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Chairman Bucshon, Ranking Member Lipinski, and Members of the Subcommittee, it is my privilege to be here with you today to present the National Science Foundation's budget for the 2014 fiscal year.

For more than six decades the National Science Foundation has had a profound impact on our nation's innovation ecosystem by funding transformative research that has pushed forward the frontiers of scientific knowledge. As the only Federal agency dedicated to the support of basic research and education in all fields of science and engineering, NSF empowers discoveries across a broad spectrum of scientific inquiry.

Each year, NSF awards thousands of grants that engage the talents of researchers, postdoctoral fellows, trainees, teachers and students. Collectively, NSF-funded researchers have won more than 200 Nobel Prizes for their work in the fields of chemistry, economics, physics and physiology and medicine.

In an era of fiscal austerity and focus on return on investment for the U.S. taxpayer, the strategic investments in NSF's FY 2014 portfolio sustain national economic growth, create new high technology jobs, support the transition to a clean energy economy, and train and develop the Nation's globally competitive science and engineering (S&E) workforce. NSF's comprehensive commitment to empower discoveries helps keep our nation at the very forefront of the world's science-and-engineering enterprise.

NSF's FY 2014 Budget Request is \$7.626 billion, an increase of \$592.69 million (8.4 percent) over the 2012 Enacted level. This request reflects a rigorous prioritization of activities across the Foundation. Even as the overall budget grows, the Agency Operations and Award Management account increases only \$4.89 million (1.6 percent) as administrative costs are kept constrained. Approximately \$37 million in lower priority education and research programs are terminated, reduced, or consolidated.

With this budget request, the Administration has conveyed its determination to build on the nation's history of success in leading-edge discovery and innovation.

NSF has identified critical funding priorities that will provide long-term benefits for the nation. We have made difficult choices to reduce or eliminate lower priority programs, and seized opportunities to leverage resources for maximum impact.

## **FY 2014 PRIORITIES**

The investments that form this Budget Request flow from the goals established in the agency's strategic plan: Transform the Frontiers, Innovate for Society, and Perform as a Model Organization. In FY 2014, key NSF investments in all fields of science and engineering strive to create new knowledge, enable discovery, address complex societal problems, and promote national prosperity.

In keeping with NSF's mission of advancing basic research in science, engineering, and education, this Request ensures the health of fundamental science and engineering across all disciplines, primarily through merit reviewed awards to researchers at colleges and universities throughout the country. There are six areas where core research is encouraged to enable scientists to address problems that require integration across more than one discipline. These priority investments, which encompass roughly 11 percent of the FY 2014 Request, focus on areas where progress in basic research is vital to addressing key national challenges, such as spurring innovation in manufacturing, improving data storage and analysis (e.g., Big Data), securing critical infrastructure, and promoting innovation and economic growth generally. Priorities include:

- **Cyber-enabled Materials, Manufacturing, and Smart Systems (CEMMSS)** (\$300.42 million) will transform static systems, processes, and edifices into adaptive, pervasive "smart" systems with embedded computational intelligence that can sense, adapt, and react. Through CEMMSS, NSF participates in the Administration's Materials Genome Initiative (MGI), the National Robotics Initiative (NRI), and the Advanced Manufacturing Partnership. These investments fund research in areas of national importance, such as cyber-physical systems and advanced robotics research, materials processing and manufacturing, and advanced semiconductor and optical device design. These efforts are integral to the Administration's overall emphasis on strengthening advanced manufacturing.
- **Cyberinfrastructure Framework for 21<sup>st</sup> Century Science, Engineering, and Education (CIF21)** (\$155.47 million) aims to expand investment in the Big Data/National Data Infrastructure program, a joint solicitation with the National Institutes of Health (NIH). NSF, as the lead agency, strives to coordinate development of new knowledge, tools, practices, and infrastructure that will enable breakthrough discoveries in science, engineering, medicine, commerce, education, and national security.
- **NSF Innovation Corps (I-Corps)** (\$24.85 million) continues to build a national innovation ecosystem by improving NSF-funded researchers' access to resources that can assist in bridging the gap between discoveries and downstream technological applications, including commercialization of new technologies, products, and processes. In FY 2014, NSF will continue investment in Innovation Teams, and will expand support for I-Corps Nodes and I-Corps Sites.
- **Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE)** (\$63.0 million) investment will continue to strengthen NSF's support of interdisciplinary, potentially transformative research by complementing existing efforts with a suite of highly innovative Foundation-wide activities and funding opportunities.
- **Science, Engineering, and Education for Sustainability (SEES)** (\$222.79 million) addresses the need to develop a sustainable world where human needs are met equitably without harm to the environment and without sacrificing the ability of future generations to meet their needs. SEES uses a systems-based approach to understanding, predicting, and reacting to change in the linked natural, social, and built environment and addresses challenges in environmental and energy research and

education. In FY 2014, NSF focuses on enhancing the Water Sustainability and Climate, Cyber-SEES, Hazards, and Sustainable Chemistry, Engineering and Materials (SusChEM) programs.

