

# **U.S. POLAR PROGRAMS**

## OFFICE OF POLAR PROGRAMS

**\$349,730,000**

The FY 2005 Budget Request for the Office of Polar Programs Activity (OPP) is \$349.73 million, an increase of \$7.58 million, or 2.2 percent, over the FY 2004 Estimate of \$342.15 million.

### Office of Polar Programs Funding (Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004	
				Amount	Percent
U.S. Polar Research Programs	255.41	274.08	281.66	7.58	2.8%
U.S. Antarctic Logistical Support	68.55	68.07	68.07	0.00	0.0%
<b>Total, OPP</b>	<b>\$323.96</b>	<b>\$342.15</b>	<b>\$349.73</b>	<b>\$7.58</b>	<b>2.2%</b>

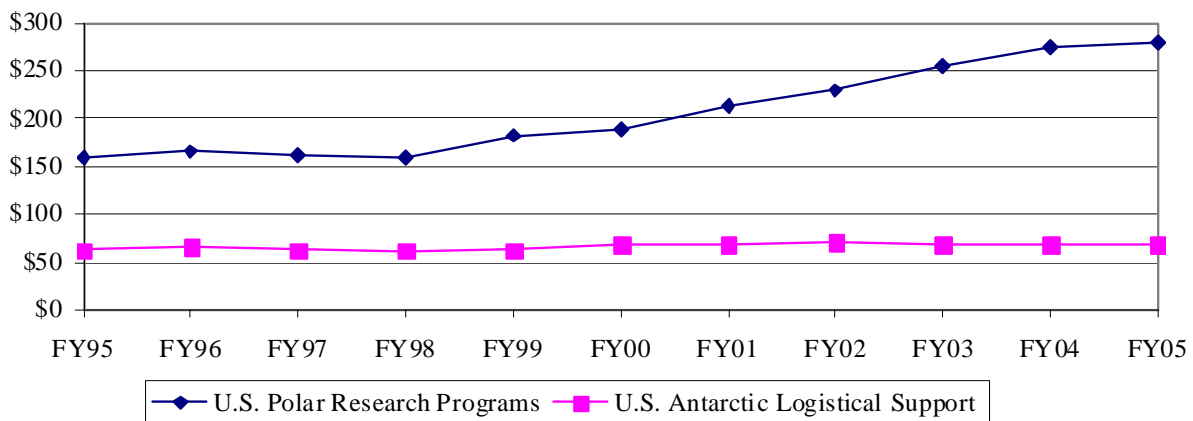
Totals may not add due to rounding.

Polar regions are key elements and possible drivers of the global climate system. They are also premier natural laboratories for a variety of fundamental phenomena that cannot be studied elsewhere. Recognizing the importance of polar regions and the benefits that can accrue from increased multi-national effort in these areas, 2007 has been declared the International Polar Year (IPY) by a number of international research organizations. The FY 2005 Request positions the U.S. to play a leading role in this broad international effort, and OPP funds most of the polar research NSF supports.

## RELEVANCE

Polar research addresses the solid earth, glacial and sea ice, terrestrial and marine ecosystems, the oceans, atmosphere and the universe. Key OPP support will broaden and deepen the fundamental observations of Arctic and Antarctic systems, including land, ice, atmosphere, ocean, and social/human systems, as well as natural records of those systems, in order to understand the components, interrelationships, and overall functioning of these systems. Increased observations, analysis and research on polar systems is critical for understanding global climate phenomena and will have ready applicability to Arctic residents, many of whom are currently experiencing a changing natural environment. OPP-sponsored research in polar regions also accesses disciplinary phenomena that cannot be studied as effectively elsewhere. The study of such phenomena in polar regions is changing the forefront of research in many fields of study.

