NATIONAL SCIENCE FOUNDATION

Directorate for Mathematical and Physical Sciences

2009

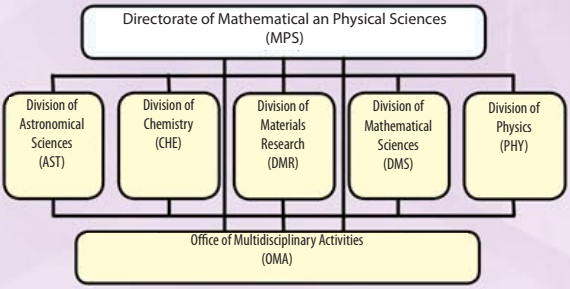
Directorate for Mathematical and Physical Sciences (MPS)

The NSF Directorate for Mathematical and Physical Sciences is comprised of the Divisions of Astronomical Sciences, Chemistry, Materials Research, Mathematical Sciences, Physics and the Office of Multidisciplinary 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 which 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.

Dear Reader:

This brochure has been created with the intent of informing you about the Mathematical and Physical Sciences Directorate of the National Science Foundation. We hope the material we've collected here gives you some idea of how the research we support serves as the foundation for major scientific advances.

MPS research spans the full range of spatial and temporal 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. We develop new mathematical structures and investigate the fundamental particles and processes of matter. We bring what we've learned in physical sciences to exploring complex biological systems, human and social dynamics, sustainable energy, and the environment. Past research in MPS has led to the MRIs you find in hospitals, the biological and chemical detectors you see in airports and the development of alternate fuel technologies.

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 innovation through the America COMPETES Act, help improve computing power past the physical and conceptual limits of Moore's Law, contribute to basic research in sustainable energy and climate change, and shed light on the very nature of matter, space, time and the physical laws that govern the evolution of 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.

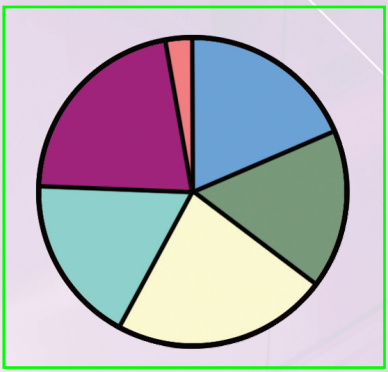
With Regards,

Tony Chan
Assistant Director
Directorate for Mathematical and Physical Sciences

Directorate for Mathematical and Physical Sciences (MPS)

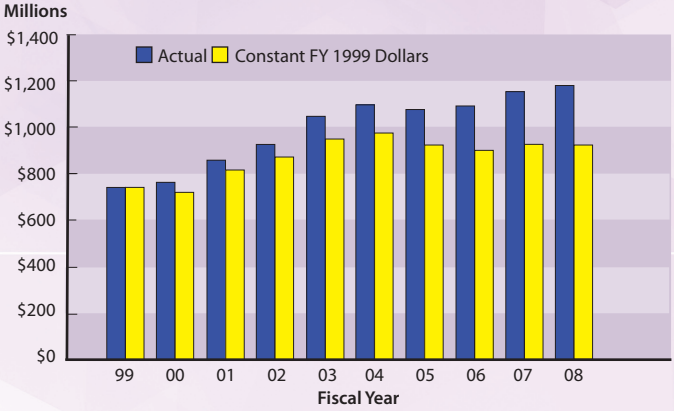
MPS Funding FY 2008

Pie chart showing MPS total budget for FY 2008. MPS spent $1.17 billion in FY 2008.



Totals may not add due to rounding.

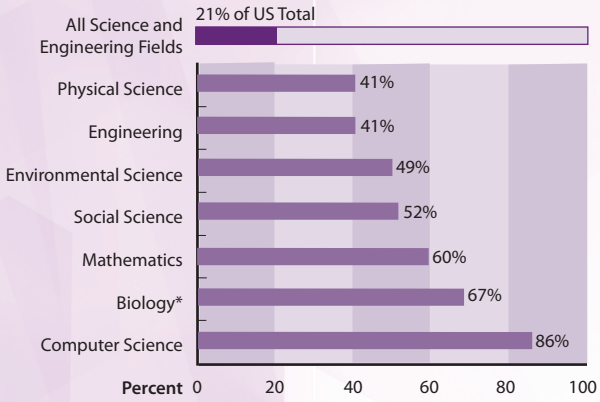
Budget in Actual and Constant FY 1999 Dollars



MPS annual budgets in actual and constant FY 1999 dollars. Constant dollars show the purchasing power of the MPS budget. Over this 10-year period, the constant dollar budget for MPS has increased 28%.

