

## National Science Foundation

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### HIGHLIGHTS

The FY 2014 budget for the National Science Foundation (NSF) is \$7.6 billion, an increase of \$520 million or 7.3 percent above the FY 2012 actual amount. The Administration's FY 2014 request is significantly higher than the FY 2013 estimate of \$6.8 billion for the agency.

The FY 2014 budget includes the following breakdown in funding for the NSF Directorates:

- **Research and Related Activities (R&RA)** would receive \$6.2 billion. This is \$454 million, or 7.9 percent, above the FY 2012 level of \$5.7 billion.
- **Education and Human Resources (EHR)** would receive \$880 million. This is \$50 million or 6 percent above the FY 2012 level of \$831 million. The FY 2014 budget includes a government-wide reorganization and consolidation of the nation's science, technology, engineering, and mathematics (STEM) education programs.
- **Major Research Equipment and Facilities Construction (MREFC)** would receive \$210 million. This is \$12 million or 6.1 percent above the FY 2012 level of \$198 million.

The FY 2014 budget continues to support federal funding for multi-agency and multi-disciplinary initiatives, including:

- **Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education (CIF-21)** – a joint NSF and National Institutes of Health project that invests in Big Data and National Data Infrastructure. The FY 2014 NSF budget requests \$155 million for

CIF-21, an increase of \$77 million or 99.3 percent over the FY 2012 level of funding of \$78 million.

- **The Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE)** – a program meant to strengthen interdisciplinary and transformative research across the agency. The NSF leadership has placed a high premium on interdisciplinary collaboration among its directorates, so it is not surprising that the FY 2014 budget includes \$63 million for this program. This is an increase of \$42.6 million or 209 percent increase over the FY 2012 level of \$20 million.
- **Science, Engineering, and Education for Sustainability (SEES)** – a program which supports sustainability projects aimed at meeting human needs, while protecting the environment for future generations. The FY 2014 budget proposes \$222.7 million for the SEES program, an increase of \$65.7 million or 41.9 percent over the FY 2012 level of \$157 million. The FY 2014 budget recommends a strong focus on water sustainability and climate; Cyber-SEES; Hazards; and Sustainable Chemistry, Engineering, and Materials (SusChEM).
- **NSF Innovation Corp (I-Corps)** – This program was established several years ago and aims to build a national innovation ecosystem for NSF-funded researchers. The FY 2014 budget requests \$24.8 million for the program, an increase of \$17 million, or 231.3 percent over the FY 2012 level of \$7.5 million. The FY 2014 budget directs NSF to continue its investment in the development of Innovation Teams and the expansion of I-Corp Nodes and I-Corp Sites.

## AGENCY OVERVIEW

The 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...” Since its creation, NSF has played a critical role supporting fundamental research and education across all disciplines of science.

Approximately 80 percent of NSF’s total R&D budget goes to support research being conducted at colleges and universities. The agency provides 21 percent of all support for basic research at U.S. academic institutions.

This share increases to 58 percent when excluding NIH biomedical research support. In many fields, NSF is the dominant source for academic support. For example, NSF provides 82 percent of federal support for basic research in computer science, 65 percent in biology, 64 percent in mathematics, and 57 percent in both the social and environmental sciences.

Over 90 percent of NSF funding is allocated as competitive awards, most of which are in the form of grants or cooperative agreements. In FY 2014, NSF expects to evaluate over 53,000 proposals and make 12,000 new awards. To accomplish this, the Foundation expects to conduct over 260,000 proposal reviews using its merit review process and to engage between 40,000 and 50,000 reviewers from the science and engineering community.

In FY 2014, NSF expects more than 342,900 people will be involved in agency research and education programs, including 57,700 senior researchers, 6,420 postdoctoral associates, 44,500 graduate students, and 29,300 undergraduate students. The agency also supports national research centers, user facilities, oceanographic vessels, and Antarctic research stations.

#### **RECENT NSF FUNDING HISTORY AND FUTURE OUTLOOK**

The 113<sup>th</sup> Congress is expected to draft and consider legislation to reauthorize the America COMPETES Act. This act authorizes federal funding and programs for NSF and other major federal research agencies.

