

**U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON RESEARCH AND SCIENCE EDUCATION**

HEARING CHARTER

The National Science Foundation's FY 2011 Budget Request

Wednesday, March 10, 2010

10:00 a.m. – 12:00 p.m.

2318 Rayburn House Office Building

1. Purpose

On Wednesday, March 10, the Subcommittee on Research and Science Education of the House Committee on Science and Technology will hold a hearing to examine the priorities in the National Science Foundation's FY 2011 budget request. In addition, in preparation for reauthorization of the 2007 *America COMPETES Act*, the Subcommittee will examine core activities, initiatives, and policy directions for research, infrastructure, education and workforce training at the Foundation.

2. Witnesses

- **Dr. Arden L. Bement, Jr.**, Director of the National Science Foundation
- **Dr. Steven C. Beering**, Chair of the National Science Board

3. Overarching questions

- What is the status of the National Science Foundation's efforts to implement the provisions of the 2007 *America COMPETES Act*? Are there programs or requirements that NSF was not able to implement as intended? If so, why not?
- What are NSF's priorities for K-12 science, technology, engineering and mathematics (STEM) education, including its STEM teacher training programs? How does the current budget request reflect those priorities? What are NSF's plans for the new Transforming Undergraduate Education in STEM program? What are NSF's priorities for graduate education and training and how does the budget request reflect those priorities? How is NSF's mission to broaden participation in STEM integrated into the full portfolio of education programs? How does NSF evaluate its STEM education and broadening participation programs?
- What is NSF's vision for the role of institutions of higher education in the development or sustainability of regional or national innovation ecosystems that facilitate economic growth through commercialization and creation of new businesses? How do the Partnerships for Innovation program and other programs at the Foundation fit into this vision? How can these programs be designed to include

diverse types of institutions and address workforce training needs at all levels of higher education?

- What is NSF's role in helping to maintain research infrastructure and instrumentation that enables the most cutting edge science and engineering research? By what mechanisms does the Foundation support such infrastructure and instrumentation? What challenges did NSF face in implementing the Academic Research Infrastructure (ARI) program under the 2009 Recovery Act? What is the role of the Foundation in supporting mid-size instrumentation that falls between instrumentation allowable under the Major Research Instrumentation program and major facilities funded under the Major Research Equipment and Facilities Construction account?

4. Overview of NSF FY 2011 Budget Request

The National Science Foundation (NSF) budget request for fiscal year (FY) 2011 totals \$7.424 billion, \$552 million or 8.0 percent more than FY 2010 funding (not including any FY 2010 carryover in the \$3.0 billion included for NSF in the Recovery Act). However, when funding for U.S. Coast Guard Icebreakers (\$54 million) is counted appropriately, the real growth is 7.2 percent. This level of funding keeps NSF on a 10-year doubling path. (More detail on the icebreaker discrepancy is provided below.)

Research and Related Activities (R&RA)

Overview

The Administration's budget would provide \$6.02 billion for R&RA in FY 2011, an increase of \$401 million or 7.1 percent over FY 2010 funding. The largest relative increases went to the Engineering Directorate (ENG, +11 percent) and the Computer and Information Science and Engineering Directorate (CISE, +10.6 percent). The Geosciences Directorate (GEO), which funds atmospheric, earth and ocean sciences, including most of NSF's climate change research; and the Biological Sciences Directorate (BIO), which funds 68 percent of all non-medical academic research in the life sciences, including environmental biology, also saw greater than 7 percent increases. The Social, Behavioral and Economic Sciences Directorate (SBE) received a 5.3 percent increase, and the Mathematical and Physical Sciences Directorate (MPS), the largest by far at NSF with a proposed budget of \$1.41 billion in FY 2011, received a 4.3 percent increase from FY 2010.

Innovation at NSF

The Administration's R&RA priorities for FY 2011 include a significant increase in funding for three programs labeled by NSF as "innovation" programs, including **Partnerships for Innovation** (\$19.2 million), **Science and Engineering Beyond Moore's Law** (\$70.2 million), and NSF's **Centers** programs (\$313.8 million across NSF).

Cyberlearning

The Foundation is proposing to establish a new multidisciplinary, multi-directorate research program called **Cyberlearning Transforming Education**, funded at \$41 million in FY 2011. ‘Cyberlearning’ is defined as the use of networked computing and communications technologies to support learning.

Polar Icebreakers

In 2005, NSF signed a memorandum of understanding (MOU) with the US Coast Guard (USCG) in which NSF agreed to take over maintenance and operations budgetary authority for USCG icebreakers operating in the Arctic and Antarctic. The rationale for the MOU was that the majority of the USCG icebreakers time was dedicated to supporting NSF’s science missions at the Poles. In FY 2010, the Appropriators required that budgetary authority be shifted back to USCG, and provided FY 2010 appropriations accordingly. As a result, \$54 million is excluded from the FY 2010 NSF budget total, thereby obscuring the true growth in funding for NSF’s programs. This issue remains unresolved between Congress and the Administration.