### OPP Subactivity Funding (Dollars in Millions)

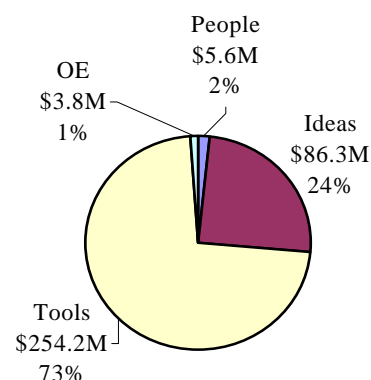


## STRATEGIC GOALS

Four strategic goals guide OPP activities:

- **PEOPLE:** OPP will place increased emphasis on improving the quality of education for young scientists, with particular focus on multidisciplinary research and on research in emerging areas. OPP-funded activity will provide information important for public policy decisions on a variety of issues. In addition, NSF will build on the interest of young students in Antarctica and the Arctic to provide educational opportunities and increase interest in math and science.
- **IDEAS:** Advancement of knowledge in all areas of science where the necessary research can best be done in polar regions, including support for work in the physical, life, and social sciences, both on a disciplinary and multi-disciplinary basis.
- **TOOLS:** Operations, maintenance, and enhancement of the infrastructure required for the conduct of polar research and development or state-of-the art tools that will enable such research in remote or otherwise inaccessible regions of the Arctic and Antarctic.
- **ORGANIZATIONAL EXCELLENCE:** Organizational Excellence provides for administrative activities necessary to enable NSF to achieve its mission and goals. These investments include support for Intergovernmental Personnel Act appointments and for contractors performing administrative functions. A substantial fraction of OPP's science support infrastructure is operated and maintained by private contractors and OPP will continue to evaluate and adopt best practices in its oversight and implementation.

**FY 2005 OPP Strategic Goals**



**Funding by Strategic Goal: Summary**  
(Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004	
				Amount	Percent
People	5.94	5.26	5.56	0.30	5.7%
Ideas	74.42	84.19	86.27	2.08	2.5%
Tools	240.27	248.95	254.15	5.20	2.1%
OE	3.33	3.75	3.75	0.00	0.0%
<b>Total, OPP</b>	<b>\$323.96</b>	<b>\$342.15</b>	<b>\$349.73</b>	<b>\$7.58</b>	<b>2.2%</b>

**PEOPLE (+\$300,000, for a total of \$5.56 million)**

**OPP People Investments**  
(Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004	
				Amount	Percent
Individuals	4.78	3.94	4.24	0.30	7.6%
Institutions	1.06	1.18	1.18	0.00	0.0%
Collaborations	0.06	0.14	0.14	0.00	0.0%
<b>Total, OPP</b>	<b>\$4.78</b>	<b>\$3.94</b>	<b>\$4.24</b>	<b>\$0.30</b>	<b>7.6%</b>

Totals may not add due to rounding.

INDIVIDUALS

- Increase support for Research Experiences for Undergraduates (REU) and dissertation fellowships.
- Redirect support within core programs to emphasize development of scientific expertise in the science workforce. This is part of a modest incremental step toward increasing grant size and duration.

**IDEAS (+\$2.08 million, for a total of \$86.27 million)**

**OPP Ideas Investments**  
(Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004	
				Amount	Percent
Fundamental Science & Engineering	72.91	82.77	84.85	2.08	2.5%
Centers Programs	1.51	1.42	1.42	0.00	0.0%
<b>Total, OPP</b>	<b>\$74.42</b>	<b>\$84.19</b>	<b>\$86.27</b>	<b>\$2.08</b>	<b>2.5%</b>

Totals may not add due to rounding.

FUNDAMENTAL SCIENCE AND ENGINEERING

- Polar Genomics – Support of Frontier in Polar Biology themes enabling aspects such as functional genomics for overall ecosystem understanding; probably a decade long theme; aligns with NSF Biocomplexity in the Environment interests, and may be done as an OPP-wide partnership with the BIO directorate.
- Support for Study of Environmental Arctic Change (SEARCH) Cyberinfrastructure and Sensors (CIS) to help prepare for U.S. leadership of the International Polar Year (IPY) in 2007. This effort also supports the goals identified at the Administration’s Earth Observation Summit of 2003. Polar activities include starting Polar Links to Undersea Telecommunications and Observatories and building a “network of networks,” -- the Circumarctic Environmental Observatory Network -- which includes advancing the implementation of the Long Range Plan for the Toolik Alaska Field Station.

