2. Specific responsibilities and duties:**

Providing JOI with advice to ensure fair and informed decisions regarding staffing and research support decisions, by:

- Participation in the review and recommendation of staffing for U.S. on-ice and off-ice scientists;
- Participation in the review and recommendation of research support for post-drilling research by U.S. on-ice and off-ice scientists;

Developing the agenda for national workshops aimed at ongoing development of the science program;

Encouraging innovative scientific, technical and educational developments; national and international collaboration; and the formulation of long-term integrated studies; in coordination with the Executive Director and Education & Outreach Coordinator;

Providing oversight on the use of NSF science funds as received for science support;

Consulting with the Executive Director and NSF on U.S.-ANDRILL-related issues and activities, as needed;

Promoting U.S.-ANDRILL activities with other large science programs through community involvement, including IODP, SHALDRIL, FASTDRILL, other SCAR and national initiatives, other national Polar/Antarctic programs, as well as potential future international research initiatives;

Reviewing and monitoring progress of regional field studies and site surveys in the context of their scientific implications and the development of future or potential drill sites, assisting the ASC in development of new projects;

Encouraging community-wide integration of ANDRILL results with regional field studies and global data sets;

Monitoring and providing advice, as needed, to the Executive Director on technical developments required for both drilling and scientific activities;

Providing the Executive Director with recommendations and comments on the USSP and the SMO budgets on an annual basis; and

Providing both the Executive Director and Education & Outreach Coordinator with recommendations on outreach and education opportunities within U.S. institutions.

## **2. Membership**

The USSC shall consist of 7 members, with at least 4 of the 7 USSC members from academic research institutions belonging to the ANDRILL U.S. Consortium (which currently comprises FSU, NIU, OSU, UMass, and UNL).

The USSC shall include ex-officio members (consisting of the U.S. National Representative(s) to the ASC, the U.S. National Representative(s) to the M-ASIC, the U.S. National Representative(s) to the ANDRILL Science Advisory Panel (ASAP), and the U.S.-ANDRILL Executive Director). The ANDRILL Staff Scientist and the Research Support Coordinator shall attend USSC Meetings as required; any additional SMO staff shall attend any meeting deemed appropriate or necessary to USSC business.

Terms of office of Committee Members shall typically be 3 years resulting in a staggered rotation of members on to and off of the USSC; however, office terms can be modified by the USSC by simple majority agreement. The first USSC rotation is expected to occur following the first drill season (2007) with 2 to 4 of the USSC memberships to rotate.

## **3. Procedures**

New USSC members will be solicited through nominations and/or volunteers from the U.S. Antarctic science community. Individuals will be reviewed by the USSC and contacted by the USSC Chair as vacancies occur.

The USSC will select a Chair from among its members. Normal duration of service will be for one year.

The Chair can serve more than one term and self-succeed.

The USSC will also select a Secretary for the same term. The Secretary will be responsible for recording and distributing minutes of the meetings, compiling action items or decisions, and generally keeping USSC members notified and apprised of USSC-related discussion and activities.

In the event that the Chair is unable to attend a meeting, the Secretary will be notified accordingly and shall act as the Chair in his or her absence.

At least 2 USSC Meetings will be held per year with a required attendance of 5 USSC members needed to achieve a quorum.

Decision-making will be by simple majority with minority opinions (if present) noted.

Email and teleconferences are considered suitable forums for USSC business or discussion. Any decisions made by the USSC through email or teleconference shall be considered legitimate, provided 5 of the seven members respond. All USSC decisions (including any dissenting opinion) shall accompany all recommendations to the Executive Director, U.S. National M-ASIC and ASC Representatives, and JOI.

USSC members directly involved with any ANDRILL business at hand (e.g. staffing consideration, proposal review, etc.) will exclude him- or herself from any discussion and resulting decision, recommendation, or action taken. Accordingly, all USSC members will be governed by the Federal Conflict of Interest policy during their tenure(s).

USSC meeting minutes, decisions, and action items or recommendations will be made openly available on the ANDRILL website, unless an Executive Session is called (for example, on personnel issues).

Proposed amendments or modifications to this ToR can be made by the USSC at any time, pending a majority vote. Typically, any proposed amendment(s) or modification(s) should be directed to the attention of the Chair and shall appear as an agenda item at scheduled USSC Meetings.

The USSC will appoint to the community-endorsed ASC a U.S. National Representative and a Deputy Representative, to represent U.S. interests in the development of new drilling projects.