Research Infrastructure

Approximately 24 percent (\$1.77 billion) of NSF’s FY 2011 budget is devoted to research infrastructure. In addition to support for major facility construction under the MREFC account (below), this total includes support from within the R&RA account for: pre-construction design, and maintenance and operations for MREFC projects; major research instrumentation (\$90 million), federally funded R&D centers, and polar facilities and logistics. For a detailed explanation of the challenges of academic facilities modernization and the **Academic Research Infrastructure** (ARI) program in particular, refer to the charter from the February 23 subcommittee hearing on that topic.¹

Education and Human Resources (EHR)

The Education and Human Resources Directorate would be funded at \$892 million in FY 2011, an increase of only \$19.2 million or 2.2 percent over FY 2010 funding. The Administration continues to offer a mixed message regarding this treatment of EHR relative to the healthy increase for R&RA. On the one hand, they point out that funding for EHR alone represents an incomplete picture of the many education and training programs and activities distributed across NSF. On the other hand, they maintain that NSF is primarily a research agency and that the Department of Education (ED) has a greater responsibility for education, especially at the K-12 level. Significant funding (\$450 million) is requested for STEM specific programs at ED in the FY 2011 budget. We understand from both NSF and ED staff that the partnership and cooperation between the two agencies has increased markedly in the last year.

COMPETES Programs

In the FY 2011 budget, the **Noyce Teacher Scholarship program** would be funded at \$55 million, the same level since FY 2009, and **Math and Science Partnerships (MSP)**

¹ http://science.house.gov/publications/hearings_markup_details.aspx?NewsID=2743

would be funded at \$58.2 million, the same level as in FY 2010 and a small decrease from FY 2009 funding. Both Noyce and MSP received significant funding in the Recovery Act (\$60 million and \$25 million, respectively).

At the graduate level, the Administration has pledged to triple the number of NSF **graduate research fellows (GRF)** to 3000 by 2013, and has provided a 16 percent increase to \$158 million for GRF in the FY 2011 proposal. NSF has an additional graduate student training program called **Integrative Graduate Education and Research Traineeship (IGERT)**, for which the Foundation proposes a decrease of 11 percent to \$62 million in FY 2011. Both programs are funded from both EHR and R&RA, with IGERT split evenly between the directorates and GRF receiving two-thirds of its funding from EHR. GRF is important in that it provides individual students with flexibility in the research they pursue rather than being tied to a particular investigator's grant, but the program does not involve any additional professional development for its fellows or involve the institution in any way. IGERT, on the other hand, creates student cohorts working on interdisciplinary projects that allow them to develop both individual and teamwork skills, and has the additional goal of catalyzing broader, cultural changes in graduate STEM education at participating institutions. In *COMPETES*, Congress required that both of these excellent and important programs grow at the same rate.

Two additional EHR programs highlighted in *COMPETES*, the 2-year college **Advanced Technological Education Program** (\$64 million), and the **STEM Talent Expansion Program** (\$32.5 million) were both flat funded in the FY 2011 request.

Broadening Participation

Of particular note in the EHR budget is the proposed restructuring of programs to broaden participation in STEM at the undergraduate level. NSF is proposing a new comprehensive broadening participation program that builds on three existing programs: **Historically Black Colleges and Universities Undergraduate Program** (HBCU-UP), **Louis Stokes Alliances for Minority Participation** (LSAMP) and **Tribal Colleges Undergraduate Program** (TCUP), and newly invites proposals from Hispanic Serving Institutions, citing the mandate in Sec. 7033 of the *COMPETES Act*. Funding for this newly consolidated program would be \$103 million in FY 2011, a \$13 million or 14.4 percent increase from the total FY 2010 funding for HBCU-UP, LSAMP and TCUP.

In the budget narrative, NSF describes this consolidation as “combining expertise developed previously in separate programs in order to promote opportunities to build sustainable partnerships and alliances among [institutions] with a strong track record in producing underrepresented STEM graduates, thereby building capacity for the STEM field across a range of institutions.” Members of various constituent communities have expressed concern about possible unintended consequences of this consolidation and about the lack of transparency by which the consolidation was conceived and developed. On March 16, our subcommittee will hold a hearing to examine Federal programs to broaden participation in STEM.

Major Research Equipment and Facilities Construction (MREFC)

The MREFC account supports large, multi-user facilities, distributed instrumentation networks, or large pieces of equipment such as telescopes, research vessels, or accelerators that benefit an entire scientific discipline and could not be achieved without significant Federal support.