The original America COMPETES Act of 2007 and the subsequent 2010 COMPETES Act stemmed from the influential and tone-setting 2007 National Academies report, *Rising Above the Gathering Storm*, which temporarily captured the attention of Washington based policy-makers. The report, and subsequent COMPETES Acts, placed renewed emphasis on the need for strong federal support for the physical sciences and engineering, calling for the “doubling” in funding for programs supported by NSF, the Department of Energy’s Office of Science, and the National Institute of Standards and Technology.

Since the enactment of the COMPETES Acts of 2007 and 2010, the nation’s fiscal crisis and ballooning federal deficit has focused congressional and White House attention on finding ways to reduce federal spending

and increase revenues. While the funds provided for NSF as a part of President Obama's economic stimulus package – the American Recovery and Reinvestment Act – temporarily put the agency back on its doubling track, NSF and the other COMPETES agencies have been falling well short of achieving the funding targets set by the COMPETES Act since the Recovery Act funding expired.

In light of the current climate of fiscal austerity, the 113<sup>th</sup> Congress will be hard pressed to pass COMPETES legislation that calls for increases in overall science funding for NSF and the other research agencies, let alone to set targets that call for a doubling in science funding. It is also possible that COMPETES might become a vehicle to try to rearrange current funding priorities within the NSF.

Driven by their stated interest in ensuring that taxpayer dollars are well spent, members of the 113<sup>th</sup> Congress may increasingly call into question funding for specific “funny sounding” NSF grants or research projects for which the value is not clearly evident. There is also growing concern that some members of Congress may seek to greatly reduce or eliminate NSF funding for social, behavioral, and economics research. Already, in the final FY 2013 funding package approved earlier this year, there was a successful effort led by Senator Tom Coburn (R-OK) to remove funding from all NSF political science projects that do not promote the “national security or economic interests of the United States.” More recently, Lamar Smith (R-TX), Chairman of the House Science, Space and Technology Subcommittee, sent a letter to the NSF director requesting additional information concerning the scientific justification for the funding awards provided to five specific NSF grants about which members of the committee had raised questions during a congressional hearing.

#### **IMPACT OF SEQUESTRATION ON NSF**

The implementation of the across-the-board spending cuts known as sequestration, established by the Budget and Control Act of 2011, has further dampened funding prospects for the NSF in the current and future years. As a result of sequestration, which officially began on March 1, 2013, NSF will be forced to absorb an approximate 5 percent cut in its final FY 2013 appropriated funding level. In a memorandum issued in late February by the agency to its awardee organizations, the NSF stated that the major impact of sequestration would be seen in the form of reductions

to the number of new research grants and cooperative agreements awarded, reducing the total number of new research grants awards in FY 2013 by approximately 1,000. The memorandum stated that the agency planned to try to minimize the impacts of sequestration by maintaining existing awards and protecting the NSF workforce and STEM human capital development programs.<sup>1</sup>

If Congress and the Administration are unable to compromise on a balanced mix of entitlement reforms and revenue generating measures to meet the budget deficit reduction targets mandated by the Budget and Control Act – which they have been unable to do as of this date – sequestration will remain in place. This will mean that additional cuts will be made to the NSF and other domestic funding agencies in FY 2014 and for a number of years into the future.

#### **NSF’S FY 2013 BUDGET REQUEST**

The Administration requested \$6 billion for R&RA, \$294 million or 5.2 percent above the FY 2012 amount of \$5.7 billion (see Table II-7). The FY 2013 request highlights key Administration priorities, including support for interdisciplinary scientific and engineering research; clean energy and sustainability research; advanced manufacturing; cybersecurity research; and STEM education.

**Research and Related Activities (R&RA)**. The FY 2014 budget requests \$6.2 billion for Research and Related Activities. This is \$454 million, or 7.9 percent, above the FY 2012 level of \$5.7 billion.

