

**U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY**

HEARING CHARTER

*An Overview of the Fiscal Year 2012 Budget Proposals at the
National Science Foundation and the National Institute of Standards and Technology*

**Friday, March 11, 2011
10:00 a.m. - 12:00 p.m.
2318 Rayburn House Office Building**

1. Purpose

On Friday, March 11, 2011, the House Committee on Science, Space, and Technology will hold a hearing to examine the Administration's proposed fiscal year 2012 (FY12) budget request for the National Science Foundation and the National Institute of Standards and Technology. There will be two panels, one focused on NSF, and the other on NIST. An Administration witness will provide testimony for each agency, and the National Science Board Chair will discuss the National Science Foundation request.

2. Witnesses

Panel 1

Dr. Subra Suresh, Director, National Science Foundation
Dr. Ray Bowen, Chairman, National Science Board

Panel 2

Dr. Patrick Gallagher, Under Secretary of Commerce for Standards and Technology and Director, National Institute of Standards and Technology

3. Hearing Overview

The National Science Foundation (NSF) is an independent federal agency created by Congress in 1950 "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense..." With an annual budget of about \$6.9 billion (FY 2010), it is the funding source for approximately 20 percent of all federally supported basic research conducted by America's colleges and universities.

The National Institute of Standards and Technology (NIST) is a non-regulatory agency within the Department of Commerce. Originally founded in 1901 as the National Bureau of Standards, NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. By working closely alongside industry, NIST has become recognized as a provider of high-quality information utilized by the private sector.

While NSF and NIST have very different organizational structures and functions, these two agencies, along with the Department of Energy's Office of Science, have been consistently recognized for their ties to the economic competitiveness and national security of the United States.

National Science Foundation (NSF)

*National Science Foundation (NSF) Spending
(dollars in millions)*

Account	FY08 Actual	FY10 Enacted	FY11 Request	FY12 Request	FY12 Request versus FY10 Enacted	
					\$	%
Research and Related Activities (RRA)	4853.2	5563.9	6018.8	6253.5	689.6	12.4
<i>Biological Sciences (BIO)</i>	615.6	714.5	767.8	794.5	79.6	11.2
<i>Computer and Info. Science and Engineering (CISE)</i>	535.3	618.8	684.5	728.4	109.6	17.7
<i>Engineering (ENG)</i>	649.5	743.9	825.7	908.3	164.4	22.1
<i>Geosciences (GEO)</i>	757.9	889.6	955.3	979.2	89.5	10.1
<i>Mathematical and Physical Sciences (MSP)</i>	1171.1	1351.8	1409.9	1432.7	80.9	6.0
<i>Social, Behavioral, and Economic Sciences (SBE)</i>	227.9	255.3	268.8	301.1	45.9	18.0
<i>Cyberinfrastructure (OCI)</i>	185.2	214.3	228.1	236.0	21.7	10.1
<i>International Science and Engineering (OISE)</i>	47.8	47.8	53.3	58.0	10.2	21.3
<i>Polar Programs (OPP)</i>	447.1	451.2	527.9	477.4	26.3	5.8
<i>Integrative Activities (IA)</i>	214.5	275.0	295.9	336.3	61.2	22.3
<i>U.S. Arctic Research Commission</i>	1.5	1.6	1.6	1.6	0	1.3
Education and Human Resources (EHR)	766.3	872.8	892.0	911.2	38.4	4.4
Major Research Equipment & Facilities Const (MREFC)	166.9	117.3	165.2	224.7	107.4	91.6
Agency Operations & Award Management	282.0	300.0	329.2	357.7	57.7	19.2
National Science Board (NSB)	3.8	4.5	4.8	4.8	.3	6.6
Office of Inspector General (OIG)	11.8	14.0	14.4	15	1.0	7.1
Totals:	6084.0	6872.5	7424.4	7767.0	894.5	13.0

NSF Overview

NSF is the primary source of federal funding for non-medical basic research, providing approximately 40 percent of all federal support, and serves as a catalyst for science, technology, engineering, and mathematics (STEM) education improvement at all levels of education. It supports the fundamental investigations that ultimately serve as the foundation for progress in nationally significant areas such as national security, technology-driven economic growth, energy independence, health care, nanotechnology, and networking and information technology.

Through roughly 10,000 new awards per year, NSF supports an average of 200,000 scientists, engineers, educators and students at universities, laboratories and field sites all over the U.S. and throughout the world. These grants fund specific research proposals that have been judged the most promising by a rigorous and objective merit-review system. In the past few decades, NSF-funded researchers have won more than 180 Nobel Prizes.