The MREFC request for FY 2011 is \$165 million, an increase of \$41 million from FY 2010. MREFC also received \$400 million in the Recovery Act to initiate construction on three projects: The Alaska Region Research Vessel, the Advanced Technology Solar Telescope, and the Ocean Observatories Initiative, two of which will continue to receive funding in FY 2011. The only new start in FY 2011 is the National Ecological Observatory Network (NEON), which passed final design review in November.

NSF FY 2011 BUDGET REQUEST

NSF Program Activity	FY 2009 Actual*	FY 2010 Plan	FY 2011 Request	Change over FY 2010	
				Amount	% Change
Research and Related Activities (R&RA)	7215.0	5563.9	6018.8	455	8.2%
Biological Sciences	916.6	714.5	767.8	53	7.5%
Computer S&E (CISE)	809.5	618.8	684.5	66	10.6%
Engineering	930.0	743.9	825.7	82	11.0%
Geosciences	1155.5	889.6	955.3	66	7.4%
Math & Physical Sciences	1718.9	1351.8	1409.9	58	4.3%
Social, Behavioral and Economic Sciences	325.5	255.3	268.8	14	5.3%
Cyberinfrastructure	279.2	214.3	228.1	14	6.4%
International S&E	61.4	47.8	53.3	5	11.4%
Polar Programs	645.4	451.2	528.0	76.8	17.0%
Education and Human Resources (EHR)	930.5	872.8	892.0	19.2	2.2%
Research on Learning	226.7	242.0	247.9	5.8	2.4%
Undergraduate Education	368.1	292.4	290.0	-2.4	-0.8%
<i>MSP</i>	86.0	58.2	58.2	0.0	0.0%
<i>Noyce Scholarships</i>	115.0	55.0	55.0	0.0	0.0%
Grad Research and Education	181.7	181.4	185.3	3.8	2.1%
Human Resources Develop.	154.1	156.9	168.9	12.0	7.6%
MREFC	414.8	117.3	165.2	47.9	40.8%
Agency Operations (AOAM)	294.1	300.0	329.2	29.2	9.7%
Inspector General (OIG)	12.0	14.0	14.4	0.4	2.5%
Nat. Science Board (NSB)	4.0	4.5	4.8	0.3	6.6%
AGENCY TOTAL	6468.8	6872.5	7424.4	551.9	8.0%

* includes ARRA funding

NSF Participation in Major Interagency Initiatives (USGCRP, NNI, and NITRD)

U.S. Global Climate Change Research Program (USGCRP)

Started in 1989, the USGCRP is an interagency effort comprised of 13 departments and agencies. Activities of the USGCRP are grouped under the following areas: improving knowledge of Earth's past and present climate variability and change; improving understanding of natural and human forces of climate change; improving capability to model and predict future conditions and impacts; assessing the Nation's vulnerability to current and anticipated impacts of climate change; and improving the Nation's ability to respond to climate change by providing climate information and decision support tools that are useful to policymakers and the general public. Overall, the Administration proposes \$2.56 billion for USGCRP in the FY 2011 budget, a \$439 million (21 percent) increase over FY 2010 enacted. Likewise, climate change science is the cross-cutting area of research at NSF that received the most significant boost in the FY 2011 budget request. The Foundation's investment in USGCRP would increase by \$50 million (16 percent) to \$370 million in FY 2011. The most significant increase (\$27 million) would go toward research on climate variability and change across temporal and spatial scales.

National Nanotechnology Initiative (NNI)

The Science and Technology (S&T) Committee was instrumental in the development and enactment of the 21st Century Nanotechnology Research and Development Act of 2003 (P.L. 108-153), which authorizes the National Nanotechnology Initiative (NNI). The NNI focuses on R&D that creates materials, devices, and systems that exploit the fundamentally distinct properties of matter as it is manipulated at the nanoscale. Currently, 13 agencies report a nanotechnology R&D budget. Overall, the Administration proposes \$1.8 billion for NNI in the FY 2011 budget, a \$5 million decrease from FY 2010 enacted. The Foundation's investment in NNI would decrease by \$16 million (3.9 percent) to \$401 million in FY 2011. However, two specific research areas under NNI would receive an increase at NSF: nanomanufacturing and environmental, health and safety research.

Networking and Information Technology R&D Program (NITRD)

Similarly, the S&T Committee was instrumental in the development of the multi-agency Networking and Information Technology R&D (NITRD) program through the High Performance Computing Act of 1991 (P.L. 102-194). The mission of the NITRD program is to accelerate progress in the advancement of computing and networking technologies and to support leading edge computational research in a range of science and engineering fields. Currently, 13 Federal agencies report a NITRD budget. Overall, the Administration proposes \$4.3 billion for NITRD in the FY 2011 budget, a decrease of \$9 million from FY 2010 enacted. The Foundation's investment in NITRD would increase by \$80 million (7.3 percent) to \$1.17 billion in FY 2011. This increase is spread across all but one of the NITRD program component areas.