

OFFICE OF POLAR PROGRAMS

\$438,100,000

The FY 2007 Budget Request for the Office of Polar Programs (OPP) is \$438.10 million, an increase of \$48.76 million, or 12.5 percent, over the FY 2006 Current Plan of \$389.34 million.

Office of Polar Programs Funding

(Dollars in Millions)

	FY 2005	FY 2006	FY 2007	Change over	
	Actual	Current Plan	Request	FY 2006 Amount	FY 2006 Percent
U.S. Polar Research Programs	278.27	322.68	370.58	47.90	14.8%
U.S. Antarctic Logistical Support	70.26	66.66	67.52	0.86	1.3%
Total, OPP	\$348.53	\$389.34	\$438.10	\$48.76	12.5%

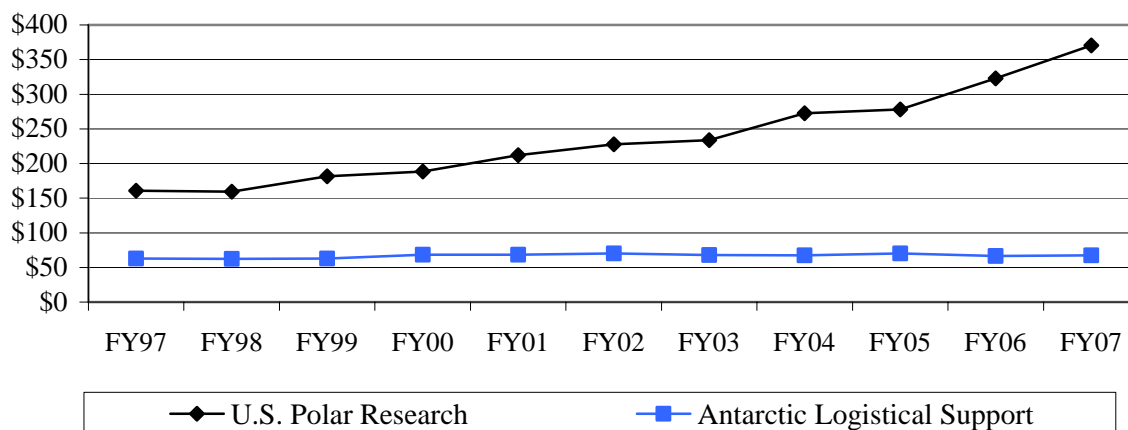
Totals may not add due to rounding.

The Office of Polar Programs supports most of the research in polar regions funded by the National Science Foundation. The Arctic and Antarctic are premier natural laboratories whose extreme environments and geographically-unique settings enable research on phenomena and processes not feasible elsewhere. For example, the cold dry environment and high altitude at the South Pole make it the world's best location for certain astrophysics measurements. Polar research provides insights into earth systems – the atmosphere, oceans and solid earth – that cannot be gained elsewhere, and study of the polar ice sheets reveals how the earth's climate has changed in the past. Polar regions also offer unusual opportunities for environmental research, as the sensitivity of polar ecosystems to small changes in climate renders them important bellwethers for potential future change. An additional area of unique current interest is that the polar regions provide information about how organisms adapt to environmental change. As in FY 2006, NSF has the responsibility for funding the costs of icebreakers that support scientific research in polar regions.

With the FY 2007 request, the OPP budget no longer includes funding for the Arctic Research Commission (ARC), which has been established as a separate activity within the Research and Related Activities account. For consistency, ARC funding is omitted from the total for OPP in FY 2005 and FY 2006. For further information, please see the Arctic Research Commission chapter.

OPP Subactivity Funding

(Dollars in Millions)



RELEVANCE

Research in polar regions offers opportunities for fundamental advances in each of the disciplinary sciences, ranging from the behavior of the earth's inner core to the formation of galaxies, from the biology of life in the cold and dark to how Arctic residents are affected by environmental change. In addition it addresses polar aspects of the global earth system – glacial and sea ice, terrestrial and marine ecosystems, the ocean, and the atmosphere – that help shape the global environment and climate. OPP funding will support the development and implementation of the enhanced observation systems needed to trace these shaping influences on a regional basis, as well as research to elucidate the interactions among them and how they impact the polar environment. The work will include study of the natural climate records from the past contained in ice cores and earth sediments. Much of this research will be carried out in collaboration with scientists in other countries, promoting international partnerships.