- Initial support for the Bering Ecosystem Study (BEST). There is a view among the stakeholder and scientific communities that there is an urgent need to improve our understanding of the linkages between climate variability and the responses of the ecosystems of the Bering Sea. BEST addresses the need to understand how climate change will affect the marine ecosystems of the eastern Bering Sea and their sustainability. Planned as a component of SEARCH, BEST is also viewed by the Interagency Arctic Research Policy Committee (IARPC) as a research priority in its own right. A coordinated research effort will couple academic and fisheries oceanography in an attempt to achieve a level of ecosystem understanding that would enable comprehension of the changes that have occurred. Such basic research will be the foundation of improved models of ecosystem response and can play a key role in helping to ameliorate the impact on society of variability in this important ocean ecosystem.
- ANDRILL - acquisition and exploitation of records of global change in “deep time,” - geological drilling to investigate key intervals in Antarctic history as Earth changed from a “greenhouse” world to an “ice-house” world.
- Begin planning and preparation for coordinated studies in the fields of Antarctic meteorological processes and ice sheet dynamics for understanding climate and environmental change.
- Southern Ocean Global Ecosystem Synthesis and Modeling -- a 3-year effort to wrap up recent investments in observing the southern ocean ecosystem.

CENTERS PROGRAMS

- Continue funding Long-Term Ecological Research centers at Palmer Station in the Antarctic peninsula and at McMurdo Station and the Dry Valleys, Antarctica.

**TOOLS (+\$5.20 million, for a total of \$254.15 million)**

**OPP Tools Investments**  
(Dollars in Millions)

	FY 2003	FY 2004	FY 2005	Change over	
	Actual	Estimate	Request	FY 2004 Amount	Percent
Polar Tools, Facilities & Logistics	240.27	248.95	254.15	5.20	2.1%
<i>Antarctic Facilities &amp; Operations</i>	141.43	149.48	153.96	4.48	3.0%
<i>Antarctic Logistics</i>	68.55	68.07	68.07	0.00	0.0%
<i>Arctic Logistics</i>	30.29	31.40	32.12	0.72	2.3%
<b>Total, OPP</b>	<b>\$240.27</b>	<b>\$248.95</b>	<b>\$254.15</b>	<b>\$5.20</b>	<b>2.1%</b>

Totals may not add due to rounding.

POLAR TOOLS, FACILITIES, AND LOGISTICS

- Continued support for a cooperative agreement with the Barrow Arctic Science Consortium to improve support and logistics in the area and make any new facilities useful for basic research programs.

- Support for research projects throughout the Arctic including Alaska, Canada, the Arctic Ocean, Greenland, Scandinavia and Russia.
- Support for Toolik Field Station, the University of Alaska, Fairbanks' field station for ecological research on Alaska's North Slope.
- Complete the supporting structure for an 8 meter telescope at the South Pole.
- Support for SHALDRIL (shallow ship-based drilling for paleoceanographic studies related to climate change).
- Support for Deep Ice Drill.
- Complete the McMurdo Power Plant.
- Continue analysis and procurement planning to provide multi-year fuel storage capacity at McMurdo Station.
- Improve maintenance of facilities and infrastructure.
- Continue with communication bandwidth increases.
- Start warehouse and dormitory design.
- Support overland traverse to remain on track for full operational traverse in FY 2007.
- Continue support for two icebreakers to open channel to McMurdo Station.
- Improve the security of USAP IT systems.

### **ORGANIZATIONAL EXCELLENCE (unchanged at \$3.75 million)**

Organizational Excellence provides for administrative activities necessary to enable NSF to achieve its strategic goals. Requested funding for FY 2005 is \$3.75 million, level with FY 2004. This includes the cost of Intergovernmental Personnel Act appointments and contractors performing administrative functions.

A substantial fraction of OPP's science support infrastructure is operated and maintained by private contractors. OPP will continue to evaluate and adopt best practices in its oversight and implementation.

### **PRIORITY AREAS**

In FY 2005, OPP will support research and education efforts related to broad, Foundation-wide priority areas in Biocomplexity in the Environment and Mathematical Sciences.

**Office of Polar Programs Investments in NSF Priority Areas**  
(Dollars in Millions)

	FY 2003 Actual	FY 2004 Estimate	FY 2005 Request	Change over FY 2004	
				Amount	Percent
Biocomplexity in the Environment	\$1.41	\$1.55	\$1.55	\$0.00	0.0%
Mathematical Sciences	0.18	0.18	0.20	0.02	11.1%

## QUALITY

OPP assures the quality of the research and development it supports partly through the use of a competitive, merit-based review process, and partly through the oversight of the OPP Office Advisory Committee, and, above all, by its program managers and section heads. Ninety-three percent of basic and applied research funds were allocated to projects that underwent merit review in FY 2003.

