NATIONAL SCIENCE FOUNDATION

Directorate for Mathematical and Physical Sciences

2010

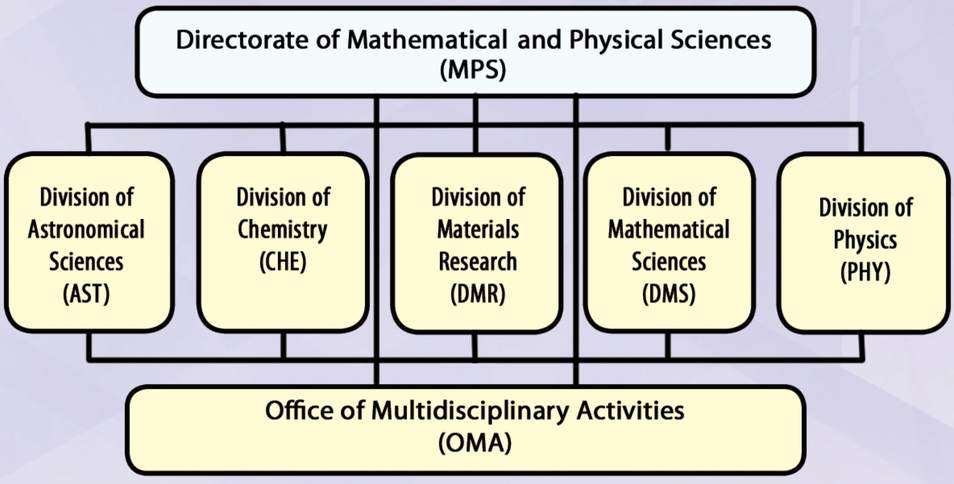
Directorate for Mathematical and Physical Sciences (MPS)

The NSF Directorate for Mathematical and Physical Sciences is comprised of the Divisions of Astronomical Sciences, Chemistry, Materials Research, Mathematical Sciences and Physics as well as the Office of Multi-disciplinary Activities. These organizations provide the basic structure for MPS support of research and education. The MPS Divisons support both disciplinary and interdisciplinary activities and partner with each other and with other NSF Directorates.

MPS Mission Statement

To make discoveries about the Universe and the laws that govern it; to create new knowledge, materials, and instruments that promote progress across science and engineering; to prepare the next generation of scientists through research; and to share the excitement of exploring the unknown with the nation.

MPS Organizational Chart



NSF Mission

To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense (NSF Act of 1950).

NSF Vision

Advancing discovery, innovation and education beyond the frontiers of current knowledge, and empowering future generations in science and engineering.

MPS

Dear Reader:

We are pleased to tell you about the Mathematical and Physical Sciences Directorate (MPS) of the National Science Foundation. MPS supports fundamental advances in astronomy, chemistry, materials research, mathematics and physics. These activities both excite our imaginations and change our lives, providing a foundation for innovation that advances economic growth, public health, and national security.

Under the American Recovery and Reinvestment Act of 2009, MPS received an additional $490 million in funding. All ARRA funds were obligated during FY 2009 or the first half of FY 2010. The charts in this brochure reflect this one-time bump-up in the MPS budget due to ARRA.

With an FY 2010 budget exceeding $1.3 billion, MPS research spans the full range of spatial and time scales accessible to human investigation--distance scales ranging from the size of atoms to the structure of galaxies and of the universe itself, and timescales ranging from reactions lasting millionths of a billionth of a second to the evolution and age of the universe. MPS research develops new mathematical structures and investigates the fundamental particles and processes of matter. What is learned in physical sciences is brought to bear on exploring complex biological systems, human and social dynamics, sustainable energy, and the environment. Past research in MPS has led to the MRIs found in hospitals, the biological and chemical detectors seen in airports, the development of alternate fuel technologies, and the invention of the laser.

Research in the mathematical and physical sciences serves as the basis for much technological innovation. In the next few years, our research will support the nation's investment in sustainability, help improve computing power past the physical and conceptual limits of Moore's Law, and shed light on the very nature of matter, space, time and the physical laws that govern the universe.

We hope this brochure will give you a flavor of the research we support at universities and laboratories throughout our country, and we invite you to learn more about us on our web site at http://www.nsf.gov/dir/index.jsp?org=MPS.

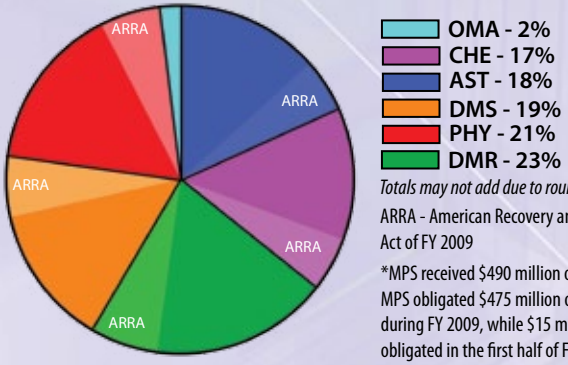
With regards,

Dr. H. Edward Seidel
Assistant Director
Directorate of Mathematical and Physical Sciences

Directorate for Mathematical and Physical Sciences (MPS)

MPS Funding FY 2009

Pie chart showing MPS total budget for FY 2009. MPS obligated $1.7 billion in FY 2009 including $475* million in ARRA funds.

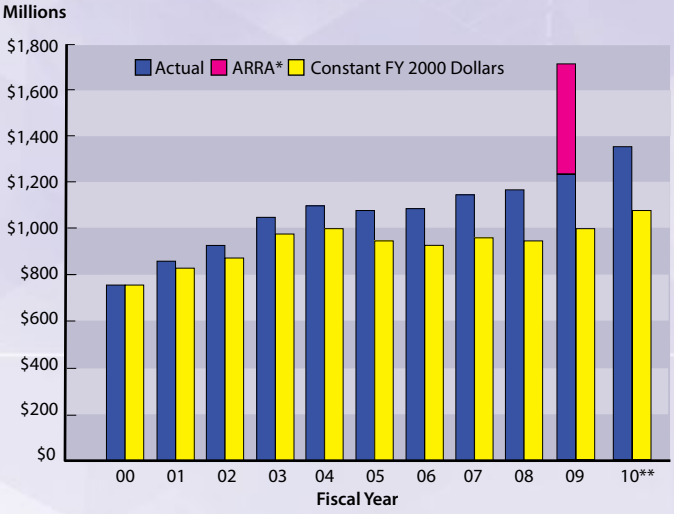


Totals may not add due to rounding.

ARRA - American Recovery and Reinvestment Act of FY 2009

*MPS received $490 million of ARRA funding. MPS obligated $475 million of this funding during FY 2009, while $15 million was obligated in the first half of FY 2010.