NSF provides interagency leadership for research planning as directed by the Arctic Research Policy Act of 1984. The NSF Director chairs the Interagency Arctic Research Policy Committee (IARPC) created for this purpose. In addition, per Presidential Decision Directive, NSF manages all U.S. activities in the Antarctic as a single, integrated program, making research possible in Antarctica by scientists supported by NSF and by U.S. mission agencies including the National Aeronautics and Space Administration, the National Oceanic and Atmospheric Administration, the U.S. Geological Survey, and the Department of Energy. The U.S. Antarctic Program supports the U.S. governance role through the Antarctic Treaty.

In FY 2006, funding responsibility for the U.S. Coast Guard's (USCG) three polar icebreakers was transferred to NSF, along with \$48.0 million from the USCG's budget. NSF and the USCG work together to formulate operations and maintenance plans and associated funding requirements.

In FY 2006, NSF will initiate funding for research to be conducted during the International Polar Year (IPY) 2007-2008. The vision for IPY established by the National Academy of Sciences (NAS)/Polar Research Board includes an "... intense, coordinated campaign of polar observations, research, and analysis that will be multidisciplinary in scope and international in participation...that will benefit society by exploring new frontiers and increasing understanding of the key roles of the polar regions in globally linked systems."

As the lead agency supporting polar research, NSF is poised to provide U.S. leadership in this activity through the work of its grantees. The FY 2007 request will enable that leadership. Major emphasis in FY 2006 is being placed on **Study of Environmental Arctic CHange (SEARCH)**, **Polar Ice Sheet Dynamics and Stability**, and studies of **Life in the Cold and Dark**, particularly at the genomic level. Work in FY 2007 will build on these themes and expand to new ones being identified in research community planning activities. NSF's Directorate for Education and Human Resources will participate actively in this work, as will most of the disciplinary-based research directorates in NSF.

Priorities for FY 2007:

International Polar Year

Study of Environmental Arctic Change (SEARCH). SEARCH is an interagency program established to study recent and ongoing change in the Arctic. The research community has identified establishment of a pan-Arctic observing system as key to advancing the science of SEARCH, both under IPY and on a longer-term basis. During FY 2007, OPP will give special emphasis to establishing a research-driven network of measurement systems in collaboration with other countries, including a

network of human observations and indigenous knowledge in the Arctic that will create a long-term legacy for future generations of scientists and policy-makers.

Polar Ice Sheet Dynamics and Stability. OPP will make research and infrastructure investments to advance understanding of polar ice sheets and their connection to global climate change. Growth and decline of the Antarctic ice sheets has dominated changes of sea level of hundreds of feet in past glacial cycles, cycles whose characteristics will be studied in the planned West Antarctic Ice Sheet (WAIS) and Antarctic Drilling (ANDRILL) programs. The WAIS Divide ice-coring program will obtain climate records of the last 40,000 years with temporal resolution that allows for direct comparison with climate changes that took place in the Arctic. A complementary record of the last three million years will be obtained by ANDRILL, a program to core marine sediments from the Antarctic margin and determine ice sheet behavior and paleoenvironmental conditions. Preparations will also begin for exploration of the Gamburtsev Subglacial Mountains, considered the nucleation point of Antarctica’s major ice sheets and an international focal point for IPY research.

Life in the Cold and Dark. OPP will fund research and required infrastructure to enable advances in understanding, particularly at the cellular and genomic level, of how life adapts and survives the polar cold and dark. Activities, as part of IPY, will support research in Alaska (particularly at Toolik field station), at Summit, Greenland, and in the McMurdo Dry Valleys of Antarctica during the polar night, a time when the extreme conditions have severely limited access by scientists in the past. Recently developed molecular techniques will be used to further advance scientific research.

Antarctic Resupply Options: The condition of the USCG polar icebreakers and the uncertainty regarding their future prompted OPP and the OPP Advisory Committee (OAC) to identify and study options for reducing demands on the ship-based logistics system and to develop contingency plans for dealing with a possible failure of that system. Funds are requested to begin implementation of several of the most promising options.