- The **Secure and Trustworthy Cyberspace (SaTC)** (\$110.25 million) investment aligns NSF's cybersecurity investments with the four thrusts outlined in the national cybersecurity strategy, *Trustworthy Cyberspace: Strategic Plan for the Federal Cybersecurity Research and Development Program*. SaTC seeks to protect the Nation's information technology infrastructure from a wide range of threats that challenge its security, reliability, availability, and overall trustworthiness.

#### **Additional Priorities and Highlights**

- NSF aims to increase the operational efficiency of **U.S. activities in the Antarctic** (\$22.0 million) by implementing the recommendations of the U.S. Antarctic Program Blue Ribbon Panel (BRP) report, *More and Better Science in Antarctica through Increased Logistical Effectiveness*. Emphases include safety and health improvements, investments with positive net present value, and facilities renewal at McMurdo and Palmer stations. Additionally, NSF aims to plan and execute more effective observational approaches to the Antarctic science community, as outlined in the 2011 National Research Council report, *Future Science Opportunities in Antarctica and the Southern Ocean*.
- In FY 2014, NSF introduces three activities to improve program effectiveness and efficiency by:
  - Ensuring **Public Access** (\$2.50 million) to NSF research. This initiative reflects the Administration and NSF priority to make government more open and accessible by improving public access to NSF-funded research. In FY 2014, NSF establishes a policy framework that will build on and refine existing technology to track research products, allow investigators and awardees to make their products known and available, and allow the general public, researchers, and policy makers to locate and make use of those products. This effort includes establishing a publicly-accessible repository for publications, leveraging existing federal infrastructure to the maximum extent possible.
  - Establishing an **Evaluation Capability** (\$5.50 million) to improve NSF's ability to inform policy decisions and improve the impact of research grant investments. In FY 2014, NSF will build a central evaluation expertise and support capability to promote rigor, transparency, and independence of evaluations. The centralized capability will coordinate the evaluation of NSF-wide activities, expand data collection, and ensure that the results of evaluation are used to improve NSF programs.
  - Improving the operational execution of the **Merit Review Process** (\$4.09 million), an essential step to address the extraordinary pressures the Foundation faces due to a growing number of proposals and intense competition for NSF funding. The FY 2014 Request will support a multi-year effort to improve major aspects of this process, including use of virtual meeting technologies for merit review; technological support for the management of reviewers and reviews; increased automation of the preliminary processing of proposals; and demand management.
- **Clean Energy** (\$372.45 million): NSF's clean energy investments include research related to sustainability science and engineering, such as the conversion, storage, and distribution of diverse power sources (including smart grids), and the science and engineering of energy materials, energy use, and energy efficiency.
- **Research at the Interface of Biological, Mathematical and Physical Sciences, and Engineering (BioMaPS)** (\$50.67 million) is a collaboration among the Directorates for Biological Sciences,

Mathematical and Physical Sciences, and Engineering, that seeks to discover fundamental knowledge at the intersections of these established disciplines. This activity will produce critical knowledge needed to catalyze the development of new technologies essential to the Nation's prosperity and economic competitiveness and will advance emerging areas of the bioeconomy, as described in the Administration's *National Bioeconomy Blueprint*.

- The **Cognitive Science and Neuroscience** investment (\$13.85 million) supports a focused, cross-foundation activity with three multi-year goals: to advance understanding of adaptation to the ever-changing world; to determine the mechanisms underlying decision-making and problem-solving in a dynamic environment; and to break the neural code by elucidating how the brain represents the world around us. This builds on ongoing NSF-wide support (approximately \$70 million per year) for fundamental research relevant to cognitive science and neuroscience. NSF's funding in FY 2014 will also contribute to the Administration's multi-agency research initiative designed to revolutionize understanding of the human brain. FY 2014 activities include workshops held to identify specific gaps in our current understanding of these issues and intractable technology problems that prevent scientific breakthroughs. These will allow development of a framework for future efforts in the Administration's initiative.
- The **Faculty Early Career Development program (CAREER)** (\$223.73 million) develops the future STEM workforce through support of young faculty who are dedicated to integrating research with teaching and learning. In FY 2014, NSF will support approximately 500 new awards. The CAREER portfolio includes projects that range across all fields of science and engineering supported by the Foundation, including high priority fields such as clean energy, climate change, STEM education, and cybersecurity. Within CAREER, NSF will support more fully utilizing the talents of individuals in all sectors of the American population by promoting Career-Life Balance, including supplemental funding requests to employ research technicians or the equivalent for up to three months to sustain research when principal investigators are on family leave.