***Biological Sciences (BIO)***. The FY 2014 budget for BIO is \$761 million, an increase of \$48 million or 6.8 percent above the FY 2012 level of \$712 million. BIO provides 64 percent of federal funding for the non-medical, basic biological research at academic institutions. The FY 2014 budget calls for support to address five grand challenges in biology: synthesizing life-like systems; understanding the brain; predicting organisms’ characteristics from their DNA sequencing; studying interactions between

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<sup>1</sup> National Science Foundation, Office of the Director, *Important Notice to Presidents of Universities and Colleges and Other NSF Awardee Organizations*, “Impact of FY 2013 Sequestration Order on NSF Awards,” February 27, 2013, (see: <http://www.nsf.gov/pubs/2013/in133/in133.pdf>)

Earth and its climate and biosphere; and understanding biological diversity. The BIO directorate will continue to partner with the Mathematical and Physical Sciences and Engineering directorates on the BioMaps program, the purpose of which is to enhance collaboration between the three directorates, while accelerating our understanding of biological systems, and leading to innovations in areas such as renewable fuels, bio-imaging, and bio-based materials.

***Computer and Information Science and Engineering (CISE).*** The FY 2014 budget for CISE is \$950 million, an increase of \$13 million or 1.4 percent over the FY 2012 level of \$937 million. CISE continues to be the principal federal funder for university-based basic research in computer science, accounting for 82 percent of federal support in this area. For FY 2014, CISE will continue its leading role in several Foundation-wide investments, including CIF-21; SEES; I-Corps; INSPIRE, and Clean Energy. The directorate will also play a major role in the cross-Foundation “Core Techniques and Technologies to Advance Big Data Science and Engineering” (BIGDATA).

***Engineering (ENG).*** The FY 2014 budget for the Engineering directorate is \$911 million, an increase of \$87 million or 10.5 percent over the FY 2012 level of \$825 million. In addition to supporting important Foundation-wide investments such as the Cyber-Enabled Materials, Manufacturing, and Smart-Systems (CEMMSS), I-Corps, and CIF-21, the Engineering directorate is home to important programs like the Engineering Research Centers (ERC) and the Industry/University Cooperative Research Centers (I/URC).

***Geosciences (GEO).*** The FY 2014 budget for GEO is \$1.39 billion, an increase of \$72 million, or 5.5 percent above the FY 2012 level of \$1.32 billion. The Geosciences directorate remains a principal source of funding for academic research, providing 61 percent of the total federal support in this area. Recently, the Office of Polar Programs was incorporated into GEO. Thus, the FY 2014 budget includes \$465 million for the Division of Polar Programs (PLR), an increase of \$29 million or 6.6 percent above the FY 2012 level of \$436 million.

***Mathematical and Physical Sciences (MPS).*** The FY 2014 budget for MPS is \$1.38 billion, an increase of \$77 million or 5.9 percent above the FY 2012 level of \$1.30 billion. MPS provides 48 percent of federal

funding for basic research to academic institutions in the mathematical and physical sciences. For FY 2014, MPS proposes to use federal funds to support midscale instrumentation projects within the Division of Astronomical Sciences and the Division of Physics. In addition, MPS plans on continuing its investment in facilities. The construction of the Large Synoptic Survey Telescope (LSST) is among the directorate's highest priorities.

***Social, Behavioral and Economic Sciences (SBE).*** The FY 2014 budget for SBE is \$272 million, an increase of \$18 million or 7.1 percent above the FY 2012 level of \$254 million. SBE provides 56 percent of federal funding for basic social sciences research at academic institutions. In addition to playing an integral role in interdisciplinary research activities across the Foundation, SBE is the sole support for fundamental research in several scientific fields of study, including economics; psychology; sociology; geography; neuroscience; anthropology; archeology; statistics; linguistics; and political science. The SBE portfolio also includes major surveys that provide essential infrastructures for the research community. These surveys include the American National Election Studies (ANES), the Panel Study of Income Dynamics (PSID), and the General Social Survey (GSS).

***Integrative and International Activities (IIA).*** The FY 2014 budget for IIA is \$537 million, an increase of \$138 million or 34.6 percent above the FY 2012 level of \$399 million. IIA includes a diverse array of programs and activities, including the administration of the Science and Technology Centers (STC), federal support for the Experimental Program to Stimulate Competitive Research (EPSCoR), Major Research Instrumentation (MRI), and the International Science and Engineering (ISE). The FY 2014 budget requests level funding of \$90 million for MRI, \$52 million for ISE, and \$164 million for EPSCoR.