USCG Polar Icebreakers: The request includes funds to operate and maintain the *POLAR SEA* and the *HEALY*, including extraordinary maintenance needs identified the USCG, and to keep the *POLAR STAR* in caretaker status with a reduced crew pending the outcome of the National Academies of Science’s study of the Nation’s icebreaking needs.

Polar Programs Funding by Major Area

(Dollars in Millions)

	FY 2006			Change over	
	FY 2005 Actual	Current Plan	FY 2007 Request	FY 2006 Amount	FY 2006 Percent
Arctic Sciences	76.10	70.83	89.59	18.76	26.5%
Antarctic Sciences	46.19	42.81	52.53	9.72	22.7%
Antarctic Ops, Science Support, Logistics	216.79	208.42	228.61	20.19	9.7%
Polar Environment, Safety, and Health	0.25	5.13	5.92	0.79	15.4%
STC: Center for Remote Sensing of Ice Sheets	-	3.95	4.45	0.50	12.7%
USCG Polar Icebreaking ^{1/}	9.20	58.20	57.00	-1.20	-2.1%
Total, Office of Polar Programs	\$348.53	\$389.34	\$438.10	\$48.76	12.5%

^{1/}Represents all funding provided to USCG. In FY 2005, in addition to payments to USCG, OPP paid \$4.13 million to charter the icebreaker *KRASIN* to perform the Antarctic break-in and in FY 2006, in addition to payments to USCG, OPP estimates it will cost \$9 million to charter the icebreaker *KRASIN* to perform the Antarctic break-in.

Summary of Major Changes by Major Area

(Dollars in Millions)

OPP FY 2006 Current Plan..... **\$389.34**

Arctic Sciences

International Polar Year:

Fund a special competition for IPY and support for a broad range of smaller innovative projects that are responsive to the International Council for Science (ICSU) and NAS/National Research Council (NRC) guidelines; and fund a significant component of the Arctic Observing Network. This is a major IPY activity that leverages observing system investments made by international partners such as the European Union. +\$8.30

Fund the Bering Sea Ecosystem Study (BEST) observation program, with an emphasis on developing a strong social science component. This program, relevant to IPY, was identified by the U.S. Arctic Research Commission as a high priority for development and support by NSF. +\$1.46

Provide essential **logistics** to implement activities planned for IPY: Enable winter research at the LTERs at Toolik field station, AK, and Summit, Greenland; make investments in infrastructure to enable NSF's research community to more effectively utilize the Barrow Global Change Climate Research Facility; and support additional ship capabilities for marine-based research in polar oceans via contract or international partnership. +\$8.00

Infrastructure:

Restore funding for a powerline upgrade in Barrow, AK. This was deferred from FY 2006 to FY 2007, due to unanticipated icebreaker costs. +\$1.00

Antarctic Sciences

International Polar Year:

Fund a special competition for IPY and support for a broad range of smaller innovative projects that are responsive to the ICSU and NAS/NRC guidelines. Funding will increase for studying the dynamics of WAIS, a major IPY activity. Although WAIS is sensitive to global environmental change and it may contribute significantly to sea level rise in the future, parts of it remain poorly characterized. Increased funding will allow key observations in these sectors of this ice sheet and thus allow incorporation of these data into developing mathematical models of ice sheet dynamics. Funding will also increase for genomics in polar biology, another major IPY activity. Molecular and genetic methods are revolutionizing understanding of biology, and polar biology is no exception. This increase will support work to exploit genetic and molecular biology approaches toward understanding how organisms and ecosystems have adapted to the extreme conditions of the Antarctic. +\$8.50

Initiate remote sensing of the previously unexplored Gamburtsev Mountains in the ice-covered interior of Antarctica. Although little is known about these mountains, they play a critical role in all models of the initial glaciation of Antarctica, a topic relevant to IPY. +\$1.22

Antarctic Operations and Science Support

U.S. Antarctic Program Resupply:

+\$10.20

Funding for studies and projects responding to recommendations made by the OAC Subcommittee on U.S. Antarctic Program Resupply for diversification of the transportation system. The goal is to mitigate the single point failure mode associated with needing icebreaker, fuel tanker, and cargo ship access to McMurdo Station, Antarctica. Further investments will be made in studies, analyses, and small-scale proof of concept efforts to pursue promising options identified by OAC. Larger projects include the following:

South Pole Traverse: Implement at least one full-capacity traverse swing for surface supply of South Pole Station. The South Pole Traverse proof-of-concept was completed in early FY 2006. Funding for a full swing will enable the traverse to deliver the equivalent of approximately 25 LC-130 flights of cargo/fuel. This capability reduces the cost of fuel delivery at the South Pole, diversifies the transportation system and therefore reduces reliance on LC-130s in the event that this asset cannot be used due to weather or is otherwise unavailable or in too short a supply to complete all required tasking in a given season.

