

# **U.S. POLAR PROGRAMS**

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**\$329,930,000**

The FY 2004 Budget Request for U.S. Polar Programs (OPP) is \$329.93 million, an increase of \$26.12 million, or 8.6 percent, over the FY 2003 Request of \$303.81 million.

### OPP Funding (Dollars in Millions)

	FY 2002 Actual	FY 2003 Request	FY 2004 Request	Change Amount	Change Percent
U.S. Polar Research Programs	230.52	235.74	261.86	26.12	11.1%
U.S. Antarctic Logistical Support Activities	70.27	68.07	68.07	0.00	0.0%
<b>Total, Polar Programs</b>	<b>\$300.79</b>	<b>\$303.81</b>	<b>\$329.93</b>	<b>\$26.12</b>	<b>8.6%</b>

Totals may not add due to rounding.

Polar regions are key elements of the global climate system. They are also premier natural laboratories for the study of a variety of fundamental phenomena that cannot be studied elsewhere. The U.S. Polar Programs Activity supports most of the polar research funded by the National Science Foundation.

## RELEVANCE

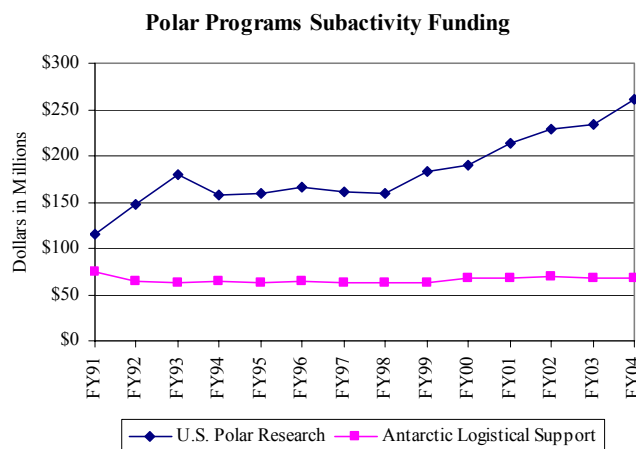
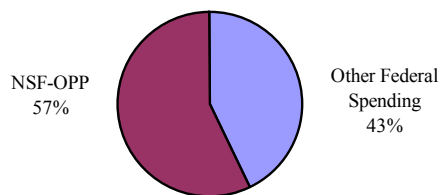
NSF is one of twelve federal agencies supporting Arctic research and logistics. As directed by the Arctic Research Policy Act of 1984, NSF is the lead agency responsible for implementing Arctic research policy, and the NSF Director chairs the Interagency Arctic Research Policy Committee (IARPC). IARPC helps coordinate multi-agency Arctic research and developed the interagency plans for Study of Environmental Arctic Change (SEARCH), an FY 2004 priority for NSF's Arctic research. NSF-funded Arctic research is concerned with the entire Arctic region, including Alaska, Canada, Greenland, Svalbard, the Arctic Ocean and adjacent seas, the upper atmosphere, and near space. Research involves a broad spectrum of scientific disciplines, including the atmospheric, ocean, and earth sciences, biology, glaciology, social science, engineering, and science education. NSF-supported research in the Arctic advances disciplinary knowledge and increases our understanding of regional climate and how climate change impacts living systems, including humans. Funding is provided for both research and associated logistics support in this remote region.

Antarctica, with 10 percent of Earth's land mass, is nearly 1.5 times the size of the United States. Its associated seas represent nearly 6 percent of the world's oceans and its ice, and 70 percent of the Earth's fresh water. NSF is responsible for managing all U.S. activities in the Antarctic as a single, integrated program. The U.S. presence in Antarctica is based on the conduct of scientific research and environmental stewardship. Scientific research ranging from astrophysics to microbiology and climatology is made possible through year-round work at three U.S. stations, two research ships, and a variety of remote field camps. Funding for the United States Antarctic Program (USAP) includes research and the science support directly linked to specific research projects, as well as support for the broader operations and logistics infrastructure that makes it possible for U.S. scientists to conduct science on the remote and uninhabited continent. NSF-supported infrastructure also enables mission agency research. All life support is provided by NSF, including facilities infrastructure, communications, utilities (water and power), logistics to, from, and within Antarctica and all related infrastructure – aircraft, runways, communications, passenger movement, baggage handling.



