

Congress of the United States

House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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MEMORANDUM

TO: Committee on Science, Space, and Technology Research and Technology Subcommittee Members and Staff

FROM: Science, Space, and Technology Research and Technology Subcommittee Staff

DATE: March 13, 2014

RE: Subcommittee Markup of H.R. 4186, the *Frontiers in Innovation, Research, Science, and Technology Act of 2014*

The Subcommittee on Research and Technology will meet on **Thursday, March 13, 2014**, in Room 2318 of the Rayburn House Office Building to consider the following:

- **H.R. 4186, the *Frontiers in Innovation, Research, Science, and Technology Act of 2014***

Background and Need

Federal policymakers have focused on scientific and technological advancement since the founding of the U.S. Policies designed to advance science and technology have been a recurring subject of congressional attention since that time. Major post-World War II legislation in this area includes the National Science Foundation Act of 1950 (P.L. 81-507) and the Stevenson-Wydler Technology Innovation Act of 1980 (P.L. 96-480).

The *Frontiers in Innovative Research, Science, and Technology Act of 2014* (FIRST Act) reauthorizes the National Science Foundation, federal STEM education programs, the Office of Science and Technology Policy, and the National Institute of Standards and Technology. In addition, technology transfer and information technology research and development issues are also addressed in this bill.

National Science Foundation (NSF)

The National Science Foundation (NSF) is the primary source of federal funding for non-medical basic research. The NSF is the major source of federal funding for many fields of scientific endeavor. Through more than 11,700 competitive awards per year, NSF supports the work of an average of 326,000 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 merit-review system.

NSF's research and education activities can be divided into six major funding areas:

- Research and Related Activities (RRA) comprises the majority of the Foundation's activities and budget by funding research in biological sciences, computer and information sciences, engineering, geosciences, mathematics, physical sciences, and the social sciences. Additional research activities include international and integrative activities and the U.S. Arctic Research Commission. Research grants are awarded through a competitive, merit-review process.
- Education and Human Resources (EHR) supports the preparation of the STEM workforce and a STEM-literate citizenry through investment in research and development on STEM education and learning.
- Major Research Equipment and Facilities Construction (MREFC) is responsible for funding the construction of large research facilities, ranging from ground-based telescopes to research ships. Funding for the design, operation and management of these major user facilities is included in the RRA budget.
- Agency Operations and Award Management (AOAM) funds all internal operations of NSF.
- National Science Board (NSB) is responsible for establishing policies for NSF and for providing national science policy advice to the President and Congress.
- Office of the Inspector General (OIG) conducts and supervises audits and investigations of NSF programs, evaluates allegations of research misconduct, and issues reports to the NSB, Foundation, and Congress regarding problems, corrective actions, and progress towards improving the management and conduct of NSF programs.

Federal STEM Education Programs and Activities

The federal government spends nearly \$3 billion dollars across thirteen federal agencies on STEM education programs each year. These programs are found primarily at the National Science Foundation, the Department of Education and the Department of Health and Human Services. Unfortunately, American students still lag behind students of other nations when it comes to STEM education. According to the OECD's 2012 PISA results, American students rank 26th in math and 21st in science.

The 2010 COMPETES Act (P.L. 111-358) included a number of requirements for the review and coordination of federal STEM programs. The Act required the National Science and Technology Council, an interagency group led by the White House Office of Science and Technology Policy, to form a Committee on STEM (CoSTEM) to develop and implement a 5-year strategic plan. CoSTEM released an inventory of federal STEM programs in December 2011; the final Strategic Plan was released in May 2013.

Office of Science and Technology Policy (OSTP)

The National Science and Technology Policy, Organization, and Priorities Act of 1976 authorized the establishment of the Office Science and Technology Policy (OSTP) to specifically advise the President on science and technology policy issues. OSTP also leads interagency efforts to development and implement science and technology budgets and to coordinate science education efforts.

The mission of OSTP has several aspects: “first, to provide the President and his senior staff with accurate, relevant, and timely scientific and technical advice on all matters of consequence; second, to ensure that the policies of the Executive Branch are informed by sound science; and third, to ensure that the scientific and technical work of the Executive Branch is properly coordinated so as to provide the greatest benefit to society.”

National Institute of Standards and Technology (NIST)

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.

NIST operates two main research laboratories in Gaithersburg, Maryland, and Boulder, Colorado, as well as radio stations in Hawaii and Colorado. NIST also maintains partnerships with the Hollings Marine Labs in Charleston, South Carolina, the Joint Institute for Laboratory Astrophysics (JILA) with the University of Colorado in Boulder, as well as the Center for Advanced Research in Biotechnology (CARB) and the Joint Quantum Institute with the University of Maryland.