Fuel Storage Capacity: Provide additional fuel tanks at McMurdo to provide a two-year capacity by FY 2008 to mitigate the consequences of a failure in the McMurdo resupply. Building on design work that will be completed in FY 2006, the FY 2007 request will provide for procurement, delivery, and site preparation for additional fuel tanks at McMurdo Station. Construction will be completed in FY 2008. Additional fuel storage capacity at McMurdo Station will provide the flexibility to skip a year of fuel resupply should ice or logistics conditions make that necessary.

South Pole Station Airstrip: Purchase equipment for milling and compacting a South Pole Station airstrip capable of handling heavy-lift aircraft (e.g., C-17) flying fuel and supplies directly from off-continent. Together with the traverse, this will help decouple South Pole Station supply from McMurdo resupply, thereby reducing demands on cargo and tanker ship access enabled by icebreakers.

Program Offsets: Program offsets will be made in other areas to provide funding for Antarctic resupply projects: Funding will be deferred for the Williams Field Relocation Project (McMurdo aircraft landing area). This project involves constructing new access trails, airfield ramp areas and runways, as well as replacing buildings, for the LC-130 skiway. Deferring this project puts the program at eventual risk for reduced LC-130 operations should the ice on which Williams Field is currently located become unusable. Indefinite deferral is not an option as the ice will eventually calve into the sea.

-\$2.18

Funding for power management and energy distribution upgrades for South Pole Station will also be deferred. This work involves changes to the power distribution network for the Dark Sector. Deferring this work will limit the power available for the installation of instruments at the South Pole and will require administrative power management procedures for Dark Sector research projects.

Palmer Station Cargo Pier:

+\$2.31

Fund design studies for replacement of the cargo pier at Palmer Station, Antarctica. The pier at Palmer Station is approaching the end of its useful life. Without a usable pier, resupply and research

vessel access to Palmer Station will be jeopardized. Funding for the initial phase of this project and funding for future construction will ensure access to Palmer Station.

International Polar Year: +\$9.00

Provide essential **logistics** to implement activities planned for IPY. Planned activities include enabling winter research at the LTER in the Antarctic McMurdo Dry Valleys; and enhancing capabilities for deep field research, including purchase of surface traverse vehicles and contracts for aircraft to support deep field research. South Pole communications bandwidth will be increased by an order of magnitude (to 100 Gbytes/day), to better support physics and astronomy experiments.

U.S. Antarctic Logistical Support +\$0.86

Funds for DoD-related costs associated with the Antarctic resupply projects discussed above, in the form of DoD engineering studies and increased airlift.

Polar Environment, Safety, and Health +\$0.79

This section was established in FY 2005 to manage and oversee the environmental, safety, and health (ES&H) aspects of research and operations conducted in polar regions. The ES&H section has overall responsibility for guiding the implementation of both an environmental perspective that provides appropriate protection and stewardship of the environment; and a safety and health perspective, including oversight of medical activities, of OPP-sponsored activities in polar regions. Funding is included for safety and health measures in remote field research that will be conducted during IPY.

Science and Technology Center for Remote Sensing of Ice Sheets +\$0.50

This Science and Technology Center (STC) will advance understanding of the contribution of the major polar ice sheets to sea level rise. This increment will assist in the funding of requisite logistics.

USCG Polar Icebreaking -\$1.20

There will be a slight decrease anticipated in the cost of USCG polar icebreaker maintenance and operations.

Subtotal, Changes +\$48.76

FY 2007 Request, OPP..... \$438.10

NSF-WIDE INVESTMENTS

In FY 2007, OPP will support research and education efforts related to broad, Foundation-wide investments in a number of areas, including NSF's multi-disciplinary priority areas and the Administration's interagency R&D priorities.