## STRATEGIC GOALS

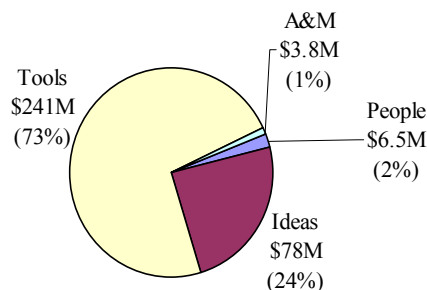
Federal Funding for Polar Research in FY 2001



Three strategic focus areas guide OPP’s activities: People, Ideas, and Tools. OPP’s support for ongoing core and new activities contributes to NSF’s efforts to achieve its strategic goals, and to the administration and management activities necessary to achieve these goals.

- PEOPLE:** Innovative efforts in Polar Programs contribute to developing a diverse, internationally competitive workforce of scientists, engineers and well-prepared citizens. These efforts have included use of new technologies such as interactive video; efforts to improve scientific literacy and education in Alaska; contributions to developing a geosciences curriculum for undergraduates relating geoscience disciplines to polar and global phenomena; and a new postdoctoral program for polar researchers. Continuing activities include support for the Antarctic Artists and Writers program; Scouting in Antarctica; the Live from Antarctica project linking researchers to classrooms; and Teachers Experiencing the Antarctic and Arctic.

FY 2004 OPP Strategic Goals



- IDEAS:** Only fundamental research that either impacts strongly on global phenomena, such as climate change, or that can be uniquely or best undertaken in the polar regions is supported. Polar research addresses the solid earth, glacial and sea ice, terrestrial and marine ecosystems, the oceans, the atmosphere and the universe. Research on the solid earth is integral to understanding plate tectonics, the evolution of life in Earth’s distant and recent past, and the interactions of Earth’s crust with the overlying ice sheets. Glacial and sea ice studies elucidate aspects of biologic productivity and global climate processes. Marine/terrestrial biota studies reveal how organisms adapted, at the genetic and macroscopic level, to the hostile environments. A major focus of ocean studies is the role of polar regions in generating nutrient-rich, cold currents that influence global ocean circulation. High latitude magnetic field and upper atmospheric studies provide unique views of near-earth space physics. The dry, cold atmosphere at the South Pole, its 9,300 foot elevation and six-month continuous night permit astronomical studies not feasible elsewhere.
- TOOLS:** Research in the polar regions requires provision of research support, special facilities, and logistics. Maintaining Arctic and Antarctic research facilities, stations, and camps requires a substantial portion of Polar Program funds for meeting ongoing, often long-term commitments.

Research support includes costs typically awarded directly to grantees in other areas of NSF – technicians, field safety equipment, laboratory costs, transportation of scientists and their cargo, and instrumentation and equipment – but handled centrally by Polar Programs when it is more cost-effective to do so. In FY 2004, both the physical infrastructure and communications will continue to be upgraded at research stations in Alaska and in Antarctica, including improving security at USAP facilities in Christchurch, New Zealand. Both scientific and operational needs for enhanced computing and communications will be met by equipment upgrades. Remote sensing, data retrieval and handling, and automated observatories will be developed.

Summary of Polar Programs Funding by Strategic Goal  
(Dollars in Millions)

	FY 2002	FY 2003	FY 2004	Change	
	Actual	Estimate	Estimate	Amount	Percent
People	4.44	4.78	6.47	1.69	35.4%
Ideas	71.43	73.76	78.35	4.59	6.2%
Tools	221.23	222.77	241.36	18.59	8.3%
Administration and Management	3.69	2.50	3.75	1.25	50.0%
<b>Total, OPP</b>	<b>\$300.79</b>	<b>\$303.81</b>	<b>\$329.93</b>	<b>\$26.12</b>	<b>8.6%</b>

Totals may not add due to rounding

**Budget Highlights**

**People** (+\$1.69 million, for a total of \$6.47 million)

The FY 2004 OPP budget will provide enhancement of multidisciplinary education, teaching, and training activities through:

- Initiation of a Postdoctoral Fellowship Program to enable the exploration of emerging areas of polar research and expand the diversity of polar researchers.
- Expanded support for science interns, primarily Alaska Native students.
- Contributing to the Foundation-wide goal of increasing support for GK-12 and IGERT.