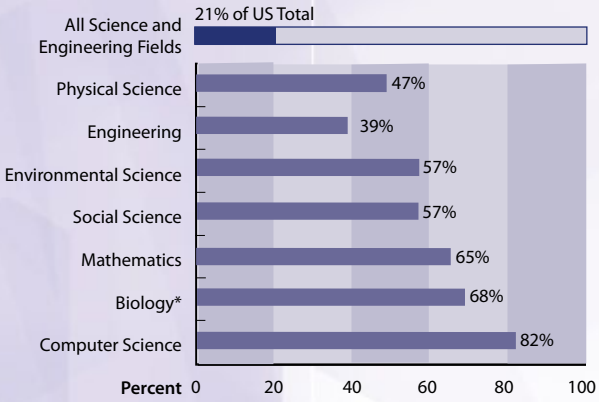
Budget in Actual and Constant FY 2000 Dollars



MPS annual budgets in actual and constant FY 2000 dollars. Constant dollars show the purchasing power of the MPS budget. Over this 11-year period, the constant dollar budget for MPS has increased 43%.
*ARRA - American Recovery and Reinvestment Act of FY 2009. ** Current Plan.

Data provided from FY 2000 to 2011 NSF Budget Requests to Congress, http://www.nsf.gov/about/budget/.

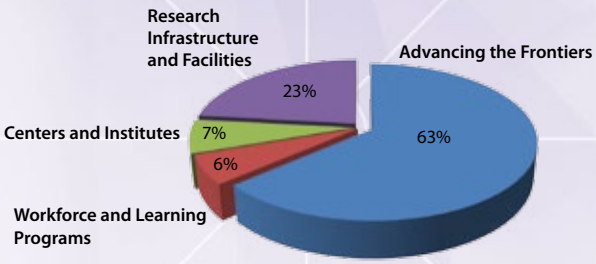
NSF Support as a Percentage of Total Federal Support of Academic Basic Research



** Excludes The National Institutes of Health*

National Science Foundation contributes significant portions of the total Federal support of many areas of academic basic research. Note that the Directorate for Mathematical and Physical Sciences includes basic research in the mathematical sciences (65% of Federal support) and in the physical sciences (47% of Federal support). Source: FY 2009 Performance Highlights, NSF 10-002.

FY 2009 MPS Budget Distribution



The Directorate for Mathematical and Physical Sciences had a budget of $1.7 billion for FY 2009 including ARRA. The budget supports research to advance the frontiers of science, and the development of the future workforce through individual investigator awards, centers and institutes, facilities, and instrumentation.

Division of Astronomical Sciences (AST)

Mission

The mission of the Division of Astronomical Sciences is to support forefront research in ground-based astronomy; to help ensure the scientific excellence of the U.S. astronomical community; to provide access to world-class research facilities through merit review; to support the development of new instrumentation and next-generation facilities; and to encourage broad understanding of the astronomical sciences by a diverse population of scientists, policy makers, educators, and the public at large.

The Division supports research in all areas of astronomy and astrophysics as well as related multidisciplinary studies. Modes of support include single-investigator and collaborative awards, funding for acquisition and development of astronomical instrumentation, technology development for future ground-based facilities, and educational projects that leverage the Division's research investments to build research and workforce capacity and to increase scientific literacy.

Astronomical Facilities

The Division invested 46% of its FY 2009 appropriation in the management and operation of ground-based astronomical facilities. Through the national observatories and international partnerships, the Division provides support for a system of multi-aperture, research-class telescopes as well as frontier facilities that enable transformational capabilities in both radio and optical/infrared astronomy. Technological advances in a number of key areas of telescope construction and design—including sophisticated adaptive optics technology to compensate for the blurring effects of the Earth's atmosphere at optical/infrared wavelengths and high-resolution aperture synthesis techniques of radio astronomy—allow these instruments to operate at the forefront of ground-based capabilities.

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Infrared image of the planet Saturn and its moon Titan (lower center) taken by the Gemini North telescope using an adaptive optics system that corrects, in real time, for most of the distortion caused by the atmosphere of the Earth. The quality of these high-resolution images allows scientists to monitor the formation of clouds in the atmosphere of Titan from roughly 800,000,000 miles away.

Credit: Gemini Observatory

Programs in Astronomical Sciences

Individual Investigator Programs
Astronomy and Astrophysics Research Grants (AAG)
Faculty Early Career Development Program (CAREER)
NSF Astronomy and Astrophysics Postdoctoral Fellowships (AAPF)
Partnerships in Astronomy and Astrophysics Research and Education (PAARE)
Research Experiences for Undergraduates (REU)
Research at Undergraduate Institutions (RUI)

Astronomical Instrumentation Programs
Advanced Technologies and Instrumentation (ATI)
Major Research Instrumentation (MRI)
University Radio Observatories (UROs)

Large Facilities
Atacama Large Millimeter Array (ALMA)
Gemini Observatory
National Astronomy and Ionosphere Center (NAIC)
National Optical Astronomy Observatory (NOAO)
National Radio Astronomy Observatory (NRAO)
National Solar Observatory (NSO)

A Guide to Programs / Browse Funding Opportunities is available at http://www.nsf.gov/funding/browse_all_funding.jsp.

Electromagnetic Spectrum Management (ESM)

AST represents the interests of NSF and the scientific community in protecting access to portions of the electromagnetic spectrum that are needed for research purposes. The sensitivity of radio and optical telescopes can be compromised by electromagnetic interference from sources such as airborne and satellite radio transmissions and light pollution. ESM personnel protect these and other scientific resources by participating in the establishment of regulations, operating procedures and technical standards related to government, private sector and international uses of the spectrum.

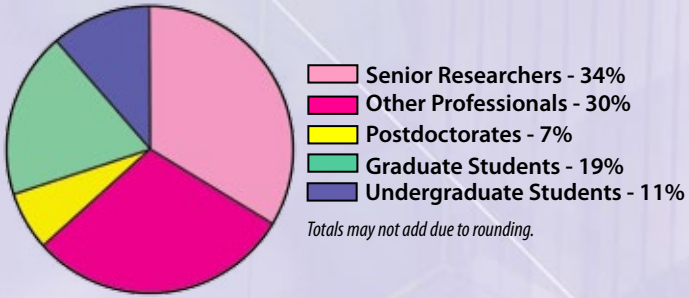
The Atacama Large Millimeter Array (ALMA) is an international collaboration to develop a world-class radio telescope composed of 66 antennas that will work together to study the universe from a high and dry site in the Chilean Andes. Once construction is completed, ALMA will function as the most capable imaging radio telescope ever built.

Credit: NRAO/AUI and ESO.

Division of Astronomical Sciences (AST)

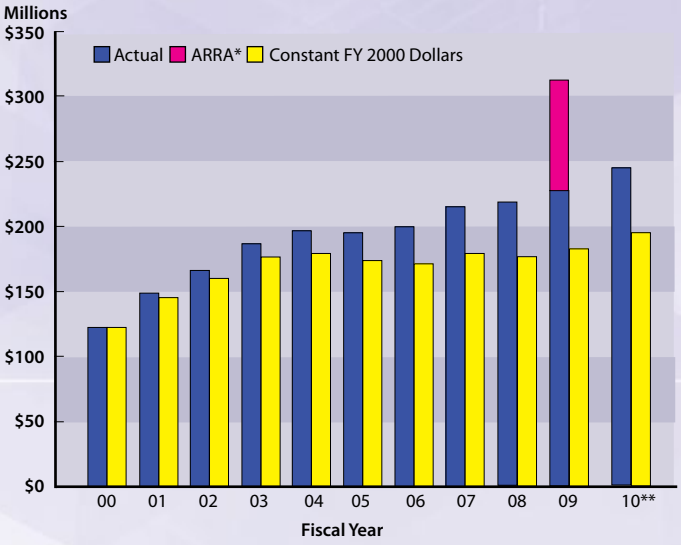
Human Resources FY 2009

Pie chart showing total number of people involved in AST.