NIST has three main budget accounts:

- Scientific and Technical Research and Services (STRS) includes NIST’s Core Laboratory research programs. STRS initiatives also include advanced manufacturing, cybersecurity research and standards and education, developing measurement tools and standards for cyber physical systems, advancing broadband communications, and disaster resilience.
- Construction of Research Facilities (CRF) supports construction of new facilities and maintenance and repair of existing NIST buildings.
- Industrial Technology Services (ITS) includes the Manufacturing Extension Partnership (MEP) program. 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. NIST currently operates six laboratory units which conduct research and development for measurement science, standards, and technology: the Material Measurement Laboratory (MML); the Physical Measurement Laboratory (PLM); the Engineering Laboratory (EL); the Information Technology Laboratory (ITL); the Center for Nanoscale Science and Technology (CNST); and the Center for Neutron Research (NCNR). In addition to the NIST laboratories, NIST manages several extramural programs supporting industry.

Technology Transfer

In fiscal year 2012, the Federal Government funded more than \$131 billion in research and development (R&D) activities. Colleges and universities conduct the majority of basic research in the United States, and cumulatively receive more than half of their total research funding from federal agencies. Because of the large amounts expended by the Federal Government on basic research by universities, research institutes, and national laboratories, efforts to improve the transfer of federally-funded research are of interest to both the Federal Government and stakeholders across the nation.

Recently, there has been bipartisan support to establish a grant program within Federal Agencies that currently participate in the Small Business Technology Transfer program to support innovative approaches to technology transfer at institutions of higher education, nonprofit research institutions, and Federal laboratories. The purpose of this program is to accelerate the commercialization of federally funded research and technology by small business concerns, including new businesses.

Networking Information Technology Research and Development (NITRD)

H.R. 967, which passed the House in April 2013, is included in this bill. Originally authorized in the High-Performance Computing Act of 1991 (P.L. 102-194), the NITRD program is the main R&D investment portfolio of 15 federal participating agencies in networking, computing, software, cyber security and related information technologies. The NITRD program supports a number of research areas, including big data, cyber physical systems, cyber security and information assurance, health technology, high performance computing and large scale networking.

Major Provisions

The *Frontiers in Innovative Research, Science, and Technology Act of 2014* (FIRST Act):

- Authorizes NSF funding by directorate within the Research and Related Activities account and prioritizes basic research areas to boost future innovation and economic growth, including mathematics, physics, chemistry, biology, computer science, and engineering.
- Funds Advanced Manufacturing R&D partnerships between universities, national laboratories, and businesses, and strengthens advanced manufacturing R&D planning
- Encourages Cybersecurity R&D and workforce development along with advances in computing for areas such as Big Data analysis and cloud computing
- Trains future scientific and technical leaders via graduate and teaching fellowships
- Encourages NSF to fund activities related to the BRAIN initiative
- Creates a STEM education advisory panel to assure stakeholder input in priority-setting
- Improves technology transfer and commercialization of federally funded R&D
- Encourages NSF and other federal science agencies to use innovative funding models for advances in research and development, such as prizes and crowd-sourcing, rather than traditional federal grant funding mechanism

- Requires OSTP to report on progress to reduce the cost of compliance with federal agencies' compliance regimes for federally-funded researchers
- Requires transparency and accountability for questionable NSF grants
- Requires research data created using federal research funds and used in published peer-reviewed papers to be made available to the public
- Requires federally-funded researchers to certify that subsequent published articles are based on an accurate representation of research results, and establishes a process for investigation and adjudication when knowing misrepresentation is suspected
- Ensures public access to the scientific research results from Federal funding, while at the same time preserving the access to and need for high quality publications using a flexible, transparent and data-driven process

Legislative History

In 2007, Congress passed the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES) Act (P.L. 110-69). Congress passed, and the President later signed, a three-year reauthorization of the America COMPETES Act in December 2010; this authorization expired at the end of 2013, thereby necessitating a reauthorization of agencies included in this bill.

On November 13th, the Research and Technology Subcommittee held a hearing to examine the fundamental science and research activities at the National Science Foundation (NSF), National Institutes for Standards and Technology (NIST), and the Office of Science and Technology Policy (OSTP). The coordination of Science, Technology, Engineering and Mathematics (STEM) education programs across several federal agencies was also examined during this hearing. Witnesses were asked to testify on their perspectives about a discussion draft of legislation entitled the Frontiers in Innovative Research, Science, and Technology (or FIRST) Act. The subcommittee heard testimony from Dr. Richard Buckius, Vice President for Research, Purdue University; Dr. Daniel Sarewitz, Co-Director, Consortium for Science, Policy & Outcomes, Professor of Science and Society, Arizona State University; Dr. Timothy Killeen, President, The Research Foundation for SUNY, Vice Chancellor for Research, SUNY System Administration; Mr. James Brown, Executive Director, STEM Education Coalition.

Authorization

- \$5,555,000 in Fiscal Year 2014 and 2015 for the White House Office of Science and Technology Policy
- \$7,171,918,000 in Fiscal Year 2014 and \$7,279,496,770 in Fiscal Year 2015 for the National Science Foundation
- \$850,000,000 in Fiscal Year 2014 and \$862,750,000 in Fiscal Year 2015 for National Institute of Standards and Technology (NIST)