



Office of Polar Programs (OPP)



The Earth's polar regions offer compelling scientific opportunities, but their isolation and extreme climate challenge the pursuit of these opportunities.

The National Science Foundation (NSF) supports Arctic and Antarctic research and education, both to improve understanding of the regions and their relationship with global processes and to seize opportunities presented by the regions as research platforms. Support is provided for investigations in a range of scientific disciplines in the physical, biological, and social sciences. This range and the unique aspects of

polar regions provide opportunities to advance discovery while promoting teaching, training, and learning.

In addition to providing individual grants to scientists and educators at U.S. institutions, NSF funds contractor-provided operational support to field and laboratory science in Antarctica, the Southern Ocean, and the Arctic.

Most NSF funding for polar research and education comes from these sources:

- [Antarctic Sciences \(Office of Polar Programs \(OPP\)\)](#)
- [Arctic Sciences \(Office of Polar Programs \(OPP\)\)](#)
- Educational Activities* (Education and Human Resources Directorate)
- [Crosscutting Programs \(Foundation-wide\)](#)

**Although these areas of NSF do not generally offer polar-specific programs, they do consider and support polar proposals.*

For More Information

Refer to the appropriate program announcement for definitive information about research areas, field support, and proposal preparation.

- Antarctic Research ([NSF 03-551](#))
- Arctic Research Opportunities ([NSF 03-574](#))

Other information sources are the Office of Polar Programs home page (<http://www.nsf.gov/od/opp/>), which describes research areas and operational support; and the OPP Advisory Committee web page (http://www.nsf.gov/od/opp/opp_advisory/oaccrit2.htm), which discusses the NSF broader impacts merit review criterion.



OFFICE OF POLAR PROGRAMS Antarctic Sciences

United States Antarctic Program

The United States Antarctic Program (USAP) in the Office of Polar Programs (OPP) encompasses U.S. Government-sponsored activities in the region roughly south of 60° south latitude. NSF funds and manages this national program, which centers on scientific research and includes operational support provided by contractors and the military. The program supports the range of U.S. Antarctic interests including adherence to the Antarctic Treaty.

Research supported by the program has two thrusts:

1. to understand the Earth and its systems, with emphasis on Antarctica's (and the Southern Ocean's) influence on and response to these systems; and
2. to utilize Antarctica as a research site by supporting studies made possible by the region's unusual and extreme conditions.

The program supports research that is *best* carried out in the Antarctic or that can be carried out *only* in the Antarctic. Research and education proposals that *will* not require fieldwork, or proposals that *will* require the use of samples already in U.S. depositories, are also welcome.

Non-United States Facilities—International Cooperation

NSF encourages scientists from the United States to participate in cooperative research programs and activities sponsored by or involving other Antarctic Treaty nations. Scientists interested in submitting a proposal for such a program are strongly encouraged to contact an OPP program manager first, to allow NSF time to coordinate the operational support needs with the other participating country or countries.

Eligibility

In addition to the categories stated in the section "Eligibility Requirements," other federal agencies may coordinate their research needs within the framework of NSF-supported Antarctic logistics.

Persons selected to work in the Antarctic must pass physical and dental examinations whose standards are specified by USAP. Prospective winterers must pass a psychological examination as well.

Defining Operational Needs

If a proposed project involves fieldwork, the proposer must also include the "Operational Requirements Worksheets" (<http://polarice.usap.gov/index.htm>) in portable document file (pdf) format in their FastLane proposal. Proposals submitted without a "pdf" file of these worksheets will be considered incomplete. The worksheets must be completed by the first Wednesday in June of the year preceding the fieldwork. For example, a proposal received on 2 June 2004 normally will be considered for projects involving fieldwork that will take place in the Antarctic beginning in the 2005–2006 austral summer.