Totals may not add due to rounding.

Budget in Actual and Constant FY 2000 Dollars

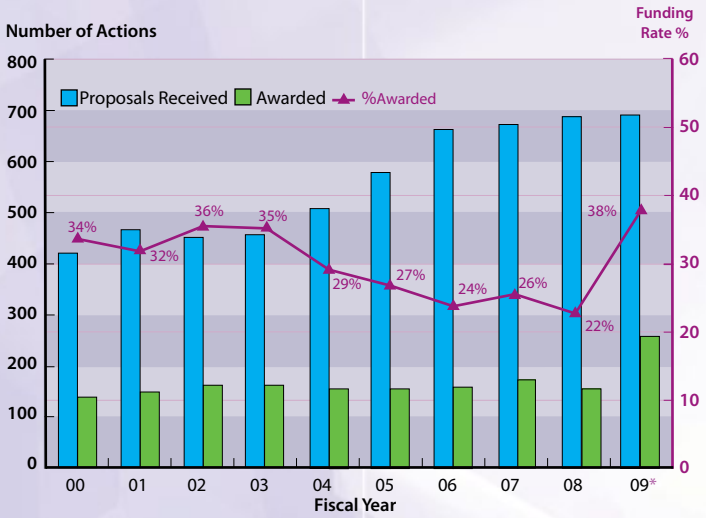


AST annual budgets in actual and constant FY 2000 dollars. Constant dollars show the purchasing power of the AST budget. Over this 11-year period, the constant dollar budget for AST has increased 60%.

*ARRA - American Recovery and Reinvestment Act of FY 2009. ** Current Plan.

Data provided from FY 2000 to 2011 NSF Budget Requests to Congress, http://www.nsf.gov/about/budget/.

Funding Rates and Number of Actions

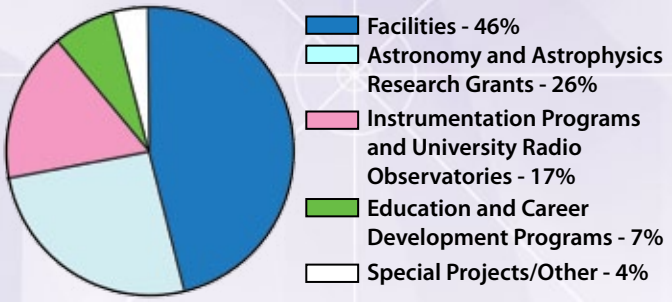


Graph shows number of proposals submitted versus awarded for Research Grants as defined by NSF and resultant success rates. Success rate is defined as the number of new or renewal proposals awarded funding divided by the total number of proposals received.

** FY 2009 funding rate includes awards made with ARRA funds.*

Note: the distribution of success rates reflects the average for the Astronomical Sciences Division and may not represent success rates in individual programs.

Modes of Support FY 2009



Division of Chemistry (CHE)

Mission

The mission of the Division of Chemistry is to promote the health of academic chemistry and to enable basic research and education in the chemical sciences. The Division also supports projects that help build infrastructure and workforce and partnerships that advance the chemical sciences.

Funding Modalities

Research projects (individual investigators and small teams) remain the dominant funding modality in CHE, reflecting 70% of the division budget in FY 2009. The research projects portfolio has recently been realigned into eight focused programs in Chemical Catalysis; Chemical Measurement and Imaging; Chemical Structure, Dynamics and Mechanism; Chemical Synthesis; Chemistry of Life Processes; Environmental Chemical Sciences; Macromolecular, Supramolecular and Nanochemistry; and Theory, Models and Computational Methods.

CHE also invests in research centers (7%), shared instrumentation(17%), and education (6%).

Workforce Development and Broadening Participation

CHE supports roughly 60 Research Experiences for Undergraduates (REU) sites reflecting many different models of undergraduate research. An exciting part of the portfolio is the international REU Sites, that which U.S. undergraduate students the opportunity to live and conduct research abroad for 8-10 weeks. CHE supports iREU sites in Europe, South America and Asia.

CHE also offers a signature postdoctoral fellowship program, the American Competitiveness in Chemistry (ACC) Fellowship. Successful ACC Fellowships integrate a strong research program, a plan to broaden participation, and an effective partnership with a government laboratory, industry research effort, or CHE-supported research center.

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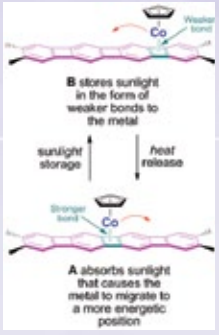


Credit: K.P.C. Vollhardt

Professor Vollhardt and his research group have found organometallic molecules that store sunlight in the form of usable thermal energy. Form B can return to A by simple thermal reversal, giving off the stored energy as heat. The molecules under investigation constitute prototypes of structures that may eventually be utilizable in "thermal batteries" that are rechargeable by sunlight.

Programs in Chemistry

Individual Investigator Programs
Chemical Catalysis
Chemical Measurement and Imaging
Chemical Structure, Dynamics and Mechanism
Chemical Synthesis
Chemistry of Life Processes
Environmental Chemical Sciences
Macromolecular, Supramolecular and Nanochemistry
Theory, Models and Computational Methods.

Integrative Chemistry Activities
Centers for Chemical Innovation
Chemical Research and Instrumentation and Facilities
Research Experiences for Undergraduates
American Competitiveness in Chemistry Fellowships (postdoc fellowship)

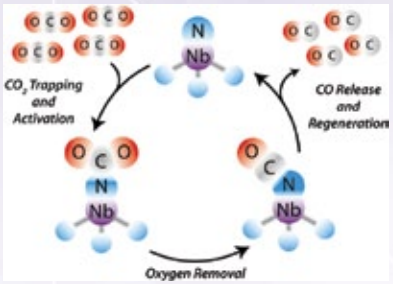
A Guide to Programs / Browse Funding Opportunities is available at http://www.nsf.gov/ funding/browse_all_funding.jsp.

The Centers for Chemical Innovation (CCI) Program supports research centers focused on major, long-term fundamental chemical research challenges. CCIs that address these challenges will produce transformative research, lead to innovation, and attract broad scientific and public interest.

Chemistry and the Global Community

CHE has developed effective partnerships with our partner funding agencies in several other countries that allow joint review and funding of collaborative international research projects. Proposals submitted to the "International Collaboration in Chemistry" program feature a joint, synergistic research project as well as opportunities for postdoctoral resesarchers, graduate students and/or undergraduate students to participate in extended research visits to the collaborator's laboratory abroad. The program also encourages the development and use of cyber infrastructure to increase the level of synergy of the proposed projects.