Data provided from FY 1999 to 2009 NSF Budget Requests to Congress, http://www.nsf.gov/about/budget/.

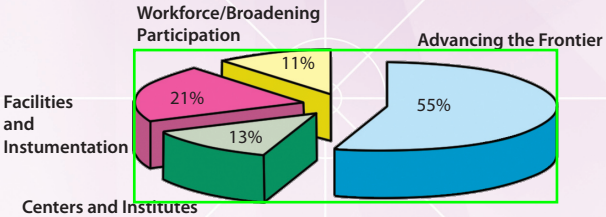
NSF Support as a Percentage of Total Federal Support of Academic Basic Research (FY2008)



** Excludes The National Institutes of Health*

The 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 (60% of Federal support) and in the physical sciences (41% of Federal support). Source: FY 2008 Performance Highlights, NSF 09-26.

FY 2008 MPS Budget Distribution



The Directorate for Mathematical and Physical Sciences had a budget of $1.17 billion for FY 2008. 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 and diverse participation in the astronomical sciences.

The Division supports research in all areas of astronomy and astrophysics and related multidisciplinary studies. Modes of support include single-investigator and collaborative awards, as well as 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 53% of its FY 2008 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.

Contact Information

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A high-resolution image taken with the Gemini Observatory shows Jupiter's two giant red spots brushing past one another in the planet's southern hemisphere. The image was obtained in near-infrared light using adaptive optics that corrects, in real-time, for most of the distortions caused by turbulence in Earth's atmosphere. The result is a view from the ground that rivals images from space.

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)

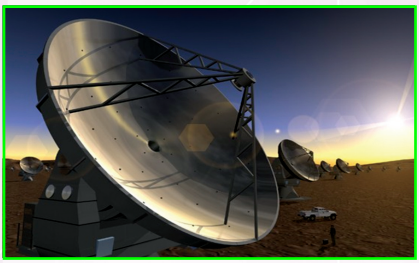
Astronomical Instrumentation Programs
Advanced Technologies and Instrumentation (ATI)
Major Research Instrumentation (MRI)
University Radio Observatories (UROs)

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.



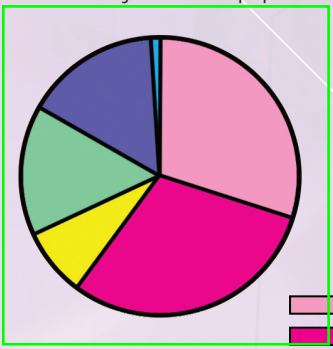
The Atacama Large Millimeter Array (ALMA) is an international collaboration to develop a world-class radio telescope composed of 66 antennas that will work together to study the universe from a high and dry site in the Chilean Andes. Once construction is completed, ALMA will function as the most capable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

Credit: NRAO/AUI and ESO.

Division of Astronomical Sciences (AST)

Human Resources FY 2008

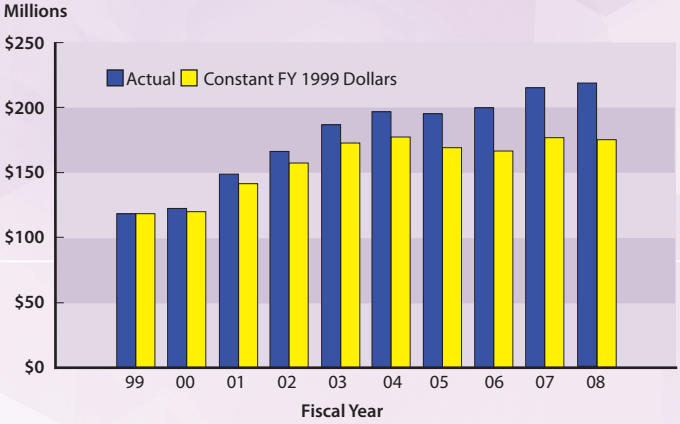
Pie chart showing total number of people involved in AST.



- Senior Researchers - 30%
- Other Professionals - 30%
- Post Doctorials - 8%
- Graduate Students - 15%
- Undergraduate Students - 16%
- K-12 Teachers - 1%

Totals may not add due to rounding.