NSF Budget Summary

The FY12 budget request for NSF is \$7.7 billion, an increase of 13 percent, or \$894.5 million over the FY10 enacted level (not including any carryover from the \$3 billion NSF received from ARRA funding). The request continues to keep NSF on a doubling path for funding as set out in the America COMPETES Act and America COMPETES Reauthorization Act. The budget for NSF is divided into three main accounts: Research and Related Activities, Education and Human Resources, and Major Research Equipment and Facilities Construction.

Research and Related Activities (RRA)

The FY12 budget request includes \$6.3 billion for Research and Related Activities (RRA), an increase of \$690 million or 12.4 percent over FY10 enacted. RRA is made up primarily of six disciplinary directorates: non-biomedical life sciences (BIO); computer sciences (CISE); engineering (ENG); geosciences (GEO); math and physical sciences (MPS); and social, behavioral, and economic sciences (SBE). Each of these directorates get significant increases in the FY12 budget request ranging from six percent for MPS to 22.1 percent for ENG. New programs established as part of the increased research funding request for FY12 include \$35 million for a nanotechnology manufacturing initiative, \$40 million in next-generation robotics technologies, and \$96 million for an interdisciplinary program to eventually replace computer chip technologies. In addition, \$87 million is requested for advanced manufacturing activities including expanded university-industry research partnerships and regional innovation ecosystems and clean energy manufacturing research. Another \$117 million is requested for “cyber-infrastructure” activities to accelerate the pace of discovery and \$12 million for a “new program that will fund a suite of activities that promote greater interdisciplinary research.”

As part of the Science, Engineering and Education for Sustainability (SEES) program that crosses all NSF directorates and has a goal of advancing “climate and energy science, engineering, and education to inform the societal actions needed for environment and economic sustainability and sustainable human well-being,” the FY12 budget request is \$998.1 million, an increase of \$337.5 million or 51 percent.

In addition, the FY12 budget request also includes a plan to invest broadband spectrum receipts in a variety of areas, including \$150 million to NSF in FY12 and \$1 billion total over a 5-year period for targeted research on experimental wireless technology testbeds, more flexible and efficient use of the radio spectrum, and cyber-physical systems such as wireless sensor networks for smart buildings, roads, and bridges. NSF’s participation is a piece of the \$3 billion WIN fund.

Education and Human Resources (EHR)

EHR funds most of NSF's activities that support K-12 STEM education and the majority of activities that support undergraduate STEM education. EHR also funds most of NSF's graduate fellowship and traineeship programs.

The FY12 budget request for EHR is \$911 million, a \$38.4 million or 4.4 percent increase over FY10. The Administration continues to offer a mixed message regarding the treatment of EHR relative to the healthy increase for RRA. While calling for an investment of \$3.4 billion in STEM education activities across the federal government, a number of proven NSF initiatives are being eliminated, reduced, or reprogrammed to make way for new or expanded programs. Like last year's request, the FY12 budget request continues to shift a greater responsibility for STEM education to the Department of Education while maintaining NSF primarily as a research agency.

New funding in the FY12 budget request includes an additional \$20 million for a Transforming Broadening Participation through STEM (TBPS) pilot program to seek innovative solutions for broadening participation in STEM at the undergraduate level. This is part of an overarching realigned program called Broadening Participation at the Core (BPAC), which also houses several underrepresented population programs. The BPAC program total request is \$156 million, a \$21 million or 23.3 percent increase over FY10. Research programs focused on gender and persons with disabilities have been moved from this Division to the Division of Research on Learning in Formal and Informal Settings and funding under the request is cut by 8.7 percent to \$17 million. It is unclear why this shift in funding emphasis and program location is warranted.

Additionally, the FY12 budget request includes \$40 million in funding for a new teacher-training research and development program, split evenly between K-12 teachers and undergraduate teachers. At the same time, the budget request for Noyce Scholarships is \$45 million, a decrease of \$10 million or 18.2 percent and the Math and Science Partnership is \$48.2 million, also a decrease of \$10 million or 17.2 percent.

Likewise, the Administration's budget request places a high priority on Graduate Research Fellowships (GRF) by increasing the funding to \$134.6 million, a 31.2 percent increase over FY10, while essentially flatlining the Integrative Graduate Education and Research Traineeship Program (IGERT) at \$30.2 million and moving to eliminate the Graduate STEM Fellows in K-12 Education (GK-12). While recognizing the flexibility that GRFs provide graduate students, IGERT is also an extremely well regarded and effective program that by design supports cutting-edge interdisciplinary science. The reason for this continued unbalanced treatment of two equally important and effective graduate student programs is unclear.