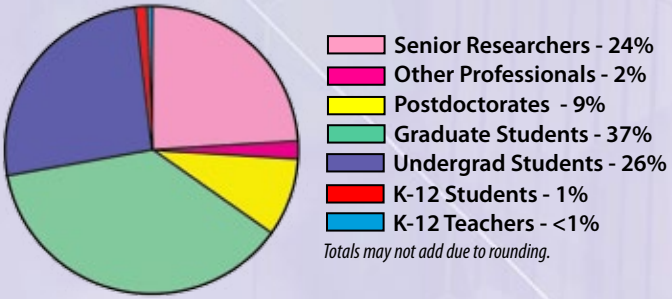
The conversion of CO_2, a greenhouse gas, to CO, a useful commodity chemical, is performed in a three-step cycle. The transformation is mediated by a unique niobium based molecule that is able to serve as a molecular harpoon, trapping and activating CO_2 through formation of a carbon-nitrogen bond. MIT Professor Christopher Cummins and his group discovered this novel conversion method as part of the Caltech-based CCI Phase II Center, Powering the Planet. http://www.ccisolar.caltech.edu/



Credit: Jared Silva, MIT

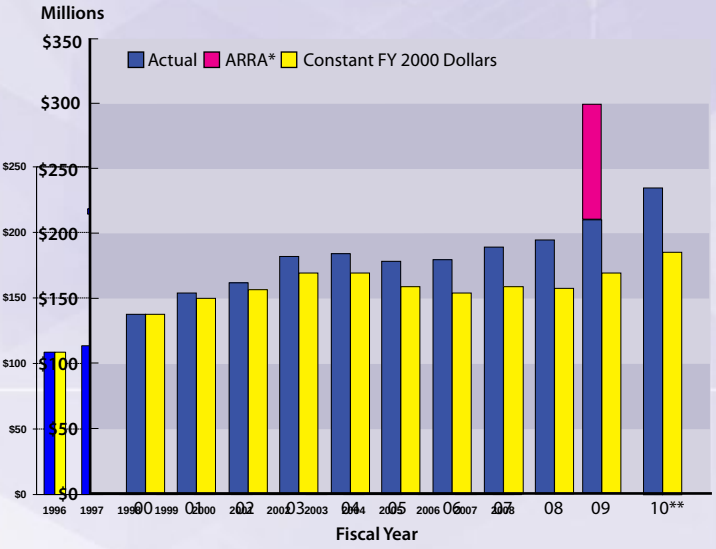
Human Resources FY 2009

Pie chart showing total number of people involved in CHE.



Totals may not add due to rounding.

Budget in Actual and Constant FY 2000 Dollars

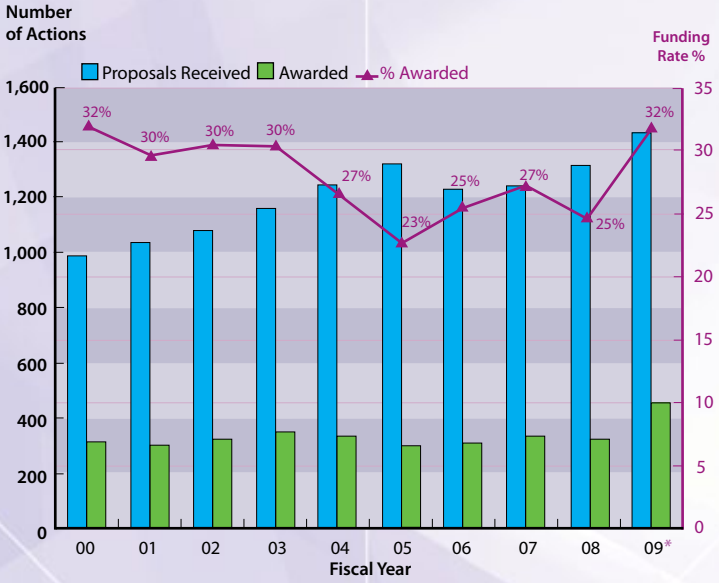


CHE annual budgets in actual and constant FY 2000 dollars. Constant dollars show the purchasing power of the CHE budget. Over this 11-year period, the constant dollar budget for CHE has increased 34%.

*ARRA - American Recovery and Reinvestment Act of FY 2009. ** Current Plan

Data provided from FY 2000 to 2011 NSF Budget Requests to Congress, http:// www.nsf.gov/about/budget/.

Funding Rates and Number of Actions

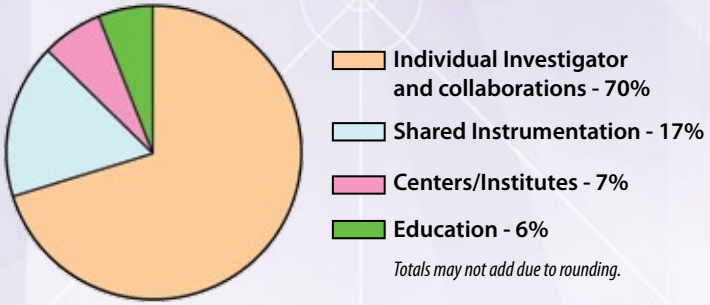


Graph shows number of proposals submitted versus awarded for Research Grants as defined by NSF and resultant success rates. Success rate is defined as the number of new or renewal proposals awarded funding divided by the total number of proposals received.

** FY 2009 funding rate includes awards made with ARRA funds.*

Note: the distribution of success rates reflects the average for the Chemistry Division and may not represent success rates in individual programs.

Modes of Support FY 2009



Totals may not add due to rounding.

Mission

The mission of the Division of Materials Research (DMR) is to make new discoveries about the behavior of matter and materials; to create new materials and new knowledge about materials phenomena; to address fundamental materials questions that often transcend traditional scientific and engineering disciplines and may lead to new technologies; to prepare the next generation of materials researchers; to develop and support the instruments and facilities that are crucial to advance the field; and to share the excitement and significance of materials science with the public at large.

The research and education activities supported are critical to national competitiveness. DMR supports experimental and theoretical research over a broad range of subfields, including condensed matter and materials physics, solid state and materials chemistry, electronic and photonic materials, metals and metallic nanostructures, polymers, ceramics, and biomaterials. Funding modes range from awards to individual investigators and small groups to centers, instrumentation and major facilities.

Workforce Development and Broadening Participation

DMR strives to broaden the participation of women and underrepresented minority groups in science and engineering at all academic levels. One aspect of this vision is the Partnership for Research and Education in Materials (PREM) program, which develops and supports long-term partnerships between academic institutions serving underrepresented groups and DMR centers and facilities. PREM was started in 2004 and currently supports 14 awards.