## APPENDIX B: MEMBERSHIP OF ANDRILL U.S. STEERING COMMITTEE (USSC)

### Current ANDRILL-USSC Members

**Robert DeConto, Secretary (2002-2006)**

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**Robert Dunbar (2002-2006)**

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**Christopher Fielding (2004-2007)**

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**Stephen Pekar (2004-2007)**

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*And:* Adjunct Associate Research Scientist  
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**Reed Scherer (2004-2007)**

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**Terry Wilson, Chair (2002-2006)**

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[wilson.43@osu.edu](mailto:wilson.43@osu.edu)

**Sherwood (Woody) Wise, Jr. (2002-2006)**

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850.644.6265  
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[wise@gly.fsu.edu](mailto:wise@gly.fsu.edu)

### **Ex-Officio USSC Members**

David Harwood (M-ASIC Representative)  
(USSC 2002-2003; Ex-officio 2003-present)  
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*And:* 328 Bessey Hall  
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402.472.2468  
Fax 402.472.4917

Ross Powell (ASC Representative)  
(USSC 2002-2003; Ex-officio 2003-present)  
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Peter-Noel Webb (ASAP Representative)  
(USSC 2002-2003; Ex-Officio 2003-present)  
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614.292.8746 or -7285  
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[webb.3@osu.edu](mailto:webb.3@osu.edu)

### **Former USSC Members**

Rosemary Askin (2002-2003)  
The Ohio State University

Thomas Janecek (2002-2004)  
Florida State University

## **APPENDIX C: ANDRILL ORGANIZATION AND SCIENCE MANAGEMENT**

### **ANDRILL Science Committee (ASC)**

The ASC is a community-endorsed planning committee that provides the Antarctic Earth science community with a framework, management structure, and mechanism to assist in the development and maturation of drilling proposals, the collection and integration of site survey results, and to coordinate initial discussions regarding resource allocations from National Antarctic Programs. The ASC's chief responsibility is the development of future ANDRILL science targets, from initial concept to the submission of proposals. Membership of the ASC includes national representatives appointed by National Steering Committees (or other bodies) and proponents of developing projects. Chief responsibilities of these members are (1) to develop science and operational portfolios for drilling around the Antarctic margin; (2) to facilitate the establishment of international consortia to support drilling operations; (3) to ensure a plan of geophysical surveys and drilling capability is operating on behalf of the international community; (4) to organize the ANDRILL Site Survey Panel (ASSP) and ANDRILL Scientific Measurements Panel (ASMP); and (5) to maintain continuity of the ANDRILL Science Plan (ASP) in the developing portfolios and drilling projects.

### **McMurdo Sound - ANDRILL Science Implementation Committee (M-ASIC)**

National Antarctic Program Managers from Germany, Italy, New Zealand and USA formally established the M-ASIC to be responsible for all scientific aspects of the two approved ANDRILL projects. Each of these nations is represented on the M-ASIC by a principal representative and by an alternate representative. The M-ASIC works with the AOMG for overall planning and implementation, and is supported by the staff of the SMO. The main objectives of the M-ASIC are to see that all science aspects of the funded projects are met and that science requirements have been appropriately considered in drill system design and field operations planning. This includes ensuring that (1) the planning of project science is fully developed, (2) the science plans are put into effect, (3) the results from each project are appropriately reported, and (4) the recovered cores are properly curated. Other ANDRILL Science Implementation Committees (ASICs) will manage future ANDRILL portfolios and projects, when approved.

### **ANDRILL Operations Management Group (AOMG)**

The AOMG comprises the National Logistics Coordinators of the ANDRILL partner nations and/or their agreed delegate(s). The main responsibilities of the AOMG are to: (1) provide governance to the approved ANDRILL projects; (2) provide operations and logistics funding for the approved projects; (3) oversee and approve all operations and logistics planning and operational execution of the projects; (4) liaise with the M-ASIC to ensure project science objectives are understood and science requirements are being incorporated into operational and logistics planning and execution; and provide direction and oversight to the Operations Management Office (OMO). The AOMG reviews, at least quarterly, the logistics support requirements, including operational funding and payment schedules, for the approved science projects.