OPP People Investments  
(Dollars in Millions)

	FY 2003	FY 2004	Change	
	Estimate	Estimate	Amount	Percent
K-12	0.13	0.13	0.00	0.0%
Undergraduate	0.64	0.64	0.00	0.0%
Graduate and Professional	3.57	5.26	1.69	47.3%
Other People	0.44	0.44	0.00	0.0%
<b>Total, People</b>	<b>\$4.78</b>	<b>\$6.47</b>	<b>\$1.69</b>	<b>35.4%</b>

**Ideas** (+\$4.59 million, for a total of \$78.35 million)

The FY 2004 OPP budget will provide enhancement of multidisciplinary research activities, inter-agency partnerships, and international activities through:

- Support for emerging frontiers in polar biology.
- Study of Arctic Environment Change (SEARCH), including the dynamics of changes and the fundamental ecosystem properties of the Bering Sea.
- Arctic System Science research on how changes in arctic biogeochemical cycles and biophysical processes would affect both arctic and global systems.
- Two Antarctic initiatives, Antarctic Drilling (ANDRILL) and West Antarctic Ice Sheet (WAIS), which will yield new information on historic climate change in Antarctica.
- Research and development of technology for exploration of Antarctic subglacial lakes.
- Research aimed at enhancing the understanding of Antarctica's dominant role in Southern Hemisphere meteorology and improving weather forecasting/modeling capabilities for operational and safety purposes.
- Ground truthing measurements of global mass balance of the ice sheets.

Priority Areas

In FY 2004, OPP will support research and education efforts related to broad, Foundation-wide priority areas in Biocomplexity in the Environment, Information Technology Research, and Mathematical Sciences.

OPP Investments in Priority Areas  
(Dollars in Millions)

	FY 2002	FY 2003	FY 2004	Change	
	Actual	Request	Request	Amount	Percent
Biocomplexity in the Environment	1.41	1.41	1.55	0.14	9.9%
Information Technology Research	1.22	1.33	1.55	0.22	16.5%
Mathematical Sciences	N/A	0.18	0.18	0.00	0.0%

- **Biocomplexity in the Environment (BE):** In FY 2004, OPP will provide \$1.55 million for BE, an increase of \$140,000, or 9.9 percent, over the FY 2003 Request of \$1.41 million. These funds will support the following:

*Arctic/Subarctic Ocean Flux (ASOF)* is a component of Study of Environmental Arctic Change (SEARCH), a broad, interdisciplinary, multi-scale program with a core aim of understanding the complex of recent and ongoing intertwined changes. Global oceanic and atmospheric circulation controls climate and is, in turn, strongly influenced by ice cover, ocean temperature, and fresh water input to the Arctic Ocean. Continued warming of the Arctic has the potential to slow or stop the “oceanic conveyor belt” that controls Northern Hemisphere weather patterns. ASOF is an international effort to monitor the valves in the Arctic Ocean circulation system to determine the water, energy, and salt balance among all of the inputs, outputs, and regions of water-mass transformation in the Arctic that drive global circulation patterns.

*Lake Vostok in East Antarctica* is considered important for understanding the geologic history of Antarctica as well as understanding the processes that may have triggered the evolutionary explosion on Earth and possibly on other planets. Workshops will be supported to address sampling, measurement and contamination control technologies so that the Lake can be realistically and safely sampled.

*Address emerging frontiers in polar biology.* The National Academy of Sciences/National Research Council is currently undertaking a study that will help set priorities in this area.

- **Information Technology Research (ITR):** In FY 2004, OPP will provide \$1.55 million for ITR, an increase of \$220,000, or 16.5 percent, over the FY 2003 Request of \$1.33 million. These funds will enable continued support for development of remote operation capabilities and development of accessible information systems for polar data and activities related to the agency's cyberinfrastructure activities.
- **Mathematical Sciences:** In FY 2004, OPP will continue support at the FY 2003 Request level of \$180,000 to fund modeling activities in polar research.

**Tools** (+\$18.59 million, for a total of \$241.36 million)

The FY 2004 OPP budget will provide enhancement of national and international facilities and laboratories through:

- Beginning the development of a network of strategically placed U.S. Long-Term Observatories in the Arctic linked to similar efforts in Europe and Canada.
- Installation of a modern local area network in Barrow, Alaska with improved access to the Internet.
- Upgrades at Toolik Field Station, University of Alaska, Fairbanks' field station for ecological research on Alaska's North Slope.
- Support for up to 30 additional projects throughout the Arctic including Alaska, Canada, the Arctic Ocean, Greenland, Scandinavia and Russia.
- Continued safety training for field researchers and funding for field safety experts, global satellite telephones for emergency response, and improved logistics coordination in the Arctic.
- Operational and logistical support for Antarctic science activities such as observation of cosmic microwave background radiation at South Pole Station.
- Development of an overland traverse capability in Antarctica.
- Replacing the McMurdo Station power plant and associated switch gear.
- Continued development of a plan, with a timeline of estimated costs, for modernizing infrastructure at McMurdo and Palmer Stations.