Contact Information

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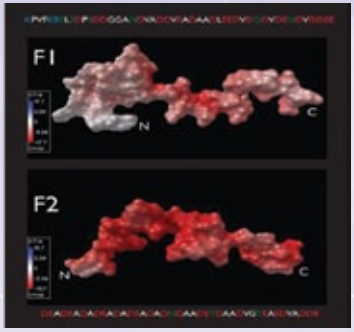


Materials science is interested in learning how proteins, like Asprich, can form puncture-resistant mineralized assemblies found in nature e.g. a mollusk shell. Part of the answer lies at the structural level, where Asprich sequences exist in a disordered state.

Credit: John Evans

Programs in Materials Research

Programs for Individual Investigators and Groups
Biomaterials
Ceramics
Condensed Matter and Materials Theory
Condensed Matter Physics
Electronic and Photonic Materials
Metallic Materials and Nanostructures
Polymers
Solid State and Materials Chemistry

Crosscutting DMR Programs

Instrumentation for Materials Research
- -Acquisition and development of instrumentation that meets the research innovation needs of the material science community.
- -Instrumentation for Materials Research – Midscale Instrumentation Program (IMR-MIP)
- -the individual investigator scale Instrumentation for Materials Research (IMR) program.
- -NSF-wide Major Research Instrumentation (MRI) program

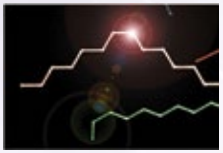
Materials Research Science and Engineering Centers (MRSECs)
- - MRSECs address fundamental materials research problems whose scope and complexity require the advantages of scale and interdisciplinarity provided by a center. Twenty-seven centers are currently supported. For more information visit http://www.mrsec.org/.
- -Partnerships for Research and Education in Materials (PREM)

National Facilities
- -DMR supports user facilities for neutron scattering, x-rays, high magnetic fields and nano-fabrication.

Office of Special Programs
- -International Materials Institutes
- -Materials World Network
- -Research Experiences for Undergraduates (REU) and Teachers (RET)

A *Guide to Programs / Browse Funding Opportunities* is available at http://www.nsf.gov/funding/browse_all_funding.jsp.

The **Materials World Network (MWN)**, initiated and supported by the Division of Materials Research in partnership with over fifty research funding organizations worldwide, engages global resources for the advancement of materials research and education. International collaborative projects underpin the network; the International Materials Institutes serve as its nodes.

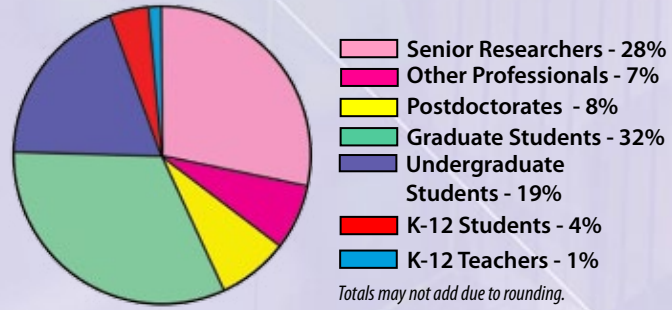


Taking nanomaterials to a new level of structural complexity, scientists have determined how to introduce kinks into arrow-straight nanowires, transforming them into zigzagging two- and three-dimensional structures with correspondingly advanced functions.

Credit: Bozhi Tian, Lieber Group

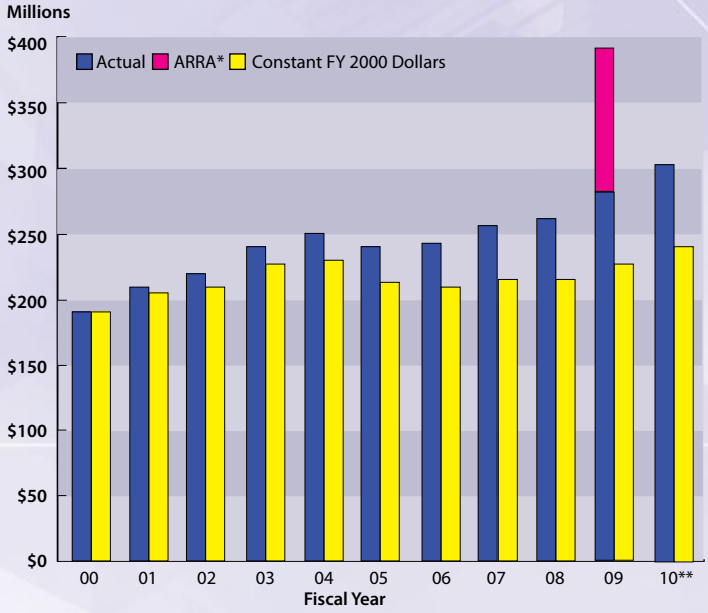
Human Resources FY 2009

Pie chart showing total number of people involved in DMR.



Totals may not add due to rounding.

Budget in Actual and Constant FY 2000 Dollars



DMR annual budgets in actual and constant FY 2000 dollars. Constant dollars show the purchasing power of the DMR budget. Over this 11-year period, the constant dollar budget for DMR has increased 27%.
*ARRA - American Recovery and Reinvestment Act of FY 2009. **Current Plan.

Data provided from FY 2000 to 2011 NSF Budget Requests to Congress, http://www.nsf.gov/about/budget/.

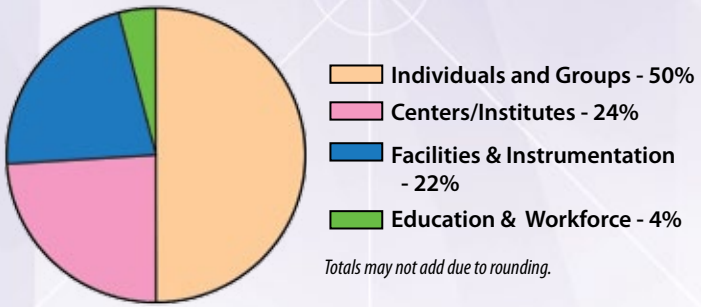
Funding Rates and Number of Actions

Graph shows number of proposals submitted versus awarded for Research Grants as defined by NSF and resultant success rates. Success rate is defined as the number of new or renewal proposals awarded funding divided by the total number of proposals received.

* *FY 2009 funding rate includes awards made with ARRA funds.*

Note: the distribution of success rates reflects the average for the Materials Research Division and may not represent success rates in individual programs.

Modes of Support FY 2009



Totals may not add due to rounding.

Division of Mathematical Sciences (DMS)

Mission

The Division of Mathematical Sciences supports research and education projects at the frontiers of discovery that achieve NSF's mission "to promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense." Modes of support include awards to individual investigators and small groups, workforce training grants, and a portfolio of national mathematical sciences research institutes. The Division supports research in core areas of mathematics and statistics as well as interdisciplinary research that cross traditional boundaries of the physical, biological, social and engineering sciences.