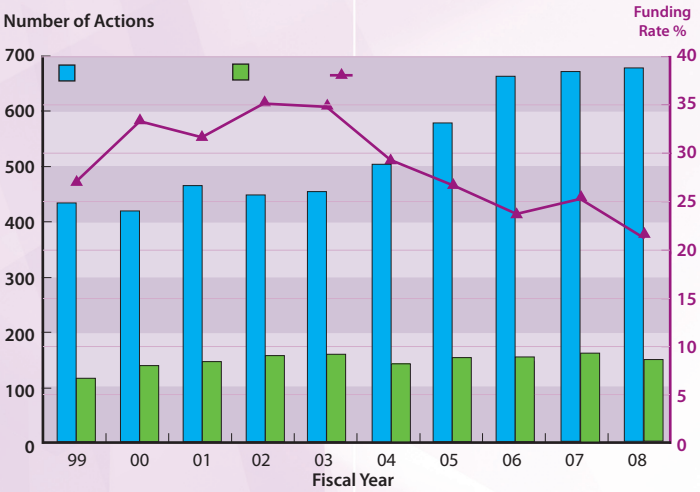
Budget in Actual and Constant FY 1999 Dollars



AST annual budgets in actual and constant FY 1999 dollars. Constant dollars show the purchasing power of the AST budget. Over this 10-year period, the constant dollar budget for AST has increased 48%.

Data provided from FY 1999 to 2009 NSF Budget Requests to Congress, http://www.nsf.gov/about/budget/.

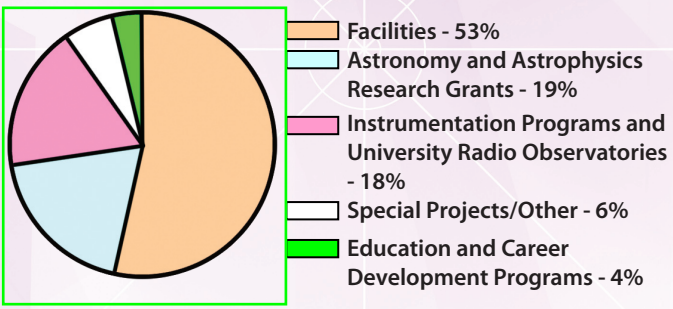
Success Rates and Number of Actions



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.

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 2008



Division of Chemistry (CHE)

Mission

The mission of the Division of Chemistry is to support innovative research in the chemical sciences, integrated with education, through strategic investment in a globally engaged U.S. chemistry workforce reflecting the diversity of America. Modes of support include single investigator and multi-investigator awards, as well as funding for shared instrumentation, instrumentation development, and educational projects that leverage the division's research investments to build research capacity. The Division supports research in all areas of chemistry and in multidisciplinary fields that draw upon the chemical sciences. Projects that help build infrastructure and workforce and partnerships that advance the chemical sciences are also supported.

Funding Modalities

The Division is sensitive to the chemistry community's concern about preserving the single investigator method of research but is also receptive to an increasing number of investigators who favor research work in small and large groups. The Division's plan is to continue to offer the chemistry community the possibility of submitting their best scientific research ideas through one of three modalities: as single investigators, as small groups (collaboratives) and as larger groups (centers).

Establishing interdisciplinary centers for chemical research is important as centers offer a means to increase funding and visibility for Chemistry, facilitate strong scientific synergism, and achieve the goals of the America COMPETES Act.

Workforce Development and Broadening Participation

In March 2007, the Division approved an aggressive and ambitious broadening participation plan with the ultimate goal of having the face of America represented internally at NSF and externally in the chemistry community. The plan can be viewed on the CHE web site.

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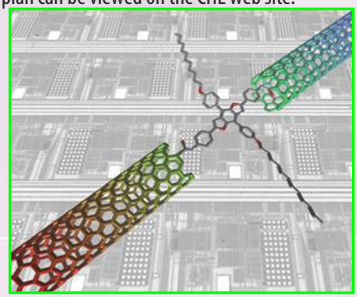


A nanotube electrode developed for directly measuring the conductance of single molecules. Credit: the Center for Electron Transport in Molecular Nanostructures, a Nanoscience and Engineering Center directed by James Yardley of Columbia University.

Credit: Support for this work was provided by the Nanoscale Science and Engineering Initiative of the NSF under Grant No. CHE-0117752 and by the New York State Office of Science, Technology, and Academic Research (NYSTAR).