### **Operations Management Office (OMO)**

Antarctica New Zealand is the Project Operator for the two approved drilling Projects of the McMurdo Sound Portfolio (MSP). The OMO is responsible for project management services for the MSP, including day-to-day project administration, financial management of ANDRILL funds, information dissemination to/from AOMG, M-ASIC and SMO. The OMO enters into contracts for services and equipment on behalf of ANDRILL, and the timely provision of financial, operational and technical reports to AOMG, M-ASIC and the broader ANDRILL community, as appropriate. Other tasks include: logistics services and operational planning and execution; drilling services including drill system development and drilling operations in Antarctica; support services, including the refurbishment or building of camp facilities, provision of transportation for Antarctic operations and support of drilling operations in the field; and science and technical services, including close liaison with the ANDRILL science community on drilling and operational-logistics issues that will impact science. Staff within the OMO includes the Project Manager and the Drilling Science Coordinator (DSC).

### **Science Management Office (SMO)**

The SMO is responsible for overall coordination of the ASP, including the activities of the ASC for planning of new drilling targets, the M-ASIC for implementation of approved drilling projects, as well as National Steering Committees and advisory panels. Key tasks include: (1) liaising with the above committees, the OMO and

Raytheon Polar Services Co (RPSC); (2) coordinating and managing the application process for the two projects' Science Teams; (3) consolidate the requests of scientists for field and laboratory support of efforts during drilling and site survey activities; (4) manage the deployment of the ANDRILL science and support teams to Antarctica and to project workshops; (5) coordinating all aspects of science publication, including editorial oversight and production/distribution of science reports; (5) assisting the Co-Chief Scientists and DTLs in management of the Science Team and procurement of science supplies and equipment, and coordinating education and outreach activities. The ANDRILL SMO is located at UNL and is staffed by an Executive Director, Director of Research, Coordinator of Education and Outreach, Staff Scientist and Research Support Coordinator. *CHRONOS* provides IT support for ANDRILL's web site and will maintain the science "workspace" for the two approved projects during the drilling and follow-up research phases to facilitate exchange of scientific information.

### **U.S. Science Steering Committee (USSC)**

This committee formulates scientific and policy recommendations for the ANDRILL U.S. Science Program regarding staffing and funding; on contributions to and development of proposals related to ANDRILL projects; and additional activities as it relates to the ASP. The recommendations of the USSC will be presented through U.S. National Representatives to the ASC and M-ASIC, and will be presented to the ANDRILL Executive Director on behalf of the U.S.-ANDRILL science community. The USSC will formulate policies for the AUSSP and, in cooperation with the Executive Director, will evaluate and assess the Program's accomplishments compared to long-term goals and objectives. The committee shall stimulate and coordinate wide participation by the U.S. scientific community.

### **Joint Oceanographic Institutions (JOI)**

JOI will provide a useful service to the ANDRILL U.S. science community in the evaluation of U.S. applications for staffing of ANDRILL projects and the review of proposals by U.S. scientists for post-drilling research funding. JOI will convene review panels to ensure fair and impartial evaluation of applications and proposals. This support is similar to that provided by JOI for ODP and IODP, where JOI acts as an independent broker for the review and evaluation of proposals, so that there is an independent recommendation of how ANDRILL funds should be distributed to those involved with the ANDRILL Program.

### **U.S. National Representatives to ASC and M-ASIC**

The U.S. National Representative to the ASC [and alternate/deputy] is appointed by the USSC to represent the interests of the U.S. scientists and ASC in matters regarding planning and protocol related to the ASP. The U.S. National Representative to the M-ASIC [and alternate/deputy] is appointed by the NSF Program Manager for Antarctic Geology and Geophysics to represent the U.S. science community in matters regarding the approved drilling projects. The M-ASIC National Representative will negotiate within the M-ASIC to emplace the recommendations of the USSC and JOI regarding staffing of U.S. scientists on project Science Teams. The National Representatives will ensure a flow of information between the ASC, M-ASIC, and USSC, and to the U.S. community at national workshops and in *ANDRILL News*, to appraise the community of developments and schedule of ANDRILL activities. In particular, the National Representative will ensure that information about science application procedures and deadlines for specific projects is available to the U.S. science community. The National Representative will communicate to the ASC, M-ASIC, AOMG and OMO information and concerns raised by the USSC regarding U.S. interests.