Discovery, Connections, Community

The influence of mathematical science on our daily lives is fundamental and pervasive. For example, every secure commercial transaction on the Internet is an application of research in number theory and algebraic geometry. And improvements in weather prediction, search engines, and industrial design processes are predicated on advances in algorithms and computational mathematics. DMS invests in discovery in mathematics and statistics; promotes interdisciplinary connections across fields of science, engineering and technology; and cultivates a diverse and capable community of researchers, students, professionals. The Division's top investment priorities - discovery, connections and community - are essential components of innovation engine that drives the Nation's economy in the 21st century.

New Initiatives

DMS is building on interdisciplinary activities and workforce programs developed or enhanced during the Mathematical Sciences Priority Area (FY 2003 – FY 2007). Successful programs such as Collaboration in Mathematical Geosciences and the Joint DMS/National Institute of General Medical Sciences Activity in Mathematical Biology are continuing and newer programs such as the CHE-DMR-DMS Solar Energy Initiative and Algorithms for Threat Detection are attracting broad interest from the mathematical sciences community.

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Mathematical snowflakes: In nature roughly a quintillion molecules make up every snow crystal that falls to earth, with the shape dictated by temperature, humidity and other local conditions. Researchers recently simulated the 3D growth of snowflakes using a computational model that faithfully emulates both the basic shapes and the fine details and markings of the full range of observed forms. Read about the underlying mathematics at http://psoup.math.wisc.edu/Snowfakes.htm.

Credit: David Griffeath and Janko Gravner

Programs in Mathematical Sciences

Core Programs

Algebra and Number Theory
Analysis
Applied Mathematics
Combinatorics
Computational Mathematics
Foundations
Geometric Analysis
Mathematical Biology
Probability
Statistics
Topology

Special DMS Programs

Algorithms for Threat Detection (ATM)
CHE-DMR-DMS Solar Energy Initiative (SOLAR)
Collaboration in Mathematical Geosciences (CMG)
Focused Research Groups in the Mathematical Sciences
Infrastructure
Joint DMS/NIGMS Initiative in Mathematical Biology
Mathematical Sciences: Innovations at the Interface with Computer Sciences

A Guide to Programs / Browse Funding Opportunities is available at http://www.nsf.gov/funding/browse_all_funding.jsp.

Mathematical Sciences Research Institutes program is a portfolio of projects that advances research in the mathematical sciences, increases the impact of the mathematical sciences in other disciplines, enables the mathematical sciences to respond to national needs, and expands the talent base engaged in mathematical and statistical research in the United States.

The **Workforce** program offers competitions such as Enhancing the Mathematical Sciences Workforce for the 21st Century (EMSW21), whose goal is to increase the number of well-prepared U.S. citizens, nationals, and permanent residents who pursue careers in the mathematical sciences and in other NSF-supported disciplines.

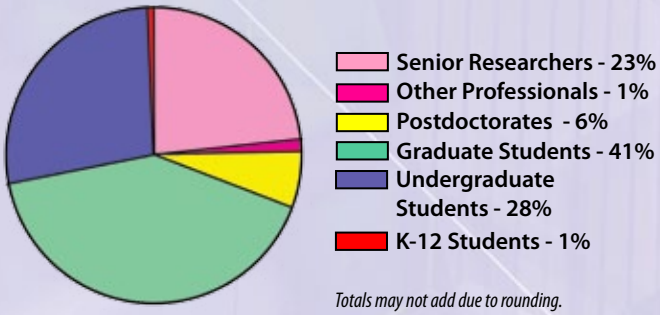
Nebraska Conference for Undergraduate Women in Mathematics (NCUWM)

The Conference is open to outstanding undergraduate women mathematicians at all stages of their careers. Students will have the opportunity to meet other women who share their interest in the mathematical sciences and learn about life in graduate school from the perspective of current women graduate students representing math departments from across the country. See: http://www.math.unl.edu/~ncuwm/12thAnnual/

Credit: Judy Walker

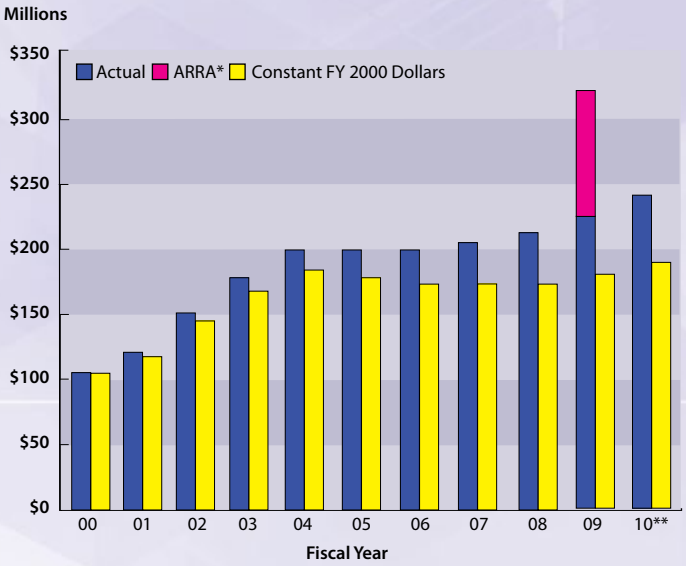
Human Resources FY 2009

Pie chart showing total number of people involved in DMS.



Totals may not add due to rounding.

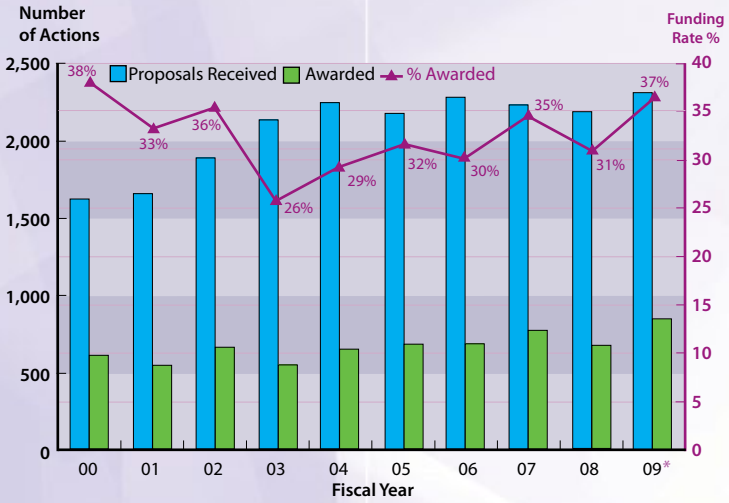
Budget in Actual and Constant FY 2000 Dollars



DMS annual budgets in actual and constant FY 2000 dollars. Constant dollars show the purchasing power of the DMS budget. Over this 11-year period, the constant dollar budget for DMS has increased 82%.
*ARRA - American Recovery and Reinvestment Act of FY 2009. **Current Plan.

Data provided from FY 2000 to 2011 NSF Budget Requests to Congress, http://www.nsf.gov/about/budget/.