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. These Committees report to the Office Advisory Committee, which then engages OPP management in discussions about the conclusions and actions that should be taken to further assure the quality of future OPP investments.

The Office of Polar Programs also receives advice from its advisory committee concerning science opportunities and support for research, education and human resource activities in polar regions. The advisory committee meets twice a year. Its membership is composed of outstanding scientists and educators representative of the community involved in OPP activities.

## PERFORMANCE

### Recent Research Highlights

**Behavior of Arctic Ocean Ridge Confounds Predictions; May Lead to New Insights into Crust Formation.** The discovery that an ocean ridge under the Arctic ice cap is unexpectedly volcanically active and contains multiple hydrothermal vents may cause scientists to modify a decades-long understanding of how ocean ridges work to produce the Earth's crust. The new results, which come from a study of the Gakkel Ridge, one of the slowest spreading ridges on Earth, have broad implications for the understanding of the globe-encircling mid-ocean ridge system where melting of the underlying mantle creates the ocean floor. In the cover story in the June 26, 2003 edition of the journal

*Nature*, scientists present striking new results obtained during a nine-week research cruise that lasted from August to October of 2001. In general, fast-spreading ocean ridges, where the Earth's crust is produced, are volcanically very active. So scientists expected the Gakkel, where the spreading rate is one centimeter (.39 inches) per year, to



Investigations of the Gakkel Ridge, the slowest spreading of the mid-ocean ridges located under the central Arctic Ocean, appeared in the 26 June 2003 issue of the journal *Nature*. The cover photo shows the multibeam sonar bathymetry of the ridge mapped using the USCGC *Healy* and the German icebreaker *Polarstern*.

exhibit little, if any, volcanic activity. Because the spreading rate decreases progressively towards Siberia, scientists expected that the amount of melting and magma production would decrease from Greenland eastward. Instead, the very first sampling station brought up fresh volcanic rock, and the new map published in *Nature* shows large young volcanoes dominating the part of the ridge nearest Greenland.

Scientists aboard the *Healy*, a U.S. Coast Guard icebreaker specially equipped for research, and a companion vessel, the German research icebreaker, the PFS *Polarstern*, achieved several scientific "firsts." They obtained high-resolution, well-navigated maps of the entire portion of the ridge, collected thousands of samples by dredging the sea floor, explored for regional anomalies in the water column that would indicate the amount and location of deep hydrothermal vents surrounded by ecosystems that thrive in the absence of sunlight. Based on the picture the Gakkel data painted, factors other than spreading rate must be taken into account when characterizing the likelihood of a given area's volcanic activity. The research team, which included more than 30 scientists from U.S. and German research institutions, based their conclusions on the remarkably detailed map of the sea floor and on 200 samples taken on average every five kilometers (3.1 miles) along the ridge.



**New Model of Glacial Erosion Dynamics.** Earth scientists have long recognized that glaciers and ice sheets have been responsible for rearranging rock and soil and shaping Earth's surface. Indeed, most visitors to places like Glacier National Park or Yosemite clearly see the magnitude of mass redistribution from ice. Glacial erosion and redistribution of mass has both contributed to the extreme uplift of mountain ranges like the Himalaya and has leveled large areas of continents, like western Canada. Conventional thinking on glacial erosion and transport focused on brute force of ice carrying rock debris along at its base, either as particles in the lowermost ice or as a heterogeneous sediment being carried along by shearing and smearing at the bottom of the ice, or on glacial meltwater moving material along under the ice and away as the water emerged from beneath the ice sheet. A new conceptual model of sediment erosion and transport by Alley and colleagues, featured on the cover article of *Nature* (v.424, 14 August 2003), brings water and ice together in a coupled dynamic system that explains many important observations of glacially formed landscape. This model

is important because it ties observations to physical processes that can be rigorously modeled. This in turn will allow development of realistic models of ice sheets and glaciers so that we can better understand their role and predict their fate in a changing global environment.