OPP Investments in Tools  
(Dollars in Millions)

	FY 2003 Estimate	FY 2004 Estimate	Change	
			Amount	Percent
Antarctic Facilities and Operations	128.70	144.29	15.59	12.1%
Antarctic Logistics	68.07	68.07	0.00	0.0%
Arctic Logistics	26.00	29.00	3.00	11.5%
<b>Total, Tools</b>	<b>\$222.77</b>	<b>\$241.36</b>	<b>\$18.59</b>	<b>8.3%</b>

## **Administration and Management**

Administration and Management provides for administrative activities necessary to enable NSF to achieve its strategic goals. Requested funding for FY 2004 is \$3.75 million, an increase of \$1.25 million over the FY 2003 Request of \$2.50 million. This includes the cost of Intergovernmental Personnel Act appointments and contractors performing administrative functions.

## **QUALITY**

The U.S. Polar Programs Activity maximizes the quality of the research and development (R&D) it supports through the use of a competitive, merit-based review process. The percent of basic and applied research funds that were allocated to projects that undergo merit review was 93 percent in FY 2002, the last year for which complete data exist.

To ensure the highest quality in processing and recommending proposals for awards, OPP convenes Committees of Visitors, composed of qualified external evaluators, to review each program every three years. These experts assess the integrity and efficiency of the processes for proposal review and provide a retrospective assessment of the quality of results of NSF's investments. OPP contracts – for support organizations, leased vessels, helicopters, and fixed-wing aircraft – are regularly competitively re-competed, and functions are outsourced wherever feasible and economical. OPP also receives advice from the OPP Office Advisory Committee (OAC) on such issues as the mission, programs, and goals that can best serve the scientific community. The OAC meets twice a year and members represent a cross section of polar research with representatives from a broad spectrum of disciplines, as well as a cross-section of institutions, broad geographic representation, and balanced representation of women and under-represented minorities.

## **PERFORMANCE**

Highlights of recent support and areas of continuing interest in polar research include the following:

- Identification of anti-freeze proteins (AFPs) in marine fish, insects, plants, fungi, and bacteria. AFPs enable organisms to metabolize at temperatures below freezing. Understanding how AFPs work and the evolution of these capabilities holds promise for cryopreservation of biomedical materials, foods and agriculture.
- Continuing research on understanding what causes major ice streams, like the Pine Island Glacier, to thin and accelerate the flow of ice into the ocean, and how that process will affect global sea levels.
- Discovery of rapid climate change over the last 110,000 years through the study of ice cores in Greenland.
- Continuing efforts to understand the patterns and mechanisms driving Arctic sea ice and permafrost melting, the impact of such albedo changes on the global climate and potential impacts on indigenous peoples in the Arctic.
- Scientists at the South Pole, using the Degree Angular Scale Interferometer (DASI), made the first-ever measurements of polarization in the cosmic microwave background (CMB), the sky-pervading afterglow of the big bang. The polarization of the CMB was produced by the scattering of cosmic light when it last interacted with matter, nearly 14 billion years ago. The discovery verifies the framework that supports modern cosmological theory and indicates that ordinary matter – humans,

stars and galaxies – accounts for less than five percent of the universe’s total mass and energy. The vast majority of the universe, therefore, is made of a mysterious force that astronomers call “dark energy” – as-yet undiscovered forms and objects.