Funding Rates and Number of Actions

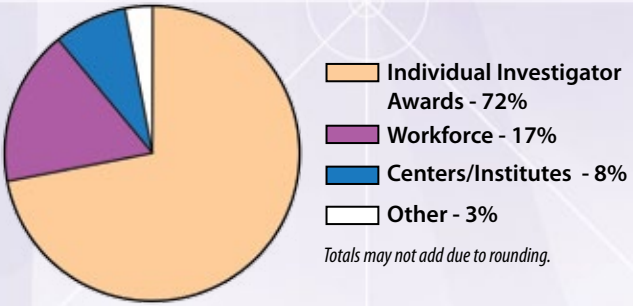


Graph shows number of proposals submitted versus awarded for Research Grants as defined by NSF and resultant success rates. Success rate is defined as the number of new or renewal proposals awarded funding divided by the total number of proposals received.

** FY 2009 funding rate includes awards made with ARRA funds.*

Note: the distribution of success rates reflects the average for the Mathematical Sciences Division and may not represent success rates in individual programs.

Modes of Support FY 2009



Totals may not add due to rounding.

Division of Physics (PHY)

Mission

To support fundamental research across the intellectual frontiers of physics, to support research that has broader impacts on other fields of science and on the health, economic strength, and defense of society, to enhance education at all levels and share the excitement of science with the public through integration of education and research, and to steward the physics community so as to maintain the intellectual capital essential for future advances. Modes of support include single investigator awards, group awards, centers and institutes, some interdisciplinary in nature, and several national user facilities, as well as research equipment/instrumentation development grants.

Physics research probes the properties of matter at its most fundamental level, the interactions between particles, and the organization of constituents and symmetry principles that lead to the rich structure and phenomena that we observe in the world around us. Physics seeks a deep understanding of processes that led to the formation of the cosmos, to the structure of matter at the very shortest distance scales where quantum effects dominate, and to the structure of atomic and molecular systems that shape and control the everyday world of chemistry and biological systems. Because of the breadth and scope of physics, it forms part of the core educational curriculum in most sciences and in engineering.

Workforce Development and Broadening Participation

The Physics Division strongly supports workforce development and broadening participation at all levels, from outreach efforts in large facilities and centers, to a variety of opportunities for undergraduates through the REU program, to large scale projects such as QuarkNet, to individual PI awards. Students involved in these projects gain skills and knowledge to become members of the nationally critical high tech workforce.

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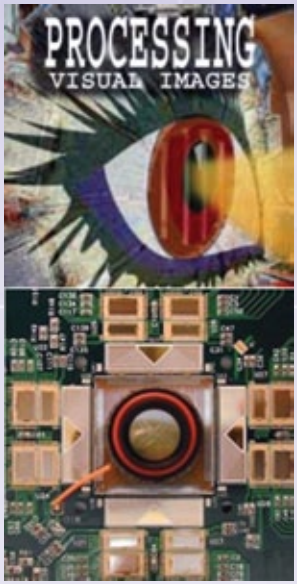


A 512-electrode array developed by a team of researchers from the University of California at San Diego at the Salk Institute in La Jolla. This array led to the discovery of a new ganglion cell which may contribute to the perception of motion.

Credit: Alan Litke

Programs in Physics

Programs for Individual Investigators and Groups
Atomic, Molecular, Optical and Plasma Physics
Physics of Living Systems
Elementary Particle Physics
Gravitational Physics
Nuclear Physics
Particle and Nuclear Astrophysics
Physics at the Information Frontier
Education and Interdisciplinary Research
Theoretical Physics (including Atomic, Molecular, and Optical Physics, Elementary Particle Physics, Nuclear Physics, Cosmology and Astrophysics, and Mathematical Physics)

Crosscutting PHY Programs
Physics Frontier Centers
National Facilities
- National Superconducting Cyclotron Laboratory (NSCL)
- Cornell Electron Storage Ring (CESR)
- Laser Interferometer Gravitational-Wave Observatory (LIGO)
- Large Hadron Collider (LHC), a joint NSF-DOE-CERN project
- IceCube Neutrino Observatory
- LArge Plasma Device (LAPD)

Research Experiences for Undergraduates (REU) and Teachers (RET)

A *Guide to Programs / Browse Funding Opportunities* is available at http://www.nsf.gov/funding/browse_all_funding.jsp.

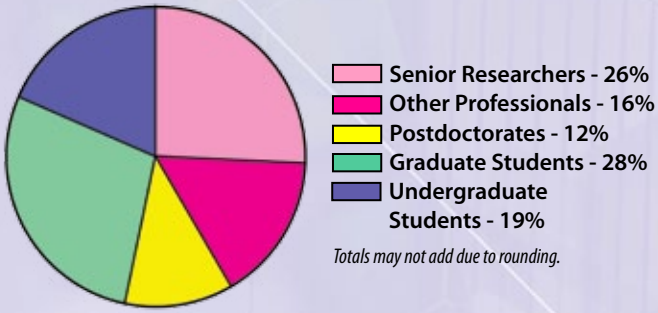
The Physics Frontier Centers
This program has been established to foster major advances at the intellectual frontiers of physics by providing needed resources, e.g., combinations of talents, skills, disciplines, and/or specialized infrastructure, not usually available to individual investigators or small groups. The program supports university-based centers and institutes where the collective efforts of a larger group of individuals can enable transformational advances in the most promising research areas. Activities supported through the program are in all sub-fields of physics within the purview of the Division of Physics. Interdisciplinary projects at the interface between these physics areas and other physics sub-fields and disciplines, e.g., biology, quantum information science, mathematical physics, and condensed matter physics, and emerging areas of physics are also included.

Physics and the Global Community

The PHY Division participates in numerous international efforts, including large scale facilities such as the LIGO, LHC and IceCube facilities, and large astrophysics detectors such as Boexino, VERITAS, and the Pierre Auger Observatory. In addition, the PHY Division also participates in the Open Science Grid, a distributed shared cyberinfrastructure which provides computing and storage resources for large NSF supported international projects and partners internationally with other grid projects such as Enabling Grids for E–sciencE in Europe and related efforts in South America and Asia.

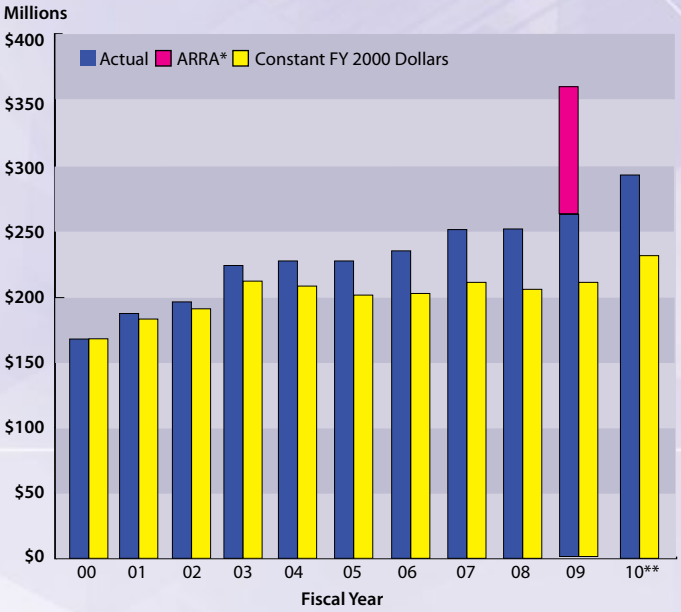
Human Resources FY 2009

Pie chart showing total number of people involved in PHY.