Instructions on how to submit the worksheets are available in the *Antarctic Research* program announcement (<http://www.nsf.gov/pubsys/ods/getpub.cfm?nsf03551>). Funding programs offered by areas of NSF other than the Office of Polar Programs, may have different deadlines or target dates. However, the Operational Requirements Worksheets must still be completed by the same deadline (first Wednesday in June) as proposals submitted to the Office of Polar Programs. Be sure and include copies of the worksheets in the FastLane proposal to NSF, as instructed in the *Antarctic Research* program announcement.

For multiyear proposals, include the worksheets in the original proposal to NSF, even if fieldwork is proposed for a later year.

Antarctic Sciences

The Office of Polar Programs funds Antarctic research through these programs:

1. Antarctic Aeronomy and Astrophysics

- **Aeronomy and Space Physics**—Supports unique studies of Earth's ionosphere, magnetosphere, and solar-terrestrial relationships. Year-round station-based research is possible in Antarctica because of its physically stable location at high geomagnetic latitudes, which range from 53°S at Palmer Station to 79°S at McMurdo Station. Automatic platforms provide year-round support for low-powered autonomous instruments at sites on the ice sheet. Research objectives include improving understanding of Earth's upper atmosphere and near-space environment; investigating coupling between the magnetosphere and ionosphere, and investigating solar-terrestrial effects on neutral atmosphere.
- **Astronomy and Astrophysics**—Because of its location at the Earth's spin axis on the 2.8-kilometer-thick East Antarctic Ice Sheet, South Pole Station is well situated for long, continuous astronomical and astrophysical observations. The high elevation of the station (2,835 meters), dry atmosphere, extremely low air turbulence and temperature, isolation from radio noise, and long periods of clear weather provide superior observing astronomical conditions. In addition, a crystal-clear (at depths 1.5 - 2.5 km) ice allows almost ideal detection of Cherenkov's emission caused propagating cosmic neutrinos.
- **Long-Duration Ballooning**—In cooperation with the National Aeronautics and Space Administration, NSF has developed the capability to launch balloon science payloads from McMurdo Station. These payloads may weigh more than a ton and can reach altitudes of approximately 40 kilometers. The balloons then circle once or twice over the Antarctic during a 10- to 30-day period. This capability can be used by several disciplines and may serve as a low-cost substitute for space flights.

2. Antarctic Biology and Medicine

- **Marine Biology/Biological Oceanography**—The oceans around Antarctica make up one of the world's more productive marine regions. Research objectives are to understand the structure and function of the Antarctic marine ecosystems; to determine the adaptations of organisms; and to acquire more knowledge of their distribution, abundance, and dynamics. The focus is on ship- and shore-based studies that stress trophodynamics, including detailed investigations at all trophic levels. Topics of interest include interdisciplinary studies of carbon and nutrient cycling, krill, ice-edge ecosystems, and low-temperature adaptations.
- **Medical Research**—Biomedical studies can be directed toward physiological and psychological attributes and adaptations of people in small, isolated groups.
- **Terrestrial and Freshwater Biology**—Biota of terrestrial and freshwater Antarctica, and particularly their adaptation to the extreme environment, are of interest. The simplicity of these ecosystems provides opportunities for analysis that is more difficult and sometimes impossible in the complex systems of the lower latitudes. The primary research objective is to understand the effects of the physical environment on the biota and adaptations of organisms, and to gain further knowledge of their distribution, abundance, and dynamics.

3. Antarctic Geology and Geophysics

- **Marine Geology and Geophysics**—The seafloor around Antarctica is complex and presents fundamental problems in marine geology and geophysics. Its sediments provide detailed records of change over time in the size of the Antarctic ice sheet, as well as clues to other geological and tectonic processes that have affected the continent. Research objectives are to interpret geological and glacial history and to understand geological processes from studies of the continental margins and the adjacent oceanic crust.
- **Terrestrial Geology and Geophysics**—Antarctica represents about 9 percent of the Earth's continental crust and has been in a near-polar position for more than 100 million years. Reconnaissance has increased understanding of the geology of the continent and has provided evidence in support of plate tectonics models and the Gondwana supercontinent. Focused projects now contribute to solving regionally and

globally significant geologic problems such as geophysical investigations of the sub-ice bedrock. Objectives are to explain the geology and the geological evolution of Antarctica; to understand the relationship of Antarctica to global geodynamic systems; and to exploit unique aspects of Antarctica to address fundamental problems in geology and geophysics.