Major Research Equipment and Facilities Construction (MREFC)

The MREFC account funds the construction of large research facilities, such as telescopes and research ships. Funding for the design, operation and management of these major user facilities is included in the R&RA budget.

The FY12 budget request includes \$224.7 million for the Major Research Equipment and Facilities Construction (MREFC) account. This is a 91.6 percent increase from FY10, but the FY10 amount does not include \$146 million provided in ARRA funding for the Advanced Technology Solar Telescope (ATST). A bulk of MREFC funding in FY12 includes \$87.9 million for the second year construction of the National Ecological Observatory Network (NEON), which will collect data across the U.S. on the impacts of climate change, land use change, and invasive species. Another \$102.8 million is requested for the fourth year of construction of the Ocean Observatories Initiative (OOI), an integrated network of instrumentation that will provide continuous and interactive access to the ocean. OOI also received \$157 million in ARRA funding in FY09.

Agency Operations and Award Management (AOAM)

The AOAM account funds the internal operations of NSF. The FY12 budget request includes \$357.7 million for AOAM. This is a 19.2 percent increase of \$57.7 million. \$44.7 million of this increase is related to the expiration of the NSF building leases in 2013. A new lease will need to be signed in FY12.

National Institute of Standards and Technology (NIST)

National Institute of Standards and Technology (NIST) Spending
(dollars in millions)

Account	FY08 Actual	FY10 Enacted	FY11 Request	FY12 Request	FY12 Request versus FY10 Enacted	
					\$	%
Scientific & Technical Research and Services (STRS)	440.5	515.0	584.5	678.9	163.9	31.8
Construction of Research Facilities (CRF)	160.5	147.0	124.5	84.6	(62.4)	(42.4)
Industrial Technology Service (ITS)	154.8	194.6	209.6	237.6	43.0	22.1
Technology Innovation Program (TIP)	65.2	69.9	79.9	75.0	5.1	7.3
Manufacturing Extension Partnership (MEP)	89.6	124.7	129.7	142.6	17.9	14.4
Advanced Manufacturing Consortia*	--	--	--	12.3	12.3	100.0
Baldrige Performance Excellence Program**	7.9	9.6	9.9	7.7	(1.9)	(19.8)
Totals:	755.8	856.6	918.6	1001.1	144.5	16.9

*new initiative

**in FY11 funded under STRS account

NIST Overview

NIST operates two main research laboratories in Gaithersburg, MD, and Boulder, CO, as well as radio stations in Hawaii and Colorado. NIST also maintains partnerships with the Hollings Marine Labs in Charleston, SC, the JILA joint institute operated with the University of Colorado, and the Center for Advanced Research in Biotechnology (CARB) and the Joint Quantum Institute, both operated in conjunction with the University of Maryland.

NIST employs about 3,100 scientists, engineers, technicians, and support and administrative personnel. Also, NIST annually hosts about 2,600 associates and facility users from academia, industry, and other government agencies. In addition, NIST partners with 1,600 manufacturing specialists and staff at about 400 Manufacturing Extension Partnership (MEP) service locations around the country. Of note, NIST scientists have earned three Nobel Prizes over the last 15 years, and NIST led a building and fire safety investigation to study the structural failure and subsequent progressive collapse of the World Trade Center buildings following the terrorist attacks of 2001.

NIST Reorganization

In October 2010, NIST reorganized its structure, with the goal of aligning its research units according to a structure defined around mission instead of scientific disciplines. The realignment is expected to allow increased decision-making flexibility, greater accountability for customer product and services delivery, and for more interdisciplinary research to be conducted at NIST. Finally, the number of operational units dropped from ten to six, creating a more streamlined management structure.

NIST Budget Summary

In FY12, the Administration has requested a funding level of \$1 billion or a 16.9 percent increase from FY10 enacted funding for the NIST. The budget request would provide \$678.9 million for NIST's core Scientific and Technical Research and Services (STRS); \$84.6 million for Construction of Research Facilities (CRF); \$142.6 million for the Manufacturing Extension Partnership (MEP) program; and \$75.0 million for the Technology Innovation Program (TIP).

Research and Facilities

The FY12 NIST budget request is \$678.9 million for the Agency's Scientific and Technical Research Services (STRS), an increase of \$163.9 million or 31.8 percent, and includes \$168 million in specific initiatives to address national priorities related to cyber infrastructure, technology interoperability, nanotechnology, and advanced manufacturing and materials. The STRS FY12 request continues the Administration's plan to double funding for key basic research agencies.