Totals may not add due to rounding.

Budget in Actual and Constant FY 2000 Dollars

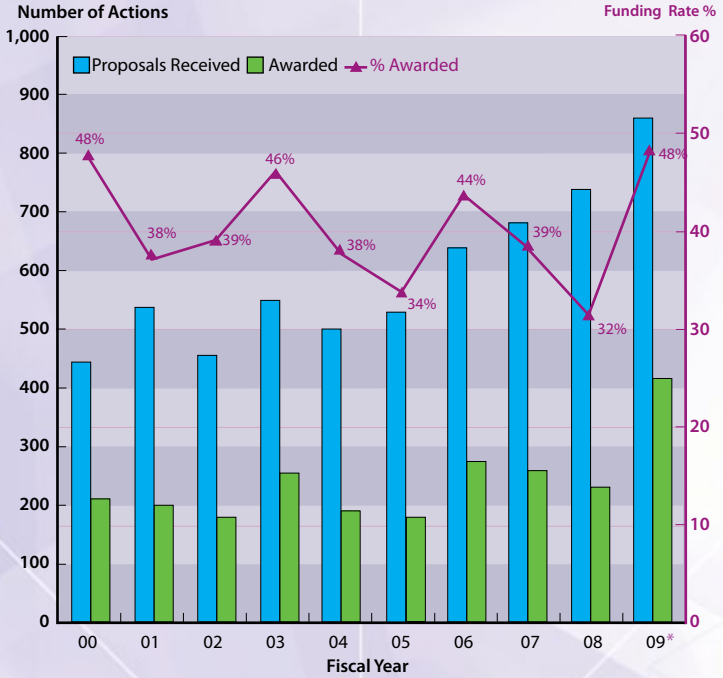


PHY annual budgets in actual and constant FY 2000 dollars. Constant dollars show the purchasing power of the PHY budget. Over this 11-year period, the constant dollar budget for PHY has increased 37%.

*ARRA - American Recovery and Reinvestment Act of FY 2009. **Current Plan.

Data provided from FY 2000 to 2011 NSF Budget Requests to Congress, http://www.nsf.gov/about/budget/.

Funding Rates and Number of Actions



Graph shows number of proposals submitted versus awarded for Research Grants as defined by NSF and resultant success rates. Success rate is defined as the number of new or renewal proposals awarded funding divided by the total number of proposals received.

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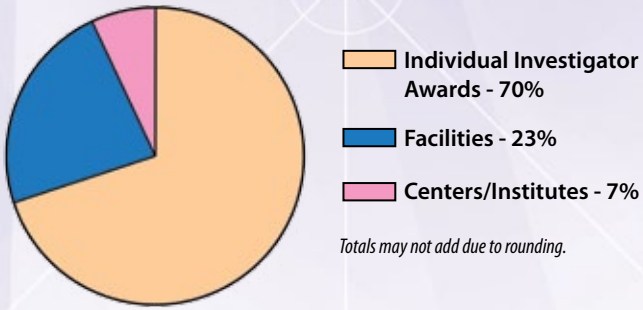
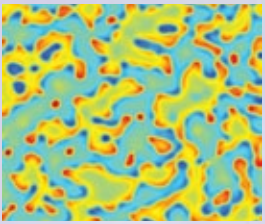
Modes of Support FY 2009



Totals may not add due to rounding.

Office of Multidisciplinary Activities (OMA)

OMA seeds crosscutting research in areas of strategic emphasis for MPS as well as areas that might develop into strategic importance; facilitates partnerships with other agencies, national laboratories, industries, state and local governments, and international organizations; and supports innovative experiments in education and broadening participation. The purpose of OMA investments is to initiate, but not sustain indefinitely, these activities.



A numerical simulation of the temperature field of mixing alloys using the Allen-Cahn equation, from a DMS student research project.

Credit: Timothy Sauer and Tom Stephens, George Mason University

Advanced LIGO exhibit at the 2009 World Science Festival in New York City.

Credit: Marco Cavaglia

OMA does not accept external proposals, but rather encourages submission from MPS Divisions of initiatives and projects that are multi-investigator, multi-disciplinary, and strategic to MPS, as well as innovative projects incorporating education and broadening participation that contribute to a diverse, technical workforce.

Participants in the 2008 Undergraduate ALFALFA Team at the Arecibo Observatory.

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Directorate for Mathematical and Physical Sciences (MPS)

Proposal Review: MPS maximizes the quality of the proposals it supports through the use of a competitive, merit-based review process. In FY 2009, 88% of research funds were allocated to externally reviewed projects.

Committee of Visitors (COV): MPS 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. COV reports and Directorate responses are at http://www.nsf.gov/od/oia/activities/cov/covs.jsp.

MPS Advisory Committee (MPSAC): MPS also receives advice from the Mathematical and Physical Sciences Advisory Committee on such issues as: the mission, programs, and goals that can best serve the scientific community; promoting quality graduate and undergraduate education in the mathematical and physical sciences; and priority investment areas in MPS-supported research. Minutes are at http://www.nsf.gov/mps/advisory.jsp.

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Ms. Terri D. Powell	Administrative Support Assistant
Dr. Celeste M. Rohlfing	Head, Office of Multidisciplinary Activities
Dr. G. Wayne Van Citters	Senior Advisor, Facilities & Planning Mgt.
Ms. Margaret-Anne Wampamba	Executive Assistant

International Opportunities

Partnerships for International Research and Education (PIRE)
Research Experiences for Undergraduates – Sites (REU Sites)
International Collaboration in Chemistry between US Investigators and their Counterparts Abroad (ICC)
Materials World Network: Cooperative Activity in Materials Research between US Investigators and their Counterparts Abroad (MWN)
International Materials Institutes (IMI)
Banff International Research Station for Mathematical Innovation and Discovery (BIRS)
Atacama Large Millimeter Array
Gemini Observatory
Southern Astrophysical Research Telescope
Cerro Tololo Interamerican Observatory
International Research Fellowship Program (IRFP)
Pan-American Advanced Studies Institutes Program (PASI)

Directorate for Mathematical and Physical Sciences (MPS)
http://www.nsf.gov/dir/index.jsp?org=MPS

Division of Astronomical Sciences (AST)
http://www.nsf.gov/dir/index.jsp?org=AST

Division of Chemistry (CHE)
http://www.nsf.gov/dir/index.jsp?org=CHE

Division of Materials Research (DMR)
http://www.nsf.gov/dir/index.jsp?org=DMR

Division of Mathematical Sciences (DMS)
http://www.nsf.gov/dir/index.jsp?org=DMS

Division of Physics (PHY)
http://www.nsf.gov/dir/index.jsp?org=PHY

Office of Multidisciplinary Activities (OMA)
http://www.nsf.gov/dir/index.jsp?org=OMA

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Paul G. Spyropoulos

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