OPP NSF-wide Investments

(Dollars in Millions)

	FY 2005	FY 2006	FY 2007	Change over	
	Actual	Current Plan	Request	FY 2006 Amount	FY 2006 Percent
Biocomplexity in the Environment	\$1.55	\$1.53	\$0.83	-\$0.70	-45.8%
Climate Change Science Program	10.50	10.50	10.50	-	-
Cyberinfrastructure	25.38	26.24	26.24	-	-
Human and Social Dynamics	-	0.20	0.20	-	-
International Polar Year	-	10.00	47.27	37.27	372.7%
Mathematical Sciences	0.20	0.20	0.10	-0.10	-49.5%

Biocomplexity in the Environment will include support for polar genomics consistent with areas of research identified in the National Academy of Sciences/Polar Research Board report *Frontiers in Polar Biology in the Genomic Era*, including enabling aspects such as functional genomics for overall ecosystem understanding.

Climate Change Science Program provides the nation and world with the science-based knowledge to predict change, manage risk, and take advantage of opportunities resulting from climate change and climate variability.

Cyberinfrastructure Support will be provided for the Arctic Systems Sciences (ARCSS) Data Coordination Center that serves as a central point for deposition of data deriving from ARCSS-funded research. Support is also provided for Arctic modeling, distributed field sites, and autonomous flux towers. In the Antarctic, funds support data center/data repositories, 3-D bathymetric data fusion, and environment monitoring, both marine and terrestrial. In addition, support is provided for the engineering, operations and maintenance, and security of information technology systems.

Human and Social Dynamics will support innovative research on the dynamics of human social-cultural systems and individual behavior, as well as human decision-making and risk in the polar regions.

International Polar Year will provide support for the vision established by the National Academy of Sciences/Polar Research Board which includes an "... intense, coordinated campaign of polar observations, research, and analysis that will be multidisciplinary in scope and international in participation....that will benefit society by exploring new frontiers and increasing understanding of the key roles of the polar regions in globally linked systems."

Mathematical Sciences will include support for modeling activities associated with polar research.

QUALITY

OPP maximizes the quality of the R&D it supports through the use of a competitive, merit-based review process. The share of research funds that were allocated to projects that undergo external merit review was approximately 86 percent in FY 2005, the last year for which complete data exist. OMB's definition of competitive, merit-based review does not include contracts, therefore support for the U.S. Antarctic Program support contract, although a competitively bid contract that undergoes a high degree of review, both internal and external, is not considered competitive, merit-based review for this calculation. If included, it would raise the percentage significantly.

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 also receives advice from the OAC on such issues as: the mission, programs, and goals that can best serve the scientific community; how OPP can promote quality graduate and undergraduate education in the sciences it supports; and priority investment areas in polar research. The OAC meets twice a year. Members represent a cross-section of polar research, with representatives from different disciplines, and include a balanced representation of gender, members of underrepresented groups, and geographic regions.

PERFORMANCE

NSF's FY 2007 budget is aligned to reflect funding levels associated with the Foundation's four strategic outcome goals and the ten investment categories highlighted in the FY 2003-2008 Strategic Plan. These categories were designed as a mechanism to better enable assessment of program performance and to facilitate budget and performance integration.

Office of Polar Programs
by Strategic Outcome Goal and Investment Category
(Dollars in Millions)

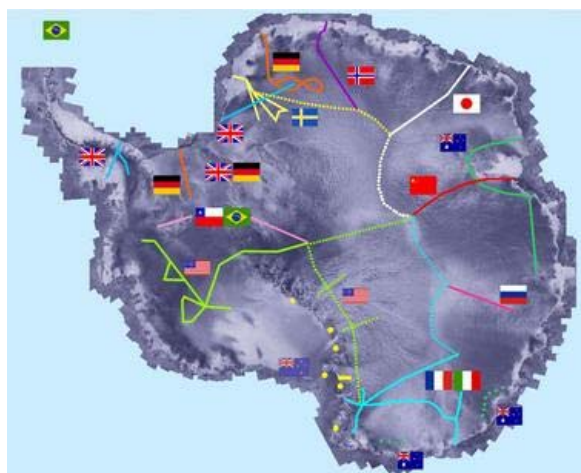
	FY 2005 Actual	FY 2006 Current Plan	FY 2007 Request	Change over FY 2006	
				Amount	Percent
Ideas					
Fundamental Science and Engineering	\$80.62	\$67.43	\$83.67	\$16.24	24.1%
Centers	-	3.95	4.45	0.50	12.7%
Capability Enhancement	-	-	-	-	N/A
	80.62	71.38	88.12	16.74	23.5%
Tools					
Facilities	-	-	0.50	0.50	N/A
Infrastructure and Instrumentation	0.15	-	-	-	N/A
Polar Tools, Facilities and Logistics	261.30	306.95	336.43	29.48	9.6%
Federally-Funded R&D Centers	-	-	-	-	N/A
	261.45	306.95	336.93	29.98	9.8%
People					
Individuals	4.02	6.55	7.08	0.53	8.1%
Institutions	1.18	1.17	1.68	0.51	43.6%
Collaborations	-	1.00	2.00	1.00	100.0%
	5.21	8.72	10.76	2.04	23.4%
Organizational Excellence					
	1.25	2.29	2.29	-	-
Total, OPP	\$348.53	\$389.34	\$438.10	\$48.76	12.5%