4. Antarctic Glaciology

The world's largest ice sheet covers 98 percent of the Antarctic continent and is up to 4.8 kilometers thick, comprising 90 percent of the world's ice and storing information about climate and atmospheric constituents and their variation over time. Objectives of this program are 1) to determine the dynamics of the ice sheet; 2) to understand the climatic record stored in the layers of firn and ice; 3) to determine the history of glacial advance and retreat through the study of glacial/geologic deposits; and 4) to determine the present dynamic status of the ice sheet and its relationship to glacial and climatic history.

5. Antarctic Ocean and Climate Systems

- **Atmospheric Sciences**—Antarctica interacts strongly with regional and global weather and climate. Far removed from pollution sources, it is an important monitoring and research area for world background levels of natural and anthropogenic atmospheric constituents. Conditions in Antarctica reflect global atmospheric changes on many scales. Research objectives are to improve understanding of the physical processes of the atmosphere; determine the relationship between events and conditions in the Antarctic atmosphere and global events; and assess the region's role in past and present global climate.
- **Physical and Chemical Oceanography**—The Southern Ocean has a central role in world ocean circulation. Large-scale heat exchange and ice formation at the ocean surface overturn the water column and mix trace constituents, making the Southern Ocean the site of global-scale deep-ocean ventilation and one of two primary sources (the other being the Arctic) of the world's intermediate and deep-water masses. Huge annual changes in the extent of sea ice—between 4 and 20 million square kilometers—also influence energy transfer. The Antarctic Circumpolar Current—the world's largest ocean current—has a primary role in ocean circulation. Research objectives are to determine the dynamics of formation and distribution of water masses, currents, and sea ice; investigate the relationships among oceanic and atmospheric circulation systems and the physical bases for biotic productivity; and investigate interactions between the Southern Ocean and climate processes.

6. Antarctic Operational Support

The U.S. Antarctic Program provides operational and laboratory support in Antarctica. Operational support includes the following: a year-round inland research station at the South Pole (90°S.); two year-round coastal research stations with extensive laboratory and computing capabilities—one at McMurdo Station (78°S.) on Ross Island and one at Palmer Station (64°S.) on Anvers Island in the Antarctic Peninsula region; summer field camps for research, as required; the ice-capable research ship *Laurence M. Gould*, 70.1 meters in length; the icebreaking research ship *Nathaniel B. Palmer*, 94 meters in length; ski-equipped LC-130 airplanes (for heavy-lift transport); other airplanes; helicopters; a Coast Guard icebreaker for channel breaking at McMurdo as well as research support; over-snow vehicles; and automated, unmanned weather and geophysical observatories. Occasionally, vessels from the U.S. academic fleet and from the Ocean Drilling Program support Antarctic research. NSF-supported research by U.S. scientists also can be carried out as an international collaboration with other national antarctic programs and aboard non-U.S. research ships.

For instructions on how to request Antarctic operational support in a proposal, see the *Antarctic Research* program announcement ([NSF 03-551](#)).



OFFICE OF POLAR PROGRAMS Arctic Sciences

Arctic Research Program

NSF's Arctic Research Program seeks to gain a better understanding of the Arctic's biological, geological, chemical, and sociocultural processes, and the interactions of ocean, land, atmosphere, life, and human systems in the Arctic and with global systems. Arctic research is supported by the Office of Polar Programs (OPP) and by other NSF disciplinary programs. The program is structured to allow coordination across NSF disciplines when appropriate, enable joint review and funding of Arctic proposals, and provide mutual support of projects with high logistics costs.