**New Views of Subglacial Lake Vostok.** This project undertook a comprehensive aerogeophysical survey to characterize the lake and to understand its geological setting. The survey utilized a unique aerogeophysical system that was specifically designed for work over ice sheets. It consisted of an integrated system that combined a laser surface profiler, an ice-penetrating radar, a magnetometer, and a gravimeter all supported by high precision GPS navigation. Results published provide extraordinary new knowledge about the lake system. Interpretations of ice from the bottom of a deep drill hole completed in the 1990s as a French-Russian-U.S. collaboration showed that the lake water was freezing onto the base of the ice sheet. This process has substantial implications for the nature of the water in the lake. The new aerogeophysical survey provides important new information to help quantify processes and develop a



comprehensive model for the lake. This work provides new and unprecedented information about subglacial Lake Vostok, a unique long-lived environment that may represent a new class of ecosystem.

**Tidal Modulation of Ice Stream Flow.** Research was supported to investigate the new-found, startling sensitivity of two major West Antarctic ice streams (WAIS) to tidal oscillations to learn the extent and character of the effect and its ramifications for future ice-stream behavior. The improved knowledge of ice-stream behavior from this study will contribute to assessment of the potential for rapid ice-sheet change affecting global sea level with societal consequences. Results will be disseminated through scientific publication and talks at professional meetings, as well as contacts with the press, university classes taught by the PIs, visits to schools and community groups, and other activities. Two graduate students will be educated through the project. This work has a good chance of providing a significant improvement to our understanding of ice stream dynamics and by extension, the stability of WAIS in general, which has obvious societal importance.

**South Pole Traverse Proof of Concept.** Progress was made toward implementation of the proof of concept for an overland traverse capability to the South Pole by the end of 2004 by safely crossing the McMurdo Shear Zone and reaching the “Farthest South” point at S 79 24.213 E 171 09.776. With



Overland traverses from the coast near McMurdo Station to Amundsen-Scott South Pole will be able to deliver up to 2.2 million pounds of materials — the equivalent 85 LC-130 flights.

completion of the proof of concept traverse, the U.S. Antarctic Program will be able to move forward with development of a full-scale traverse capability. The proof of concept fleet will be able to deliver approximately 162,000 pounds of revenue payload to the South Pole per trip, or the equivalent of 6.25 LC-130 flights. Based on current planning, the fully developed traverse capability of three traverse swings, each swing made up of six tractors and 23 trailers or sleds, making three trips per season (twenty days to the South Pole and ten days to return), will deliver approximately 2.2 million pounds of revenue payload – or the equivalent of 85 LC-130 missions – to the South Pole per season at lower cost and with reduced fuel consumption.

**Antarctic Health and Safety.** The value of the return on investments in telemedical capabilities became apparent during April 2002 when emergency surgical repair of a person’s knee was made possible through use of this technology. The South Pole physician, observed in real-time and guided via video link by state-side orthopedic surgeons, was able to perform this first-ever invasive surgery at the South

Pole. In addition, OPP and Raytheon continue to invest in methods to reduce injuries through, for example, safety training and awareness programs. In 2003, a 61 percent reduction in recordable injuries from the prior year was achieved. Delivery of medical services in remote areas is crucial to protecting the health and safety of all USAP participants.

**Other Performance Indicators**

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

**Number of People Involved in OPP Activities**

	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate
Senior Researchers	787	870	880
Other Professionals	616	685	700
Postdoctorates	105	120	120
Graduate Students	439	490	500
Undergraduate Students	236	260	260
<b>Total Number of People</b>	<b>2,183</b>	<b>2,425</b>	<b>2,460</b>

**OPP Funding Profile**

	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate
<b>Statistics for Competitive Awards:</b>			
Number	241	267	275
Funding Rate	43%	43%	44%
<b>Statistics for Research Grants:</b>			
Number of Research Grants	148	160	181
Funding Rate	43%	43%	44%
Median Annualized Award Size	\$126,143	\$129,900	\$133,700
Average Annualized Award Size	\$144,392	\$148,700	\$153,100
Average Award Duration, in years	2.6	2.7	2.8



**U.S. POLAR RESEARCH PROGRAMS**

**\$281,660,000**

The FY 2005 Budget Request for U.S. Polar Research Programs Activity is \$281.66 million, an increase of \$7.58 million, or 2.8 percent, over the FY 2004 Estimate of \$274.08 million.