Recent Research Highlights

► **Ice sheets and climate change: In the air and on the ground:** By virtue of its heavy snow accumulation and geologic setting, the West Antarctic Ice Sheet (WAIS) is considered at great risk for catastrophic collapse and melting—an event that could potentially raise the global sea level by about 20 feet. NSF has accordingly joined in a broad international initiative to understand this area. In 2005, for example, scientists from the University of Texas at Austin teamed with researchers from the British Antarctic Survey to conduct an aerogeophysical survey of the ice sheet’s key drainage basins. The results are providing a wealth of information for glaciologists, which is especially important because these glaciers currently show signs of accelerated thinning and retreat.



The NSF-supported University of Texas, Austin survey aircraft parked at the remote field camp at Thwaites Glacier which served as one hub of the NSF (US)-British Antarctic Survey (U.K.) collaborative project to study the glaciers. *Credit: Photo by Gonzalo Echeverry*



ITASE traverse routes overlaid on Radarsat imagery. *Credit: SCAR ITASE Project Office, Climate Change Institute, University of Maine*

► NSF is also participating in the International Trans Antarctic Scientific Expedition (ITASE), a 20-nation consortium that is developing a continent-wide, calibrated record of the continent’s climate over the last 200-1000 years. ITASE has already completed traverses in the WAIS area, and found that while the peninsula is warming, other areas show temperatures within the average range of the past 200 years. ITASE has an extensive program of public outreach and provides significant opportunities for students to experience multidisciplinary Antarctic research.

NSF’s overall WAIS initiative also includes major drilling efforts to recover samples of ancient ice during the upcoming International Polar Year.

► **Raising awareness about Antarctica through photography:** An exhibit titled *Wondrous Cold: An Antarctic Journey* will open May 2006 at the Smithsonian Institution's National Museum of Natural History.



This million-year-old ice core was collected under a research project to understand the Earth's climate record and to infer processes that occur on Mars.

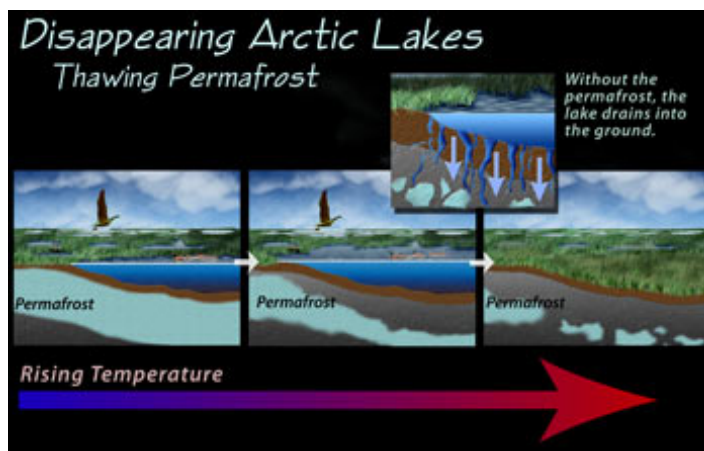
It features the work of photographer Joan Myers, an awardee of NSF's Antarctic Artists and Writers Program, which aims to improve the public's understanding of the Antarctic by giving selected individuals access to the coldest continent.