NSF is one of 12 Federal agencies that sponsor or conduct Arctic science, engineering, and related activities. As mandated by the Arctic Research and Policy Act of 1984, planning for Federal interagency research is coordinated through the Interagency Arctic Research Policy Committee, chaired by NSF.

Further information on other agency programs is presented in the U.S. Arctic Research Plan and its biennial revisions.

The Arctic is the homeland of native peoples and attention must be given to all aspects of research and education that may affect their lives. For further information in this regard, see the interagency statement "Principles for the Conduct of Research in the Arctic" (<http://www.nsf.gov/od/opp/arctic/conduct.htm>). All Arctic research grantees are expected to abide by these guidelines. Additional information can also be found in the *Arctic Research Opportunities* program announcement (NSF 03-574).

Submission of Proposals

Submit proposals for field projects (including projects requiring an oceanic research vessel) by 15 February of the year preceding fieldwork.

A minimum of 9 months advance notice is required for research vessels needing clearance for Russian waters.

For fieldwork in Greenland, fill out the Danish Polar Center application form (<http://www.dpc.dk/Guide>) and include it in "Supplementary Docs" in your FastLane proposal.

Arctic Sciences

The Office of Polar Programs funds arctic research through these programs:

1. Arctic Natural Sciences Program

Provides core support for disciplinary research in the following areas:

- **Atmospheric Sciences**—Research focuses on stratospheric and tropospheric processes, climate, and meteorology. Research on past climates and atmospheric gases preserved in snow and ice is encouraged. The program also supports research on atmosphere-sea and atmosphere-ice interactions. In upper atmosphere and space physics, research interests include auroral studies, atmospheric dynamics and chemistry, and magnetosphere-ionosphere coupling.
- **Biological Sciences**—Research emphasis is on understanding the adaptation of organisms; freshwater, marine, and terrestrial biology; organismal biology; ecology; microbiology; ecosystem structure and

processes; and the consequences of ultraviolet radiation.

- **Earth Sciences**—Research includes all subdisciplines of terrestrial and marine geology and geophysics. Of greatest interest is a better understanding of Arctic geological processes that are important for improving our ability to interpret the geologic record of environmental change in the polar regions. Also of interest is better understanding and reconstruction of the plate tectonic history of the Arctic Ocean.
- **Glaciology**—Research can focus on the history and dynamics of all naturally occurring forms of snow and ice including seasonal snow, glaciers, and the Greenland ice sheet. The program also supports mass balance modeling, glacial geology, and remote sensing studies of ice sheets.
- **Ocean Sciences**—Research to expand the knowledge about the structure of the Arctic Ocean and adjacent seas; their physical and biological interactions with the global hydrosphere; and the formation and persistence of sea-ice cover.

2. Arctic System Science (ARCSS)

The Arctic comprises a tightly coupled system of air, ice, ocean, land, and people. The Arctic System Science (ARCSS) program supports interdisciplinary research on arctic physical, geological, chemical, biological, and socio-cultural processes that relate to global change. The purpose is to advance the scientific basis for predicting change on a time scale from seasons to centuries. Research is thematic rather than disciplinary in nature and is organized around the following broad questions.

- How do human activities interact with changes in the Arctic to affect the sustainability of ecosystems and societies?
- What are the limits of arctic system predictability?
- How will changes in arctic cycles and feedbacks affect arctic and global systems?

These questions emphasize concepts fundamental to research on arctic change, including predictability, sustainability, and feedbacks. Global change proposals that focus on the arctic system are also welcome from individual investigators or small groups of investigators.

ARCSS supports studies that predict and analyze the consequences of environmental variability and global change. To achieve this, ARCSS supports a Synthesis, Integration and Modeling Studies (SIMS) effort. A successful ARCSS proposal normally will connect directly to some suite of existing ARCSS-funded projects; fill a gap in understanding of the arctic system; connect parts of the arctic system; help explain the range of states for the arctic system; and focus on explaining cause and effect.