**Polar Research Programs Funding**  
(Dollars in Millions)

	FY 2003	FY 2004	FY 2005	Change over	
	Actual	Estimate	Request	FY 2004 Amount	FY 2004 Percent
Arctic Research Program	37.56	44.00	44.88	0.88	2.0%
Arctic Research Support and Logistics	30.29	31.40	32.12	0.72	2.3%
Arctic Research Commission	1.08	1.19	1.19	0.00	0.0%
Antarctic Research Grants Program	42.55	45.20	46.70	1.50	3.3%
Antarctic Operations and Science Support	143.93	152.29	156.77	4.48	2.9%
<b>Total, U.S. Polar Research Programs</b>	<b>\$255.41</b>	<b>\$274.08</b>	<b>\$281.66</b>	<b>\$7.58</b>	<b>2.8%</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 Programs is also responsible for managing several activities funded out of the Major Research Equipment and Facilities Construction (MREFC) Account, including IceCube and 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. See the MREFC section for further information on these projects.

*Polar Activities*

The following activities planned for FY 2005 cut across all Polar Research Programs:

- Continuation 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 Council study will help set priorities in this area through the report, *Frontiers in Polar Biology in the Genomic Era*.
- Facilitate opportunities for development and deployment of autonomous remote sensors and the cyberinfrastructure to link them together with larger networks and home laboratories.

### Arctic Research Program

The FY 2005 Budget Request for the U.S. Arctic Research Program within Polar Programs is \$44.88 million, an increase of \$880,000, or 2.0 percent, over the FY 2004 Estimate of \$44.0 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 2005 include:

- Support for Study of Environmental Arctic Change (SEARCH) Cyberinfrastructure and Sensors (CIS) to help prepare for U.S. leadership of the International Polar Year (IPY) in 2007. This effort also supports the goals identified at the Administration's Earth Observation Summit of 2003. Polar activities include starting Polar Links to Undersea Telecommunications and Observatories and building a "network of networks," -- the Circumarctic Environmental Observatory Network -- which includes advancing the implementation of the Long Range Plan for the Toolik Alaska Field Station.
- Initial support for the Bering Ecosystem Study (BEST). There is a view among the stakeholder and scientific communities that there is an urgent need to improve our understanding of the linkages between climate variability and the responses of the ecosystems of the Bering Sea. BEST addresses the need to understand how climate change will affect the marine ecosystems of the eastern Bering Sea and their sustainability. Planned as a component of SEARCH, BEST is also viewed by the Interagency Arctic Research Policy Committee (IARPC) as a research priority in its own right. A coordinated research effort will couple academic and fisheries oceanography in an attempt to achieve a level of ecosystem understanding that would enable comprehension of the changes that have occurred. Such basic research will be the foundation of improved models of ecosystem response and can play a key role in helping to ameliorate the impact on society of variability in this important ocean ecosystem.

BEST will be a major effort requiring, as part of integrated field programs, collaborative research among multiple institutions and disciplines, including international collaboration, the deployment of *in situ* long-term instrument arrays, satellite-based remote sensing studies, and the deployment of multiple ships. Mathematical modeling studies will be an integral part of the program from the outset, and will provide frameworks for testing program hypotheses and sampling scenarios. Such an ambitious effort will of necessity require capacity building through targeted internship and training programs, the involvement of social scientists, and strong public awareness and outreach efforts.

- With continued funding, implementation of BEST and most parts of SEARCH will be possible by the time of the International Polar Year (IPY) in FY 2007.

### *Arctic Research Support and Logistics*

The FY 2005 Request for Arctic Research Support and Logistics is \$32.12 million, an increase of \$720,000, or 2.3% percent, above the FY 2004 Estimate of \$31.40 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. Funding includes:

- 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, support for research conducted on the U.S. Coast Guard Cutter *Healy*, and University-National Oceanographic Laboratory vessels and coastal boats.
- 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 at 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 2005, ARC is requesting \$1.19 million, level with the FY 2004 Estimate.