Through her photographic journal, Myers set out to answer questions that many ponder, such as: Why does Antarctica matter? and Why spend money for research there? Her images of historic huts remind us of hardships faced by explorers, while pictures of modern research stations illustrate progress, as well as the promise of scientific discovery.

► **Arctic Warming May Be a Factor in Vanishing Lakes:** NSF-supported researchers investigating the disappearance of Arctic lakes have identified a prime suspect: climate change. Results of a recent study indicate that rising Arctic temperatures over the past two decades have thawed the ground enough to allow more than 125 lakes to drain into the soil and vanish.

The new finding provides additional evidence that the 20-year-old warming trend documented in the Arctic is physically affecting the landscape. Absence of the lakes could have a devastating effect on the living conditions of native people and Arctic wildlife. Migratory birds depend on these lakes as a summertime habitat and they are critical to the feeding and rearing of young. As temperatures in the region continue to rise, scientists expect this trend to persist and spread northward, resulting in the disappearance of more lakes.

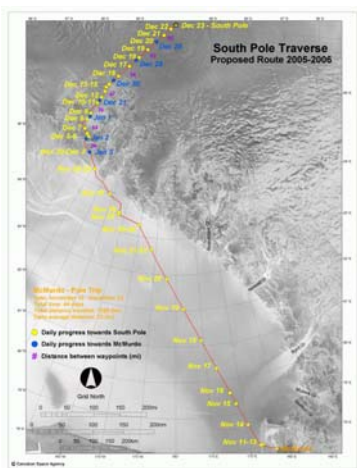
One of the major efforts of the International Polar Year 2007-2008 (IPY) is to assess large-scale environmental change in polar regions. As part of the U.S. IPY effort, NSF's Office of Polar Programs plans to lead an interagency effort titled: "Study of Environmental ARctic CHange (SEARCH)" aimed at documenting and understanding the broad spectrum of Arctic change.



Laurence Smith of the University of California, Los Angeles says rising temperatures have led to the disappearance of 125 Arctic lakes. His study attributes the loss to thawing of the permafrost, a continuous, permanently frozen ground layer that acts as a water barrier beneath lakes. *Credit: Nicolle Rager Fuller, National Science Foundation*

► **A New System to Resupply the South Pole:** An NSF-supported team has found a way around a longstanding problem for research at the South Pole: until now, supplies have only been able to reach the Pole by air when weather permits. On December 22, 2005 the South Pole proof-of-concept traverse arrived at Amundsen-Scott South Pole Station, completing a four-year effort to develop a safe and repeatable overland route to the Pole from McMurdo Station hundreds of miles to the north, where ships and large aircraft drop off equipment and supplies.

The successful traverse makes surface transportation a viable, all-weather alternative to air transportation, and will allow for the movement of items too large to fit into LC-130 Hercules aircraft, the traditional delivery vehicle. When fully implemented, the traverse will also provide a means of potentially resupplying South Pole Station from locations other than McMurdo Station and will support the goals of the International Polar Year by developing critical infrastructure that ensures scientists with long-term access to polar regions.



Traverse route from McMurdo to South Pole. USAP photo.



Tractors moving equipment toward the South Pole. USAP photo.

► **Arctic River Transport – Teenagers in Science:** Researchers and teachers from the U.S. have teamed up with teachers and students in Russia to understand how river water affects the nature of oceans at high latitude. The five-year Pan-Arctic River Transport of Nutrients, Organic Matter, and Suspended Sediments (PARTNERS) project uses river water chemistry as a means to study the origins and transit of continental runoff. Understanding sources and fates of river discharge is important because rivers make an enormous contribution to the freshwater budget of the Arctic Ocean.



Anya Suslova, the 13 year old daughter of ship captain Mikhael Suslov. Anya assisted in sampling and sample processing. With the help of her father, Anya has continued to collect samples since the PARTNERS group left. *Credit: Max Holmes, Woods Hole Oceanographic Institute.*

Researchers are studying water in the six largest rivers that drain the watershed of the Arctic Ocean: the Yenisey, Lena, Ob, Mackenzie, Yukon, and Kolyma rivers. Analyses of long-term data show an increase in volume over recent decades. If the change in river discharge is linked to global warming, future increases could be large enough to impact circulation of the Atlantic Ocean significantly. In 2004, the PARTNERS group involved a U.S. undergraduate student working in Siberia, as well as two Russian undergraduate students and an elementary school teacher from Vermont. Anya Suslova, a 13-year-old girl living in Zhigansk, volunteered to collect samples throughout the year. This collaboration has grown to include students and teachers in several other towns near river deltas under study.