### **U.S. ANDRILL Consortium**

Five U.S. institutions have signed a Memorandum of Understanding (MoU) as a commitment to advance the U.S. science effort of ANDRILL and work collaboratively in Antarctic paleoenvironmental, glacial and tectonic research toward the benefit of advancing scientific pursuits at all institutions. Members of the U.S. Consortium are currently FSU, NIU, OSU, U-MASS, and UNL. Membership is open to any U.S. institution. Membership fees are used to: (1) support the activities of the USSC and National Representatives; (2) to promote ANDRILL activities at national conferences; (3) to enhance education and outreach activities for ANDRILL, e.g. through an anticipated lecture series; and (4) to provide educational opportunities for graduate students at consortium institutions.

### **ANDRILL Scientific Measurements Panel (ASMP)**

The ASMP will contribute advice to the ASC and M-ASIC with regard to handling scientific data and information, on methods and techniques of measurements on core, and downhole measurements and experiments. Its specific

mandate from the ASC is to develop policies and to furnish advice about scientific measurements, which will assist the M-ASIC and AOMG in formulating plans for scheduled projects, and the ASC for proposed projects. Specific responsibilities for the panel are databases, curation, computers, on-ice equipment and analyses (needs and operating procedure), measurement calibrations and standards. Development of measurement guidelines in the form of guidebooks will be a secondary priority. This Panel will work to ensure continuity of scientific measurements and reporting between projects. Members are appointed by the ASC based on nominations to the SMO from National Steering Committees and interested scientists. Panel composition reflects a broad range of geoscience disciplines important for the analysis of stratigraphic core records.

#### **ANDRILL Site Survey Panel (ASSP)**

The ASSP is responsible for the review and evaluation of drilling proposals to ensure their development to high level of maturity and to guarantee all necessary information is obtained by ANDRILL project proponents to address safety, operational and science needs. Members of the ASSP are appointed by the ASC, which considers nominations from the scientific community. The ASC will work with the proponents of drilling projects and an Operations Planning Group to identify the requirements for drilling. The ASSP will advise the ASC on the status of developing projects.

#### **ANDRILL Science Advisory Panel (ASAP)**

The ASC invites a panel of internationally recognized scientists with experience in large project leadership to periodically assess the direction and overall progress of the ANDRILL Program and specific drilling projects. The ASAP is an integral part of the direction, credibility and profile of the ANDRILL Program. The ASAP shall maintain a dialogue of constructive criticism with the ASC and M-ASIC and make regular recommendations regarding issues and improvements to the Science Plan and Project Management. ASAP members will advise the National Representatives to the ASC and M-ASIC and provide guidance to National Steering Committees.

#### **Co-Chief Scientists**

Co-Chief Scientists are responsible for the development of scientific aspects of a drilling project, and for ensuring the successful implementation of a project's Science and Logistics Plan (SLIP). During drilling, decisions on science operation and drilling strategy are the responsibility of the Co-Chief Scientists and the on-ice operations management team. Co-Chief scientists are appointed by the M-ASIC through written invitation and acceptance.

Co-Chief Scientists will identify potential DTLs who will assist in development of the science plan and staffing matrix. DTLs will be formally appointed by the M-ASIC following approval of the final staffing plan. Co-Chief Scientists are responsible for ensuring the success of project science objectives during drilling operations, and will oversee science at the drill site and science laboratory facilities. They will prepare, with assistance from the Staff Scientist, weekly progress reports to be circulated to the on-ice drilling operations management team, Project Operator, M-ASIC, AOMG, ASAP, and the project Science Team. Co-Chief Scientists will work with the DSC, Project Operator, and the rest of the on-ice drilling operations management team to resolve issues regarding science priorities and targets; with the M-ASIC to resolve issues of overlapping scientific interests; and with the M-ASIC, DTLs and Curators regarding core sampling. Co-Chief Scientists will work with Curators and the Staff Scientist to plan and implement a Core Workshop (to be held 4 to 6 months after drilling at the designated curatorial facility). Project science objectives may be revised by the Co-Chiefs at the workshop on the basis of the initial core characterization, who will report any revised science priorities to the M-ASIC, AOMG and Project Science Team. Co-Chief Scientists, with the Staff Scientist, DTLs and the drafting team will compile an On-Ice Project Report to include basic core description and relevant data for use prior to and during the core workshop. Co-Chief Scientists will prepare a summary article for submission to *EOS*, *Geotimes*, *Geology*, etc., to describe the immediate post-drilling results of the Project. Co-Chief Scientists are responsible for establishing an editorial team that will assist the SMO in production of the Project's Initial Report and Scientific Results. Co-Chief Scientists are responsible for ensuring timely production of an Initial Report immediately following the core workshop, and Scientific Results following the Science Integration Workshop. Co-Chief Scientists can decide on the appropriate venue for publication of the Scientific Results (e.g. special issues in international Earth Science journals). Content and authorship of flagship and key synthesis papers will be negotiated between Co-Chief Scientists, DTLs, and relevant project scientists. Disputes over publications (e.g. authorship) will be resolved by the Co-Chief Scientists, in consultation with the M-ASIC. Eighteen months after drilling (approximately one year after the Core Workshop) Co-Chief Scientists will organize and convene a Science Integration Workshop where the project Science Team will