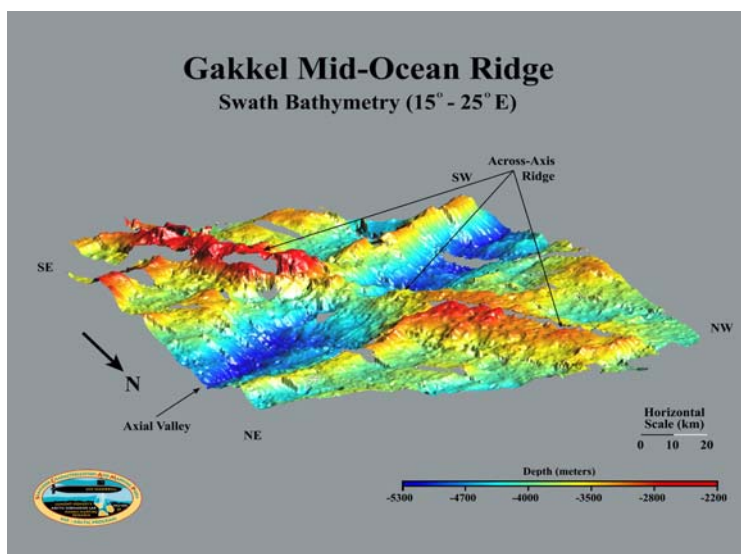
DASI, the Degree Angular Scale Interferometer, is a radio telescope designed to measure temperature and polarization irregularities in cosmic microwave background (CMB) radiation over a large range of scales with high sensitivity. Working at the U.S. station at the South Pole, University of Chicago astrophysicists using DASI in 2001 and 2002 made highly precise measurements to "see" temperature differences in and a minute polarization of CMB. These discoveries not only extend scientific understanding of formation of the Universe but also verify the framework that supports modern cosmological theory. Shown here are DASI (right), the Martin A. Pomerantz Observatory (middle), and a second telescope Viper (left) in the "dark sector" near South Pole Station.



Photo Credit: U.S. Antarctic Program/U.S. Air Force photo by MSgt Thomas Cook.

- Discovery that in addition to providing 420,000 years of climate information, Lake Vostok ice cores revealed that the water frozen from the lake surface contains microorganisms. Studies aimed at improving the sensitivity for detecting organisms and dissolved organic compounds in these cores is continuing.
- Discovery of hydrothermal vents (black smokers) on the Gakkel Ridge in the Arctic Ocean in a multi-national project with the U.S. Coast Guard Cutter *Healy* and the German icebreaker *Polarstern*. The Arctic Ocean and its floor remain the least explored of the world’s oceans.

Using the newly developed SCAMP (Seafloor Characterization and Mapping Pods), investigators from Tulane University, University of Hawaii’s Hawaii Mapping and Research Group, and Lamont-Doherty Earth Observatory (LDEO) mapped previously uncharted areas of the Arctic Ocean floor. SCAMP, developed at LDEO, provided the first high-resolution bathymetric map of the Gakkel Ridge, gravity-anomaly data, narrow-beam bathymetry, and “chirp” sub-bottom profiler data for inclusion in an arctic bathymetric map.





- A meteorologist wintering over at the South Pole underwent successful knee surgery with the help of a telemedicine link between the South Pole and doctors at Massachusetts General Hospital. The operation was carried out by the physician at the South Pole, who was assisted by an orthopedic surgeon and an anesthesiologist in Boston, Massachusetts. Two-way voice and video links between the U.S. and Antarctica have been used to assist in medical procedures before, but this is the first time that telemedicine has been used for surgery.

### Other Performance Indicators

The tables below show the number of people benefiting from OPP's funding, and trends in award size, duration, and number.

Number of People Supported in OPP Activities

	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate
Senior Researchers	779	800	880
Other Professionals	498	515	560
Postdoctorates	116	120	130
Graduate Students	379	390	430
Undergraduate Students	227	230	250
<b>Total Number of People</b>	<b>1,999</b>	<b>2,055</b>	<b>2,250</b>

Polar Programs Funding Profile

	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate
Number of Requests for Funding	936	980	1,020
Dollars Requested (in millions)	\$630	\$680	\$737
Total Number of Awards	621	640	700
Statistics for Competitive Awards:			
Number	264	270	300
Funding Rate	46%	40%	40%
Statistics for Research Grants:			
Number of Research Grants	222	235	250
Median Annualized Award Size	\$81,517	\$83,900	\$86,400
Average Annualized Award Size	\$130,353	\$134,300	\$138,300
Average Award Duration, in years	3.1	3.5	3.5

**U.S. POLAR RESEARCH PROGRAMS**

**\$261,860,000**

The FY 2004 Budget Request for U.S. Polar Research Programs Activity is \$261.86 million, an increase of \$26.12 million, or 11.1 percent, over the FY 2003 Budget Request of \$235.74 million.

Polar Research Programs Funding  
(Dollars in Millions)

	FY 2002 Actual	FY 2003 Request	FY 2004 Request	Change	
				Amount	Percent
Arctic Research Program	35.89	37.84	40.76	2.92	7.7%
Arctic Research Support and Logistics	27.58	26.00	29.00	3.00	11.5%
Arctic Research Commission	1.02	1.08	1.19	0.11	10.2%
Antarctic Research Grants Program	39.88	40.46	44.21	3.75	9.3%
Antarctic Operations and Science Support	126.15	130.36	146.70	16.34	12.5%
<b>Total, U.S. Polar Research Programs</b>	<b>\$230.52</b>	<b>\$235.74</b>	<b>\$261.86</b>	<b>\$26.12</b>	<b>11.1%</b>

Totals may not add due to rounding.