Programs in Chemistry

Individual Investigator Programs
Analytical and Surface Chemistry
Inorganic, Bioinorganic, and Organometallic Chemistry
Organic and Macromolecular Chemistry: Organic Dynamics; Synthesis
Physical Chemistry: Experimental Physical Chemistry; Theoretical and Computational Chemistry

Integrative Chemistry Activities
Centers for Chemical Innovation
Chemical Research Instrumentation and Facilities
Research Experiences for Undergraduates
American Competitiveness in Chemistry Fellowships
Undergraduate Research Collaboratives

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 centers that address major, long-term basic chemical research problems. Appropriate research problems are high-risk but potentially high-impact and will attract broad scientific and public interest. Center teams may be connected through cyberinfrastructure, will respond rapidly to emerging opportunities and may include researchers from academia, industry, government laboratories and international organizations.

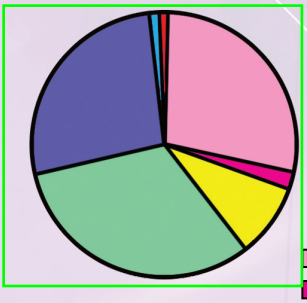
Centers are selected through a multi-stage peer-reviewed process. Phase I awards are $1.5 million for 3 years. Successful Phase I awards may compete for Phase II funding, which is approximately $3 to $4 million per year for 5 to 10 years.

The American Competitiveness in Chemistry Fellowship (ACC-F) program supports postdoctoral associates in chemistry, for two years of postgraduate study. The ACC-F programs seeks to (1) build ties between academic and industrial, and/or national laboratory, and/or Chemistry Division-funded center researchers (partners) and (2) involve beginning scientists in efforts to broaden participation in chemistry. Fellows must propose a well-integrated, synergistic research plan with their chosen affiliate as well as an effective outreach plan that will broaden participation by underrepresented groups in chemistry. In the first funding cycle four postdoctoral associates were awarded $200,000 for a total of two years through the ACC-F program.

Chemistry and the Global Community
The International Collaboration in Chemistry between US Investigators and their Counterparts Abroad (ICC) is a successful partnership with the German Research Foundation, the Austrian Science Fund, the Engineering and Physical Sciences Research Council of the United Kingdom, the National Natural Science Foundation of China, and the National Research Agency of France. Relationships with other countries are being explored.

Human Resources FY 2008

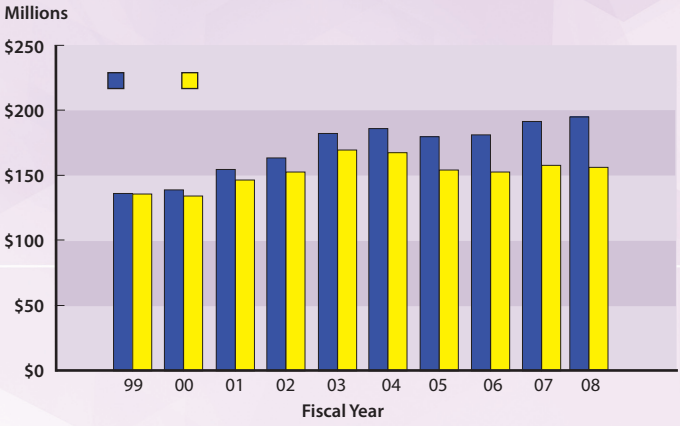
Pie chart showing total number of people involved in CHE.



- Senior Researchers - 28%
- Other Professionals - 2%
- Post Doctorials - 9%
- Graduate Students - 32%
- Undergraduate Students - 27%
- K-12 Teachers - 1%
- K-12 Students - 1%

Totals may not add due to rounding.