The FY12 budget request for Construction of Research Facilities (CRF) is \$84.6 million, a 42.4 percent decrease from FY10 enacted. The significant decrease represents the completion of several major renovation projects at the laboratory facilities in Boulder, CO. CRF funding would support maintenance and repair of existing NIST buildings as well as continue the interior renovation efforts of the Boulder lab Building 1 (\$25.4 million).

In order to advance measurement science, standards, and technology, NIST currently operates six laboratory units:

- **Material Measurement Laboratory (MML)** The MML serves as the national reference laboratory for measurements in the chemical, biological, and material sciences. The MML provides measurement services used by a broad set of industries including but not

limited to: healthcare (biomarkers), renewable energy (measuring the quality of fuels) and forensic science (biometric identification techniques).

- **Physical Measurement Laboratory (PLM)** The PLM develops and disseminates the national standards of measurement, e.g., length, mass, force and shock, acceleration, time and frequency, electricity, temperature, humidity and pressure. This information supports consistent timekeeping, on which many technologies like GPS rely; and underpins the safety of our national electricity grid.
- **Engineering Laboratory (EL)** The EL develops and disseminates advanced manufacturing and construction technologies, guidelines, and services to the U.S. manufacturing and construction industries. Examples of EL work include researching ways to reduce the spread of fire in residential buildings and developing performance metrics for advanced manufacturing processes.
- **Information Technology Laboratory (ITL)** The ITL develops and disseminates standards, measurements, and testing for interoperability, security, usability, and reliability of information systems, including cyber security standards and guidelines for federal agencies and U.S. industry. ITL works in areas such as cloud computing, health information technology, and advanced voting technologies.
- **Center for Nanoscale Science and Technology (CNST)** is the only national nanotechnology center focused on commerce. The facility offers shared space – utilized by a variety of public and private stakeholders – for nanoscale fabrication and measurement and develops innovative nanoscale measurement and fabrication capabilities.
- **Center for Neutron Research (NCNR)** provides a national user facility, utilized by universities, government and industry, to study neutron-based measurement capabilities. The level of measurement capabilities is unavailable anywhere else in the country, allowing researchers to answer questions in nanoscience and technology with a broad range of applications.

Strategic and Emerging Research Initiative (SERI) Within its laboratory programs, NIST also operates a program (\$10 million requested in FY12) providing flexibility to target research efforts in certain “high-risk, high-payoff” areas of interest. Current areas of focus include quantifying greenhouse gas measurements, standards for remediation and decontamination of structures contaminated by methamphetamine laboratories, biomanufacturing, and characterizing nanoparticles currently used in consumer products.

Industrial Technology Services (ITS)

In addition to the laboratories, NIST manages several extramural programs supporting industry. The FY12 \$142.6 million request for the Manufacturing Extension Partnership (MEP) program is a \$17.9 million or 14.4 percent increase from the FY10 enacted level. The MEP program is a public/private partnership run by Centers in all 50 states and Puerto Rico that provides technical assistance for small and medium-sized manufacturers to modernize their operations and adapt to foreign competition. MEP Centers are supported by equal contributions from federal funds, state funds, and industry client fees. The requested increase would expand the program in support of the Administration’s initiatives to reinvent domestic manufacturing to create jobs and respond to future challenges and opportunities.

The FY12 request for the Technology Innovation Program (TIP) is \$75 million, a \$5.1 million increase over FY10 enacted. TIP awards cost-shared grants to small companies and joint ventures for the development of high-risk, high-reward technologies that meet critical national needs. This program was created by the 2007 America COMPETES Act but was not reauthorized in the 2010 America COMPETES Reauthorization Act (P.L. 111-358).

The Baldrige Performance Excellence Program (BPEP) would receive \$1.9 million less than FY10 enacted in the FY12 budget request, reflecting the Administration's goal of transitioning the program to privately funded sources. Baldrige provides criteria and evaluation of successful strategies and performance practices across an array of industries.

New in FY12 is the Advanced Manufacturing Technology Consortia (AMTech) Program, with a \$12.3 million request. Modeled after the Nanoelectronics Research Initiative (NRI), a partnership between NSF, NIST, industry, and universities across the nation, the AMTech program would align industry needs with university research in innovative manufacturing. The program would fund facilities, equipment, and research at universities and government laboratories to address long-term research needs of the manufacturing industry.

Public Safety Innovation Fund

The FY12 budget request includes a plan to invest broadband spectrum receipts in a variety of areas, including \$100 million annually provided to NIST for 2012-2016 for research supporting the development and promotion of wireless technologies to advance public safety, Smart Grid, and other broadband capabilities. NIST's participation is a piece of the \$3 billion WIN fund.