3. Arctic Social Sciences

Encompasses all areas of social science supported by NSF, including anthropology, archaeology, economics, geography, linguistics, political science, psychology, sociology, and related subjects. The following are areas of particular interest: rapid social change including the processes and consequences of social, economic, and cultural change; community viability including issues relating to community and cultural vitality and survival; and human/environmental interactions including issues related to subsistence and sustainable development.

The program encourages projects that: include indigenous peoples; are circumpolar or comparative; integrate social and natural sciences; involve collaborations between researchers and those living in the Arctic; include traditional knowledge; and form connections among disciplines, regions, researchers, communities, and students, including those at grades K–12 level and undergraduate and graduate programs.

Projects Involving Research with Human Subjects -- must ensure that the subjects are protected from research risks in conformance with the Common Rule (*Federal Policy for the Protection of Human Subjects*, 45 CFR §690). All projects involving human subjects must either (1) have approval from the organization's Institutional Review Board (IRB) before issuance of an NSF award or (2) identify the applicable subsection exempting the proposal from IRB review, as established in section 101(b) of the Common Rule. The box for "Human Subjects" should be checked on the proposal Cover Sheet with the IRB approval date (if available) or exemption subsection from the Common Rule identified in the space provided.

4. Arctic Research and Education

The integration of research with outreach and education is important to OPP. Investigators are encouraged to

include these activities in their research proposals in accordance with the broader impacts review criterion.

Some education and outreach activities may develop during the course of a research grant that's already been implemented. They may even warrant a separate proposal. The Arctic Research and Education program supports these activities in concert with funded research grants and agreements through supplemental requests and as separate proposal requests to support new ventures in arctic research and education. Proposals submitted to this program may include formal or informal education or outreach for students K-12 or higher, or to the broader public. Most commonly, these awards are made as supplements to research grants or small grants. The Arctic Research and Education program seeks to collaborate with other Directorates at NSF to promote the integration of research and education.

5. Arctic Research and Policy

OPP supports the management of Arctic data and information. The objective is to make data and information resources more readily available to researchers. Proposals to integrate data and information management are encouraged. Further information is available at the National Information Services Corporation home page, <http://www.nisc.com/request/bibltrial.asp>.

6. Arctic Research Support and Logistics

Supports the logistics components of field research projects and a variety of activities considered to be research support—most notably, long-term observations. The program was created to improve access and safety in the Arctic for scientists. It supports field components of research funded by the Arctic Sciences Section, other Directorates at NSF, and occasionally other Federal agencies. Support includes but is not limited to, providing transportation, food, and shelter while conducting field work; user and day-rate fees at field camps; salaries of staff hired specifically for field work; and activities such as travel to coordinate projects with permitting agencies and Native peoples. For more information, visit the "Arctic Research Support and Logistics" web page, <http://www.nsf.gov/od/opp/arctic/suplog.htm>. Access to logistics from this program is through the regular proposal process.

The program supports collection, management, and dissemination of data in the service of the broad arctic research community. Examples include the establishment or maintenance of long-term observations; the support of aspects of collecting underway data from ships; the acquisition of satellite and airborne imaging and mapping data; and the production and dissemination of user-friendly data products. The program works with several organizations to meet the needs of arctic field research as described in the Arctic Research Opportunities program announcement, [NSF 03-574](#).



OFFICE OF POLAR PROGRAMS Crosscutting Programs

Because the Office of Polar Programs supports research in several disciplines, a number of NSF-supported programs that cross traditional disciplinary boundaries will be of interest to investigators planning polar research and education projects. These crosscutting programs offer significant additional opportunities for support. OPP strongly urges investigators considering polar research to examine the programs before submitting proposals.

For More Information

Visit the NSF Crosscutting Programs home page,
<http://www.nsf.gov/home/crssprgm/>.

The National Science Foundation
4201 Wilson Boulevard, Arlington, Virginia 22230, USA
Tel: 703-292-5111, FIRS: 800-877-8339 | TDD: 703-292-5090