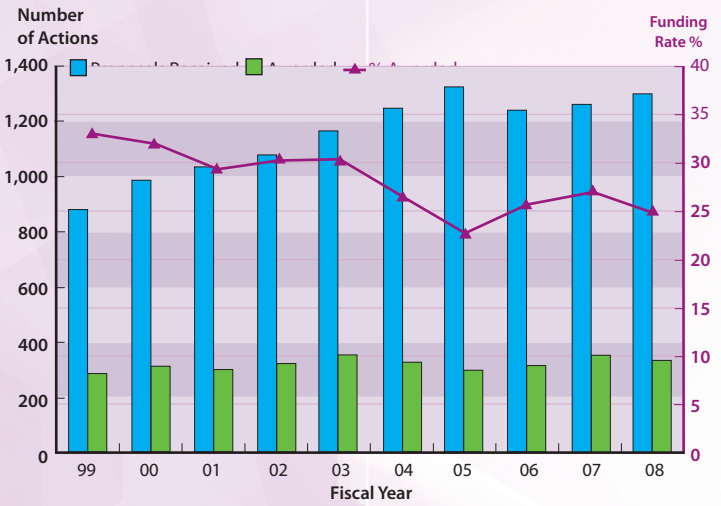
Budget in Actual and Constant FY 1999 Dollars



CHE annual budgets in actual and constant FY 1999 dollars. Constant dollars show the purchasing power of the CHE budget. Over this 10-year period, the constant dollar budget for CHE has increased 16%.

Data provided from FY 1999 to 2009 NSF Budget Requests to Congress, http://www.nsf.gov/about/budget/.

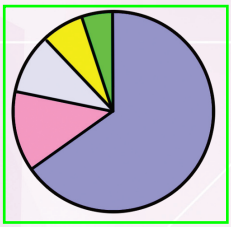
Success Rates and Number of Actions



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.

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 2008



- Individual Investigator Awards with 1 or 2 Investigators - 65%
- Shared Instrumentation - 13%
- Collaborative Awards and Individual Investigator Awards with 3 or more Investigators - 10%
- Centers - 7%
- Research Experiences for Undergraduates and Chemistry Education Programs - 5%

Totals may not add due to rounding.

Division of Materials Research (DMR)

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, metallic materials and 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 10 awards.

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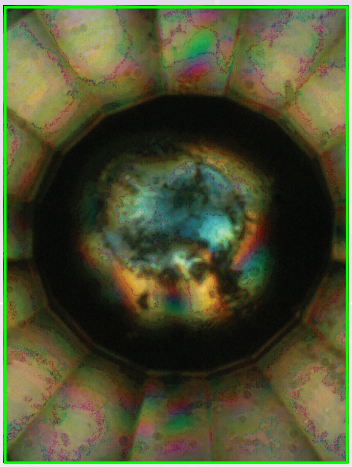


A sample of lutetium (blue oval) compressed between diamond anvils to a pressure of 174 GPa (25 million psi). Using high pressures to create new superconductors and to modify their properties helps us develop superior materials with potentially important applications.

Credit: James Schilling

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

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

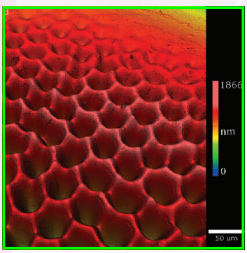
-DMR supports user facilities for neutron scattering, x-rays, high magnetic fields and nano-fabrication.

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.



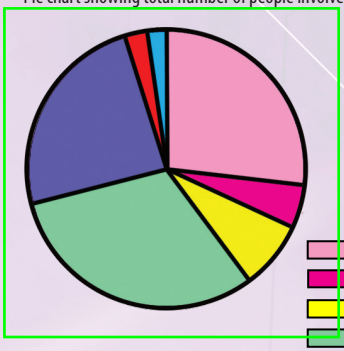
New wrinkle morphologies can be induced in polymers, such as the silicone rubber shown here, which could offer major benefits to their surface and adhesive properties.

Credit: Alfred Crosby.

Division of Materials Research (DMR)

Human Resources FY 2008

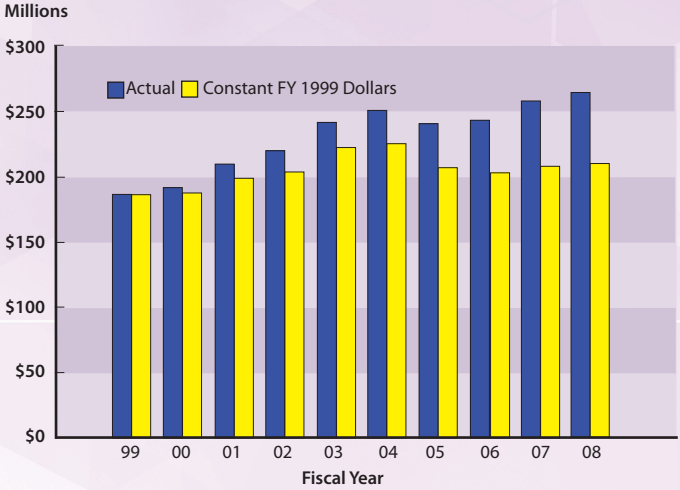
Pie chart showing total number of people involved in DMR.