### *Antarctic Research Grants Program*

The FY 2005 Budget Request for the Antarctic Research Grants Program is \$46.70 million, an increase of \$1.50 million, or 3.3 percent over the FY 2004 Estimate of \$45.20 million. The program provides grants to fund scientific research related to Antarctica and to the Southern Ocean. The FY 2005 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 2005 include:

- Polar Genomics – Support of Frontier in Polar Biology themes enabling aspects such as functional genomics for overall ecosystem understanding; probably a decade long theme; aligns with NSF BE interests, and may be done as an OPP-wide partnership with the BIO directorate.
- ANDRILL - acquisition and exploitation of records of global change in “deep time,” - geological drilling to investigate key intervals in Antarctic history as Earth changed from a “greenhouse” world to an “ice-house” world.
- Begin planning and preparation for coordinated studies in the fields of Antarctic meteorological processes and ice sheet dynamics for understanding climate and environmental change.
- Southern Ocean Global Ecosystem Synthesis and Modeling -- a 3-year effort to wrap up recent investments in observing the southern ocean ecosystem.

#### *Antarctic Operations and Science Support*

The FY 2005 Budget Request for Antarctic Operations and Science Support is \$156.77 million, an increase of \$4.48 million, or 2.9 percent, over the FY 2004 Estimate of \$152.29 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).

FY 2005 priorities include:

- Complete the supporting structure for an 8 meter telescope at the South Pole
- Support for SHALDRIL (shallow ship-based drilling for paleoceanographic studies related to climate change)
- Support for Deep Ice Drill
- Provide a modest increase in level of science support
- Complete the McMurdo Power Plant
- Continue analysis and procurement planning to provide multi-year fuel storage capacity at McMurdo Station
- Improve maintenance of facilities and infrastructure
- Continue with communication bandwidth increases
- Continue efforts to streamline inventory management
- Start warehouse and dormitory design
- Support overland traverse to remain on track for full operational traverse in FY 2007
- Continue support for two icebreakers to open channel to McMurdo Station
- Improve the security of USAP IT systems

Longer-term priorities for the program include:

- Complete US commitment to ANDRILL
- Develop a ski-equipped research LC-130
- Replace the current McMurdo trade shops
- Provide for modern warehousing and increase quality of life with new dormitories
- Complete South Pole Traverse
- Increase fuel storage capacity in McMurdo for two years supply
- Complete studies for 24x7 broadband access to South Pole.

Science support and operations are provided primarily through a support contractor, selected through a competitive bidding process. U.S. Coast Guard icebreakers provide access to McMurdo Station for re-supply ships, without which national goals of maintaining three year-round stations would not be possible. Coast Guard costs for icebreaking have increased dramatically in recent years.

The Air Force provides inter-continental air transport to Antarctica and the Air National Guard provides inter- and intra-continental air transport. Both of the above are provided on a reimbursable basis from the Logistical Support Account discussed below. Other agencies and contractors also provide technical support in areas of expertise such as engineering, construction and communications. The estimated costs of these functions are displayed in the following table:

**Antarctic Operations and Science Support**

(Dollars in Millions)

	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate
Administration	6.10	6.30	6.40
Science Facilities, research ships, field camp operations, science support aircraft	39.30	40.30	41.40
Operations at McMurdo, South Pole and Palmer Stations	35.93	36.80	37.70
Transportation of people and cargo, materials and inventory	21.60	23.10	23.77
Engineering, construction and facilities maintenance	13.00	15.79	16.60
Data handling and communications	18.10	19.60	20.30
Waste management, fire protection, health and safety, quality assurance	3.60	3.70	3.80
U.S. Coast Guard Icebreaker support	6.30	6.70	6.80
<b>Total, Antarctic Operations and Science Support</b>	<b>\$143.93</b>	<b>\$152.29</b>	<b>\$156.77</b>





**U.S. ANTARCTIC LOGISTICAL SUPPORT ACTIVITIES** **\$68,070,000**

The FY 2005 Budget Request for U.S. Antarctic Logistical Support Activities is \$68.07 million, which is unchanged from the FY 2004 Estimate.

**Antarctic Logistical Support Funding**  
(Dollars in Millions)

	FY 2003	FY 2004	FY 2005	Change from	
	Actual	Estimate	Request	FY 2004 Amount	Percent
U.S. Antarctic Logistical Support	68.55	68.07	68.07	0.00	0.0%
Total, U.S. Antarctic Logistical Support Activities	\$68.55	\$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.