Other Performance Indicators

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

Number of People Involved in OPP Activities

	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate
Senior Researchers	845	840	920
Other Professionals	645	640	810
Postdoctorates	155	150	110
Graduate Students	395	370	420
Undergraduate Students	270	230	240
Total Number of People	2,310	2,230	2,500

OPP Funding Profile

	FY 2005	FY 2006	FY 2007
	Estimate	Estimate	Estimate
Statistics for Competitive Awards:			
Number	284	262	390
Funding Rate	35%	35%	45%
Statistics for Research Grants:			
Number of Research Grants	231	200	340
Funding Rate	30%	30%	40%
Median Annualized Award Size	\$122,106	\$140,000	\$170,000
Average Annualized Award Size	\$180,394	\$180,000	\$200,000
Average Award Duration, in years	2.7	2.7	3.0

U.S. POLAR RESEARCH PROGRAMS**\$370,580,000**

The FY 2007 Budget Request for the U.S. Polar Research Programs subactivity is \$370.58 million, an increase of \$47.90 million, or 14.8 percent, over the FY 2006 Current Plan of \$322.68 million.

U.S. Polar Programs Funding

(Dollars in Millions)

	FY 2005 Actual	FY 2006 Current Plan	FY 2007 Request	Change over FY 2006	
				Amount	Percent
Arctic Research Program	\$41.04	\$35.63	\$44.69	\$9.06	25.4%
Arctic Research Support and Logistics	35.06	35.20	44.90	9.70	27.6%
Antarctic Research Grants Program	46.19	42.81	52.53	9.72	22.7%
Antarctic Operations and Science Support	146.53	141.76	161.09	19.33	13.6%
Polar Environment, Safety, and Health	0.25	5.13	5.92	0.79	15.4%
STC: Center for Remote Sensing of Ice Sheets	-	3.95	4.45	0.50	12.7%
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About U.S. Polar Research Programs:

The U.S. Polar Research Programs subactivity supports both Arctic and Antarctic 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 Arctic 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.

Antarctic support includes funding for NSF-supported researchers as well as meeting NSF responsibilities as manager of the entire federal Antarctic program, including special requirements for operations and science support. The program provides grants to fund scientific research related to Antarctica and to the Southern Ocean. 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.

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 these remote locations and fuel to the South Pole. See the MREFC chapter for further information on these projects.

In general, approximately 45 percent of U.S. Polar Research Programs funds are available for new awards and activities. The remaining 55 percent funds commitments to awards made in previous years.

U.S. Polar Research Programs has two major modes of support: research and education grants, and polar facilities and logistics.

- OPP research and education grants range widely in scope and include individual-investigator awards for field research in the Arctic and Antarctica or the investigator's home institution; large collaborative awards with numerous investigators and institutions; awards for projects with international partners; awards for provision of science support in the polar regions; and agreements with other government agencies for logistic support in the polar regions. In FY 2005, OPP received approximately 685 competitive proposals and funded 270, for a funding rate of 39 percent.
- OPP is also responsible for operating and maintaining the three U.S. stations in Antarctica as well as supporting research in the Arctic, making research possible in these remote, but scientifically unique regions. In FY 2006, NSF assumed the responsibility from the U.S. Coast Guard for funding the costs of icebreakers that support scientific research in polar regions.

U.S. ANTARCTIC LOGISTICAL SUPPORT ACTIVITIES **\$67,520,000**

The FY 2007 Budget Request for U.S. Antarctic Logistical Support Activities is \$67.52 million, an increase of \$860,000, or 1.3 percent, over the FY 2006 Current Plan.

U. S. Antarctic Logistical Support Activities Funding
(Dollars in Millions)

	FY 2005 Actual	FY 2006	FY 2007 Request	Change from	
		Current Plan		FY 2006 Amount	Percent
U.S. Antarctic Logistical Support Activities	\$70.26	\$66.66	\$67.52	\$0.86	1.3%

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.
- 109th 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 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.
- Fuel purchased from the Defense Logistics Agency.
- Reimbursement for use of Department of Defense satellites for communications.