- Senior Researchers - 27%
- Other Professionals - 5%
- Post Doctorials - 8%
- Graduate Students - 31%
- Undergraduate Students - 24%
- K-12 Teachers - 2%
- K-12 Students - 3%

Totals may not add due to rounding.

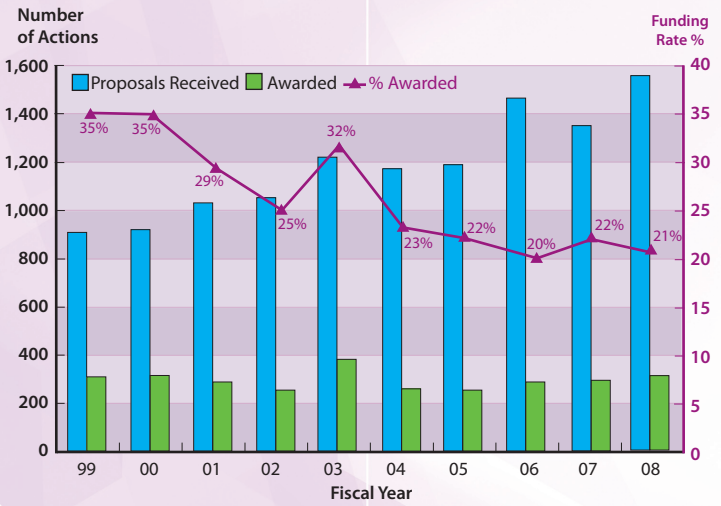
Budget in Actual and Constant FY 1999 Dollars



DMR annual budgets in actual and constant FY 1999 dollars. Constant dollars show the purchasing power of the DMR budget. Over this 10-year period, the constant dollar budget for DMR has increased 13%.

Data provided from FY 1999 to 2009 NSF Budget Requests to Congress, http://www.nsf.gov/about/budget/.

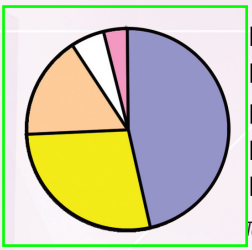
Success Rates and Number of Actions



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.

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 2008



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 crosses 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. Melding of the banking, insurance, and finance industries turns on recent advances in probability and stochastic calculus. 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.

Mathematical Sciences Priority Area

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 (CMG) and the Joint DMS/NIGMS Activity in Mathematical Biology are continuing and new programs such as the CHE-DMR-DMS Solar Energy Initiative (SOLAR) and Proactive Recruitment in Introductory Science and Mathematics (PRISM) will see their first awards in FY 2009.

Contact Information

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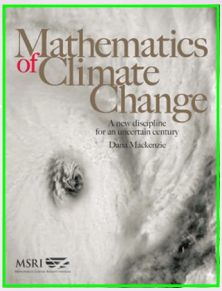

In April 2007, the Mathematical Sciences Research Institute (MSRI) organized an event bringing together mathematicians, climate modelers, economists, business leaders, politicians and the public to explore some of the political, economic and mathematical aspects of climate change. For a copy of this report, visit www.msri.org.

Programs in Mathematical Sciences

Core Programs

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

Special DMS Programs

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 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.

Enhancing Diversity in Graduate Education (EDGE): A Transition Program for Women in the Mathematical Sciences The EDGE Program, a DMS Workforce project funded jointly with The Andrew W. Mellon Foundation, is designed to strengthen the ability of women and minority students to successfully complete graduate programs in the mathematical sciences.