The U.S. Polar Research Programs Activity supports both Arctic and Antarctic research. Arctic support represents part of a larger NSF and federal research effort. Antarctic support includes funding for NSF-supported researchers as well as for meeting NSF responsibilities as manager of the entire federal Antarctic program, including special requirements for operations and science support.

*Polar Activities*

The following activities planned for FY 2004 cut across all Polar Research Programs:

- Initiation of a Postdoctoral Fellowship Program targeted at emerging scientific frontiers and underrepresented groups. The evolution of research frontiers in polar areas brings with it the opportunity to engage a new generation of scientists, particularly those from underrepresented groups.
- Activities that address emerging frontiers in polar biology. The National Academy of Sciences/National Research Center has undertaken a study that will help set priorities in this area.

*Arctic Research Program*

The FY 2004 Budget Request for the U.S. Arctic Research Program within Polar Programs is \$40.76 million, an increase of \$2.92 million, or 7.7 percent, over the FY 2003 Request of \$37.84 million. This funding, with the Arctic Research Support and Logistics funding, represents over 70 percent of the NSF support for university-based Arctic research.

The U.S. Arctic Research Program supports research on the Arctic Ocean, atmosphere, and land areas – including their people, and marine and terrestrial ecosystems. In addition to research in individual disciplines, an Arctic System Science component focuses on interdisciplinary approaches to understanding the Arctic region, including its role in global climate.

It has become widely recognized that the Arctic is in the midst of a change over the last decade. Changes have been measured in the ice cover, atmosphere, some terrestrial parameters, and northern ecosystems. Residents of the North are seeing these environmental changes affecting their lives. It is important to

determine whether these changes are correlated with a short-term shift in regional atmospheric circulation or whether they signal long-term global change. Priorities in FY 2004 include:

- Support for the Bering Sea Ecosystem Changes Study (BSECS). BSECS is a study of the dynamics of changes and the fundamental ecosystem properties of the Bering Sea – among the most productive of high latitude marine ecosystems, supporting one of the world’s richest assemblages of seabirds and marine mammals and large stocks of commercially valuable fish and shellfish. Additionally, the broad eastern shelf and shelf slope are important because they modify the heat, salt, nutrient content and particulate carbon load of water passing from the North Pacific Ocean into the Arctic Ocean. BSECS is a component of the Study of Environmental Arctic Change (SEARCH) that is planned to be a multiyear, multi-million dollar per year effort involving many federal agencies.
- Arctic System Science research on how changes in arctic biogeochemical cycles and biophysical processes would affect both arctic and global systems.
- Expanded support for science interns, primarily Alaska Native students.
- Study of Shelf-Basin Interactions, focusing on the biological, geochemical and physical processes mediating carbon exchange across the shelf in the Chuckchi Sea/Barrow area. This will be the third field season for this research.
- The second field season for the Freshwater Cycle Study. This work involves a wide range of studies of the freshwater cycle including atmospheric processes affecting deposition and transport, hydrological processes on land including watershed studies and river outflows (Arctic Community-wide Hydrological Analysis and Monitoring Program), and freshwater budgeting in the Arctic Ocean basin (Arctic/Subarctic Ocean Flux).

#### *Arctic Research Support and Logistics*

The FY 2004 Request for Arctic Research Support and Logistics is \$29.0 million, an increase of \$3.0 million, or 11.5 percent, above the FY 2003 Request of \$26.0 million. Arctic research support and logistics is driven by and responsive to the science supported in U.S. Arctic Research programs. Funding for logistics is provided directly to grantees or to key organizations that provide or manage Arctic research support and logistics. Some of the highlights and improvements are:

- Continued support to approximately 150 projects throughout the Arctic including Alaska, Canada, the Arctic Ocean, Greenland, Scandinavia and Russia. Almost half the projects are located in Alaska. There is increasing support available for work in the Arctic Ocean and Bering Sea with full use of the USCGC *Healy* augmented by either *Polar Sea* or *Polar Star*, and the *R/V Alpha Helix*.
- Continued access to fixed and rotary-wing airlift support to researchers conducting regional studies in the difficult and often fragile Arctic terrain in Alaska, Canada, Greenland, Arctic Scandinavia, and Russia.
- Continued access to U.S. Coast Guard and other icebreakers, University-National Oceanographic Laboratory vessels and coastal boats, and support on the U.S. Coast Guard Cutter *Healy*.
- Modest upgrades at Toolik Field Station, University of Alaska, Fairbanks’ field station for ecological research on Alaska's North Slope.