report on final results to be published in the Scientific Results Volume and address larger thematic issues meriting further publication as synthesis papers.

Co-Chief Scientists are responsible for organizing and hosting thematic workshops and symposia at national and international meetings in order to promote the dissemination of key scientific results, and to foster collaboration and integration within and beyond the ANDRILL community.

### **Discipline Team Leaders (DTLs)**

DTLs are members of the project scientific staff selected by the Co-Chief Scientists to serve as leaders of key scientific disciplines. They aid the Co-Chief Scientists and Staff Scientist in coordinating the production and dissemination of scientific results within the project Science Team by serving as a point-of-contact that represent related elements of the off-ice and on-ice science teams. Disciplines to be represented by Team Leaders include: sedimentology & stratigraphy, paleontology, physical properties (geophysics, magnetics, physical properties), geochemistry (largely off-ice science team), and others as needed. The DTLs will be responsible for: (1) implementing science protocol developed by the ASMP, and ensuring that scientific staff follow appropriate procedures and data reporting; (2) obtaining from their Science Team a list of equipment and supplies needed to conduct on-ice initial core characterization, and requesting these materials through the SMO Staff Scientist; (3) compiling scientific data from their Science Team in order to synthesize results, which are presented to Co-Chief Scientists and Staff Scientist for inclusion in daily and weekly reports; (4) building a collaborative environment within the discipline to aid the integration of on-ice and off-ice members of the Science Team. They will be the first step toward resolving conflicts of overlapping science interests; (5) working with other DTLs to establish a sampling plan to present to Co-Chief Scientists for approval, to distribute samples from intervals of high scientific interest, and assist in development of a sampling plan; (6) point-of-contact for the Education & Outreach Coordinator to aid in ANDRILL's educational and outreach mission; and (7) aiding the Co-Chief Scientists, Curators and Staff Scientist in planning and running the Core Workshop.

### **Staff Scientist**

The Staff Scientist is an integral member of the SMO and ANDRILL science operations. The Staff Scientist works in support of the M-ASIC, ASC and Co-Chief Scientists to ensure continuity and high-level science planning and reporting. The Staff Scientist is responsible for assisting the Co-Chief Scientists in management of the Science Teams and in coordinating the production and dissemination of scientific results by serving as a point-of-contact for related elements of the off-ice and on-ice science teams. The chief responsibility of the Staff Scientist is to facilitate the production of scientific output at all levels. The Staff Scientist is the chief point-of-contact for ANDRILL with (1) RPSC for matters concerning requests for laboratory space, equipment, supplies in preparation for an during on-ice core characterization phase, (2) the curatorial effort of FSU, and (3) the *CHRONOS* database portal. Where possible, the Staff Scientist will assist new ANDRILL project proponents with the development of science and field programs to support site survey efforts. In addition, the Staff Scientist will work closely with the ASMP to ensure consistent and appropriate measurements of scientific data are collected. The Staff Scientist also interacts closely with the OMO to ensure that the needs of the Science Teams are met. A close relationship between the Staff Scientist and the Coordinator of Education & Outreach will ensure effective communication of appropriate science content into outreach and educational materials.