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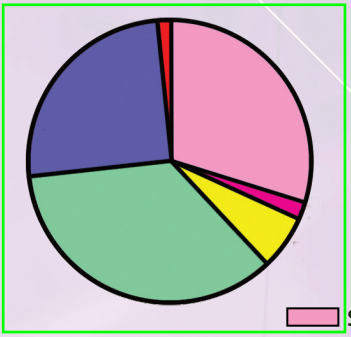
Division of Mathematical Sciences (DMS)

Human Resources FY 2008

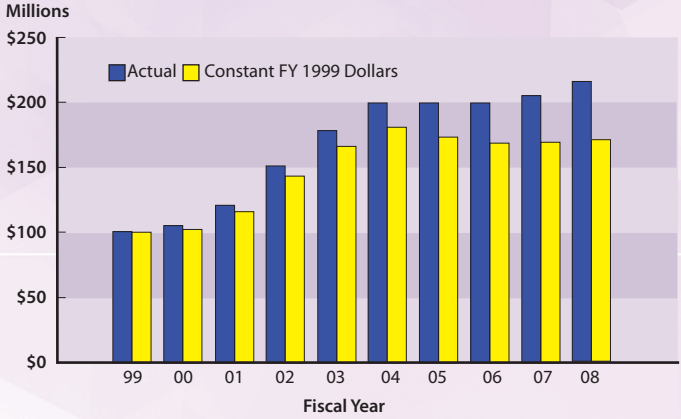
Pie chart showing total number of people involved in DMS.



- Senior Researchers - 30%
- Other Professionals - 2%
- Post Doctorials - 6%
- Graduate Students - 35%
- Undergraduate Students - 25%
- K-12 Students - 1%

Totals may not add due to rounding.

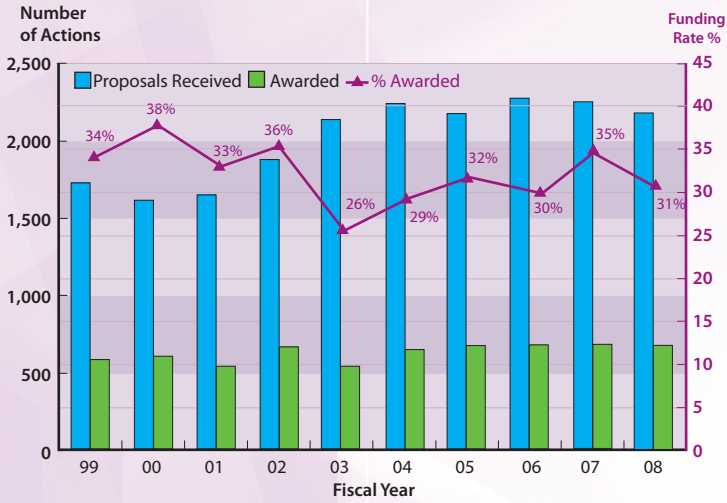
Budget in Actual and Constant FY 1999 Dollars



DMS annual budgets in actual and constant FY 1999 dollars. Constant dollars show the purchasing power of the DMS budget. Over this 10-year period, the constant dollar budget for DMS has increased 69%.

Data provided from FY 1999 to 2009 NSF Budget Requests to Congress, http://www.nsf.gov/about/budget/.

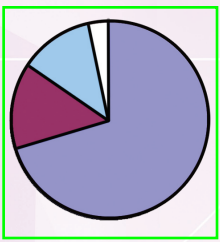
Success Rates and Number of Actions



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.

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 2008



- Individual Investigator Awards - 71%
- Workforce - 14%
- Institutes - 12%
- Other - 3%

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 supporting efforts through groups such as the National Society of Black Physicists and National Society of Hispanic Physicists, to large scale projects such as QuarkNet, CHEPREO, CROP, and ASPIRE, 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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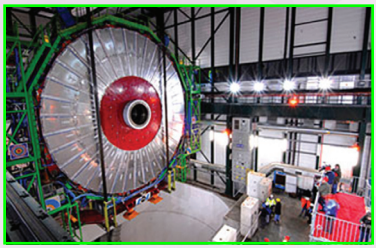


The last large piece of the Compact Muon Solenoid (CMS) detector is lowered into place in the Large Hadron Collider. The red portion is iron and the silver ring shows the backs of muon detectors

Credit: Credit: Michael Hoch/AdventueArt/CERN

Credit: Alan Litke

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

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.

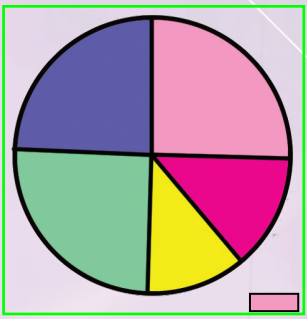
Physics and the Global Community

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, the Pierre Auger Observatory, Milagro, and HI-RES. In addition, the PHY Division also participates in the Open Science Grid (OSG), 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 (EGEE) in Europe and related efforts in South America and Asia.