**Education and Human Resources (EHR).** The FY 2014 budget requests \$880 million for the Education and Human Resources Directorate. This is \$50 million, or 6 percent, above the FY 2012 level of \$831 million. The FY 2014 budget includes a government-wide reorganization and consolidation of the nation's science, technology, engineering, and mathematics (STEM) education programs.

***Division of Graduate Education (DGE).*** The FY 2014 budget requests

\$245 million for DGE, an increase of \$8 million or 3.3 percent above the FY 2012 level of \$237 million. The FY 2014 budget also includes a reorganization of NSF's graduate fellowship and traineeship priorities. The NSF Graduate Research Fellowship (GRF) will be expanded into a National Graduate Research Fellowship program (NGRF). According to the NSF budget justification, "this new program will operate under the same general framework and principles currently used in GRF, and will include consultation with other agencies to ensure the most effective practices are used and suitable targeted opportunities are provided." The budget requests \$162.5 million for NGRF, an increase of \$52.9 million over the FY 2012 level of \$109 million. An equivalent investment (\$162.5 million) is provided through IIA, mentioned above, for a total NGRF investment of \$325 million. Due to the expansion of this program, NSF expects to award 700 additional fellowships, for a total of 2,700 new fellowships in FY 2014.

The FY 2014 budget proposes a new program called the NSF Research Traineeships Program (NRT). The Integrative Graduate Education Traineeships (IGERT) will evolve into this new NRT program. The FY 2014 budget request for NRT is \$55 million (\$28.7 million from R&RA and \$26 million from EHR).

***Division of Undergraduate Education (DUE).*** The FY 2014 NSF budget requests \$227 million for DUE, an increase of \$36 million, or 19.1 percent above the FY 2012 level of \$191 million. The budget places special emphasis on supporting and generating 100,000 effective STEM education teachers and one million STEM graduates. The Administration proposes an NSF-wide program called Catalyzing Advances in Undergraduate STEM Education (CAUSE).

In alignment with the Administration's broader plan for consolidating STEM education programs across the government, CAUSE seeks to consolidate undergraduate STEM education programs across the Foundation. The FY 2014 budget request for CAUSE is \$123 million (\$26 million from R&RA and \$97 million from EHR).

***Division of Human Resources Development (HRD).*** The FY 2014 budget requests \$130 million for HRD, a relatively small increase of \$1 million or 0.7 percent over the FY 2012 level of \$129 million. In FY 2014, the Advance Program (aimed at the advancement of women in academic

science) will help support NSF's Career Life Balance activity (\$250,000). The FY 2014 budget also includes funding for the Alliance for Graduate Education and the Professoriate (AGEP) at \$7.8 million.

***Division of Research on Learning in Formal and Informal Settings (DRL).*** The FY 2014 budget requests \$278 million, a modest increase of \$5 million or 1.7 percent above the FY 2012 level of \$273 million. The budget calls special attention to the Discovery Research (DR-K12) which is a jointly-administered program by the Department of Education and EHR that would support evidenced-based approaches to student learning at the K-16 levels. The budget requests \$15 million in funding for this program, a modest increase of \$3.3 million or 3.3 percent over the FY 2012 level of \$99.5 million.

In FY 2013, the Committee of Visitors (COV) is scheduled to review AGEP, the Centers for Research Excellence in Science and Technology (CREST), Historically Black Colleges and Universities-Undergraduate Program (HBCU-UP), and the Transforming Undergraduate Education in STEM (TUES). In FY 2014, COV will review NSF Scholarships in STEM (S-STEM), CyberCorps: Scholarships for Service (SFS); IGERT; and ADVANCE.

**Major Research Equipment and Facilities Construction (MREFC).** The FY 2014 budget request for MREFC is \$210 million. This is \$12 million, or 6.1 percent, above the FY 2012 enacted level of \$198 million. The FY 2014 budget provides funding for several projects, including the Advanced Laser Interferometer Gravitational-wave Observatory (\$14.9 million); Advanced Technology Solar Telescope (\$42 million); Large Synoptic Survey Telescope (\$27.5 million); the National Ecological Observatory Network (\$98 million); and the Ocean Observatories Initiative (\$27.5 million). The budget also includes plans to begin construction on the Large Synoptic Survey Telescope (LSST).