- Continued safety training for field researchers and funding for field safety experts, global satellite telephones for emergency response, and improved logistics coordination.
- Begin integration under SEARCH of a network of U.S. Long-Term Observatories, linking to similar efforts in Europe and Canada.
- Installation of a modern local area network the Barrow Environmental Observatory with improved access to the Internet.

#### *Arctic Research Commission*

Funding for the Arctic Research Commission (ARC), an independent federal agency, is transferred through the National Science Foundation to ARC. In FY 2004, ARC is requesting \$1.19 million, an increase of \$110,000, or 10.2 percent, over the FY 2003 Request of \$1.08 million.

#### *Antarctic Research Grants Program*

The FY 2004 Budget Request for the Antarctic Research Grants Program is \$44.21 million, an increase of \$3.75 million, or 9.3 percent over the FY 2003 Budget Request of \$40.46 million. The program provides grants to fund scientific research related to Antarctica and to the Southern Ocean. The FY 2004 Request will support research projects in Antarctica and at academic institutions in the U.S. This fundamental research will provide new information on the ozone hole, how extreme environments affect gene expression, the effects of ultraviolet radiation on living organisms, changes in the ice sheet and impacts on global sea level, global weather, climate, and ocean circulation, and on the early evolution of our universe as well as its current composition. Priorities in FY 2004 include:

- Funding support to begin planning for two Antarctic initiatives, Antarctic Drilling (ANDRILL) and West Antarctic Ice Sheet (WAIS), which will yield new information on historic climate change in Antarctica. ANDRILL is a multinational initiative to investigate Antarctica's role in global environmental change over the last 100 million years using stratigraphic drilling to determine Antarctic climatic, volcanic and tectonic history. WAIS is a multidisciplinary study of rapid climate change and future sea level. These initiatives will provide a benchmark for improvements in climate change models.
- Research, science support, and development of technology for exploration of Antarctic subglacial lakes in Antarctica. This is a growing area of interest because in addition to providing 420,000 years of climate information, Lake Vostok ice cores revealed that the water frozen from the lake surface contains microorganisms.
- Continued Ross Island Meteorology Experiment (RIME) development, aimed at enhancing the understanding of Antarctica's dominant role in Southern Hemisphere meteorology and improving weather forecasting/modeling capabilities for operational and safety purposes.
- The newly launched NASA spacecraft measuring global mass balance of the ice sheets will permit collaborative NSF/NASA studies (e.g., ground truthing) to expand from 2003 to 2004 as these data becomes available.

- Ongoing support of measurements of cosmic microwave background radiation, including its polarization, at South Pole Station, permitting unprecedented observations of the early structure/development of the universe and placing new constraints on cosmological theory.
- Southern Ocean GLOBEC (Global Ocean Ecosystems Dynamics), with the goal of understanding and ultimately predicting how populations of marine animal species interact with the physical environment and respond to natural and anthropogenic climate changes. Successful completion of the observational phase will permit migration to the analysis phase in 2004.
- International Trans-Antarctic Science Expedition (ITASE), which investigates the last 200 years of climate in Antarctica in an effort to understand atmospheric composition and anthropogenic effects.
- Continued operation of polar Long-Term Ecological Research sites (LTERs) as part of an international framework for ecosystem research. Preliminary studies will be conducted on establishment of a site in the Ross Sea area as part of the full-scale National Ecological Observatory Network.
- Astrophysics research to address the origin of the universe, galaxies, and stars.

#### *Antarctic Operations and Science Support*

The FY 2004 Budget Request for Antarctic Operations and Science Support is \$146.70 million, an increase of \$16.34 million, or 12.5 percent, over the FY 2003 Request of \$130.36 million. Antarctic Operations and Science Support makes research in Antarctica possible by providing the required research and life support facilities, food, fuel, environmental protection, health and safety and all other operational support for all U.S. research conducted on the continent, including research funded through other federal agencies (National Aeronautics and Space Administration, National Oceanographic and Atmospheric Administration, U.S. Geological Survey, Department of Energy, and the Smithsonian Institution).