Division of Physics (PHY)

Human Resources FY 2008

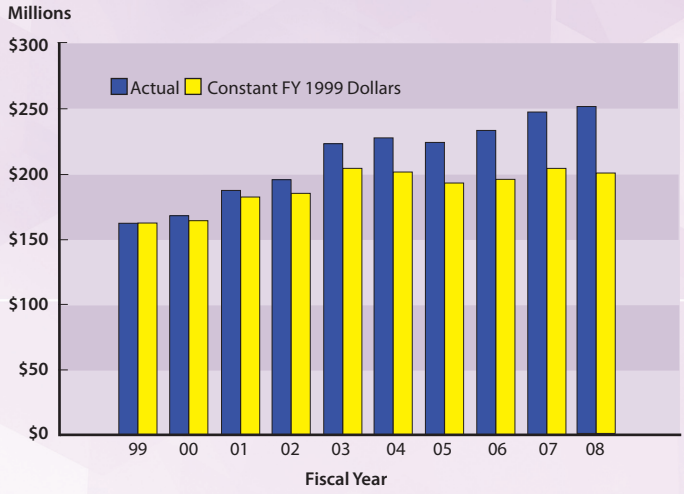
Pie chart showing total number of people involved in PHY.



- Senior Researchers - 25%
- Other Professionals - 13%
- Post Doctorials - 12%
- Graduate Students - 25%
- Undergraduate Students - 24%

Totals may not add due to rounding.

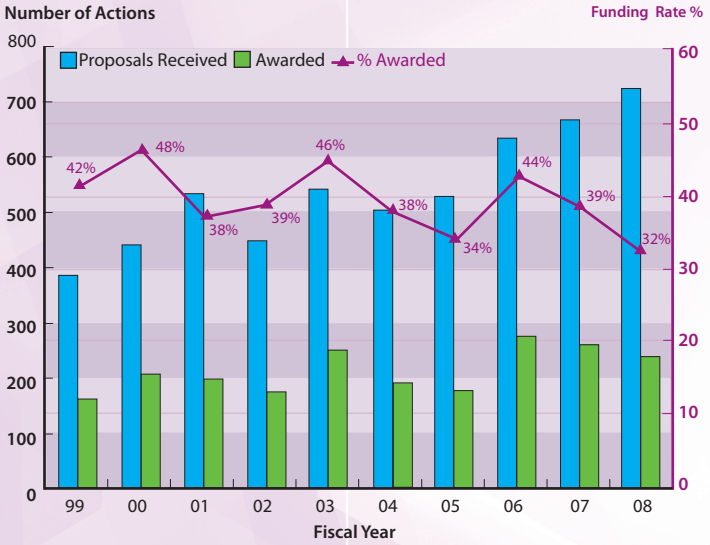
Budget in Actual and Constant FY 1999 Dollars



PHY annual budgets in actual and constant FY 1999 dollars. Constant dollars show the purchasing power of the PHY budget. Over this 10-year period, the constant dollar budget for PHY has increased 24%.

Data provided from FY 1999 to 2009 NSF Budget Requests to Congress, http://www.nsf.gov/about/budget/.

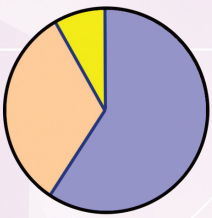
Success Rates and Number of Actions



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.

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

Modes of Support FY 2008



Individual Investigator Awards - 59%

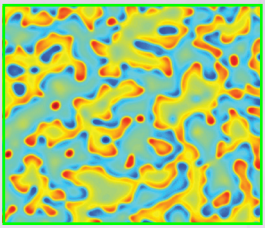
Facilities - 33%

Centers - 8%

Totals may not add due to rounding.

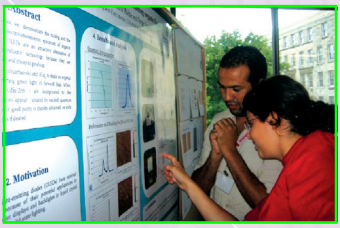
Office of Multidisciplinary Activities

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 CSUMS student research project.

Credit: Timothy Sauer and Tom Stephens, George Mason University



Participants at the 2007 CAM (Canada-America-Mexico) physics graduate student conference in Montreal, Canada.

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

Division of Materials Research (DMR)
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Division of Mathematical Sciences (DMS)
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Division of Physics (PHY)
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http://www.nsf.gov/dir/index.jsp?org=OMA

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