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## **Members of the U.S. Science Steering Committee (USSC)**

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## **Members of the ANDRILL Site Survey Panel**

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### **Members of the ANDRILL Science Advisory Panel (ASAP)**

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Southern McMurdo Sound Project (SMS):

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Fabio Florindo ([florindo@ingv.it](mailto:florindo@ingv.it))

### **Discipline Team Leaders**

McMurdo Ice Shelf Project (MIS):

Physical Properties  
Sedimentology/Stratigraphy  
Paleontology  
Geochemistry  
Chronostratigraphy

To be determined

Southern McMurdo Sound Project (SMS):

Physical Properties  
Sedimentology/Stratigraphy  
Paleontology  
Geochemistry  
Chronostratigraphy

To be determined

## APPENDIX D: ANDRILL ACRONYMS

The following list consists of acronyms related to the ANDRILL Program

AESOP	ANDRILL Education and Science Outreach Panel	IPPC	Intergovernmental Panel on Climate Change
AISP	ANDRILL International Science Proposal	IPY	International Polar Year
ANDRILL	ANtartic DRILLing (Program)	IT	Italy
AOMG	ANDRILL Operations Management Group	JOI	Joint Oceanographic Institutions
ASAP	ANDRILL Science Advisory Panel	k.y.	thousand years
ASC	ANDRILL Science Committee (2003-present)	MARGINS	A research initiative to understand the complex interplay processes that govern the evolution of continental margins; supported by NSF
	ANDRILL Steering Committee (2001-2003)	M-ASIC	McMurdo Sound- ANDRILL Science Implementation Committee
ASIC	ANDRILL Science Implementation Committee	MIS	McMurdo Ice Shelf (ANDRILL Project)
ASMP	ANDRILL Scientific Measurements Panel	MRI	Major Research Instrumentation Program
ASP	ANDRILL Science Plan	MSP	McMurdo Sound Portfolio
ASSP	ANDRILL Site Survey Panel	MSSTS	McMurdo Sound Sediment and Tectonic Studies
AUSSP	ANDRILL U.S. Science Support Program	MoU	Memorandum of Understanding
AWI	Alfred Wegener Institute for Polar and Marine Science (Germany)	m.y.	million years
BAS	British Antarctic Survey	NERC	Natural Environmental Research Council (U.K.)
CIROS	Cenozoic Investigations in the Western Ross Sea	NIU	Northern Illinois University
CHRONOS	Network of Chronostratigraphic databases, tools and information ( <a href="http://www.chronos.org">www.chronos.org</a> )	NRs	National Representatives
		NSCs	National Steering Committees
		NSF	National Science Foundation
CoreWall	Data visualization tool ( <a href="http://www.evl.uic.edu/research/res_project.php3?indi=282">http://www.evl.uic.edu/research/res_project.php3?indi=282</a> )	NZ	New Zealand
		ODP	Ocean Drilling Program
CRP	Cape Roberts Project	OMO	Operations Management Office ( <i>Antarctica</i> New Zealand)
CRST	Cape Roberts Science Team	OPP	Office of Polar Programs
CSEC	Crary Science and Engineering Center	OSU	Ohio State University
DSC	Drilling Science Coordinator	OWR	Oxford Workshop Report
DSDP	Deep Sea Drilling Project	PANGAEA	Network for Geological and Environmental Data (Germany)
DTL(s)	Discipline Team Leader(s)	PDC	Project Development Coordinator [2004-present] Portfolio Coordinator [2001-2004]
DVDP	Dry Valley Drilling Project		
EAIS	East Antarctic Ice Sheet	PNRA	National Program for Research in Antarctica (Italy)
ENEA	The Authority for New Technologies, Energy, and Environment (Italy)	REU(s)	Students-Research Experience for Undergraduates
EPICA	European Project for Ice Coring in Antarctica	RIS	Ross Ice Shelf
EPO	Education Public Outreach	RISP	Ross Ice Shelf Project
FASTDRILL	Fast-Ice Sheet Drilling	RPSC	Raytheon Polar Services Co.
FRST	Foundation for Research Science and Technology (New Zealand)	SCAR	Scientific Committee on Antarctic Research
FSU	Florida State University	SHALDRIL	SHALlow DRILLing Project
GER	Germany	SIP(s)	Support Information Package(s)
IGNS	Institute of Geological and Nuclear Sciences Limited (New Zealand)	SLIP	Science Logistics and Implementation Plan
IMAGES	International Marine Global Changes	SMO	Science Management Office
IODP	Integrated Ocean Drilling Program		

SMS	Southern McMurdo Sound (ANDRILL Project)	USSC	United States Steering Committee (Science)
TAM	Transantarctic Mountains	USSP	US Science Support
ToR	Terms of Reference	VLB	Victoria Land Basin
U.K.	United Kingdom		
UMass	University of Massachusetts	WAIS	West Antarctic Ice Sheet
UNL	University of Nebraska-Lincoln	WARS	West Antarctic Rift System