The Antarctic Operations and Science Support subactivity is also responsible for managing several activities funded out of the Major Research Equipment and Facilities Construction (MREFC) Account, including South Pole Station Modernization. The new station will provide the infrastructure required for imaginative new science on the drawing board. Taking full advantage of the new station will require new efficiencies in delivering scientists and science supplies to remote locations and the South Pole and fuel to the South Pole. Other MREFC projects are IceCube and Polar Support Aircraft Upgrades. See the MREFC section for further information on these projects.

FY 2004 priorities include:

- Providing operational and logistical support for Antarctic science activities such as observation of cosmic microwave background radiation at South Pole Station.
- Improving operational capability and efficiency, including –

Development of an overland traverse capability. With the completion of the new South Pole Station in 2007, the U.S. will have the premier research station in the Antarctic interior, setting the stage for U.S. leadership for many years to come. The traverse capability is needed in order to reduce dependence on LC-130 aircraft for delivering fuel and outsized scientific equipment to South Pole Station, and to free up LC-130 aircraft missions for science support, where their unique capability is most needed – in the deep field and wherever speed of delivery is essential. The diversification of the

USAP continental transportation system will improve its reliability and enhance its cost-effectiveness. In FY 2004, necessary equipment will be procured to allow the proposed route between McMurdo and South Pole to be tested. Current plans, depending on FY 2003 and FY 2004 appropriations, are for an operational traverse in FY 2006.

Replacing the McMurdo Station power plant and associated switch gear, which are nearing the end of their useful life. The power plant has been identified as the most critical single point failure risk to the USAP.

- Continued development of a plan, with a timeline of estimated costs, for modernizing infrastructure at McMurdo and Palmer Stations.

Longer term priorities for the program include:

- Completing studies for 24x7 broadband access to South Pole.
- At McMurdo Station:
  - Replacing and upgrading obsolete dormitories.
  - Improving and expanding health care facilities.
  - Providing appropriate food storage and adequate warehousing facilities.

Science support and operations are provided primarily through a support contractor, selected through a competitive bidding process. A Polar Class U.S. Coast Guard icebreaker provides access to McMurdo Station for resupply ships. Other agencies and contractors also provide technical support in areas of expertise such as engineering, construction and communications. Significantly increased sea ice coverage as a consequence of the presence of the icebergs B-15 and C-19 has resulted in an increase in Coast Guard costs for ice-breaking.

The estimated costs of these functions are displayed in the following table:

Antarctic Operations and Science Support (Dollars in Millions)			
	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate
Administration	5.50	5.60	5.80
Science Facilities, research ships, field camp operations, science support aircraft	35.61	36.20	40.30
Operations at McMurdo, South Pole and Palmer Stations	31.70	32.30	37.30
Transportation of people and cargo, materials and inventory	19.60	19.80	20.60
Engineering, construction and facilities maintenance	11.80	12.26	17.10
Data handling and communications	16.40	16.50	17.00
Waste management, fire protection, health and safety, quality assurance	3.30	3.40	3.50
U.S. Coast Guard Icebreaker support	2.24	4.30	4.60
<b>Total, Antarctic Operations and Science Support</b>	<b>\$126.15</b>	<b>\$130.36</b>	<b>\$146.20</b>



**U.S. ANTARCTIC LOGISTICAL SUPPORT ACTIVITIES**

**\$68,070,000**

The FY 2004 Budget Request for U.S. Antarctic Logistical Support Activities is \$68.07 million, which is unchanged from the FY 2003 Budget Request.

Antarctic Logistical Support Funding  
(Dollars in Millions)

	FY 2002 Actual	FY 2003 Request	FY 2004 Request	Change Amount	Change Percent
U.S. Antarctic Logistical Support	70.27	68.07	68.07	0.00	0.0%
Total, U.S. Antarctic Logistical Support Activities	\$70.27	\$68.07	\$68.07	\$0.00	0.0%

U.S. Antarctic Logistical Support is provided by U.S. Department of Defense components. The major elements are:

- Military personnel of the 109th Airlift Wing (AW) of the New York Air National Guard.
- 109<sup>th</sup> AW LC-130 flight activity and aircraft maintenance.
- Transportation and training of personnel in connection with the U.S. Antarctic Program.
- Support of the logistics facilities of the Air Force Detachment 13 in Christchurch, New Zealand and the 109th Airlift Wing in Scotia, New York.
- Support for air traffic control, weather forecasting, and electronic equipment maintenance.
- The charter of Air Mobility Command Airlift and Military Sealift Command ships for the re-supply of McMurdo Station, as well as surface freight charges.
- Fuel purchased from the Defense Logistics Agency.
- Reimbursement for use of Department of Defense satellites for communications.