### **Science, Technology, Engineering, and Mathematics (STEM) Education**

NSF maintains a strong commitment to advancing science and engineering education at all levels and to strengthening the Nation's workforce in STEM. The Administration is proposing a government-wide reorganization of STEM education programs to support a cohesive national STEM strategy. As part of this reorganization, in FY 2014 NSF presents a comprehensive agency-wide program to address undergraduate education and expands its leadership role in graduate education.

- **Catalyzing Advances in Undergraduate STEM Education (CAUSE)** (\$123.08 million) is a comprehensive agency-wide program for FY 2014 that aims to maximize the impact of NSF's considerable ongoing investments in STEM undergraduate education. CAUSE aims to improve STEM learning and learning environments; broaden participation in STEM and increase institutional capacity; and build the STEM workforce of tomorrow.
- Funding for the **Research Experiences for Undergraduates (REU) Sites and Supplements** (\$79.18 million total) is increased \$13.19 million over the FY 2012 Enacted. This additional funding will support enhanced research experiences for students in their first two years of college, as recommended by the President's Council of Advisors on Science and Technology (PCAST) in their report, *Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Mathematics*.

- The **National Graduate Research Fellowship program (NGRF)** (\$325.14 million) builds on and expands the longstanding NSF Graduate Research Fellowship program (GRF) to incorporate features and opportunities that allow fellows to gain specialized experiences and training in key STEM areas. Through this expanded program, an increase of approximately 700 fellows is expected, bringing the total estimated number of new fellows awarded in FY 2014 to 2,700.
- The **NSF Research Traineeships (NRT)** program (\$55.07 million) is the Foundation's investment in traineeships that focus on strategically identified research areas, mutually leveraging NSF's traineeship and research investments. NRT will build on NSF's previous investments – particularly the Integrative Graduate Education and Research Traineeship (IGERT) program – to encourage effectual innovation and design of graduate programs to support opportunities within specific disciplines.

## MAJOR RESEARCH EQUIPMENT AND FACILITIES CONSTRUCTION

In FY 2014, NSF requests funding to continue construction of four projects: the Advanced Laser Interferometer Gravitational-Wave Observatory (AdvLIGO), the Advanced Technology Solar Telescope (ATST), the National Ecological Observatory Network (NEON), and the Ocean Observatories Initiative (OOI).

Funds are also requested to begin construction of the Large Synoptic Survey Telescope (LSST), a partnership with the Department of Energy (DOE). LSST was ranked as the number one priority for a large ground-based astronomical facility in the National Academies' most recent *Decadal Survey of Astronomy and Astrophysics* (August 2010).

- **Advanced Laser Interferometer Gravitational-Wave Observatory (AdvLIGO).** A planned upgrade of the existing Laser Interferometer Gravitational-Wave Observatory (LIGO), AdvLIGO will be ten times more sensitive, powerful enough to approach the ground-based limit of gravitational-wave detection.
- **Advanced Technology Solar Telescope (ATST).** ATST will enable study of the sun's magnetic fields, which is crucial to our understanding of the types of solar variability and activity that affect Earth's civil life and may impact its climate.
- **Large Synoptic Survey Telescope (LSST).** LSST will produce an unprecedented wide-field astronomical survey of our universe, including the deepest, widest-field sky image ever. The LSST survey will change every field of astronomical study, from the inner solar system to the large scale structure of the universe.
- **National Ecological Observatory Network (NEON).** NEON will consist of geographically distributed field and lab infrastructure net worked via cybertechnology into an integrated research platform for regional to continental scale ecological research.
- **Ocean Observatories Initiatives (OOI).** OOI will enable continuous, interactive access to the ocean via multiple types of sensors linked by cutting-edge cyberinfrastructure, which will produce never-before-seen views of the ocean's depths.

## MODEL ORGANIZATION

To "Perform as a Model Organization" is an internally focused strategic goal that emphasizes the agency's desired outcome of attaining excellence in all aspects of its operations. Model Organization underpins NSF programmatic activities and encompasses all the agency's management activities. It also includes support for the activities of the Office of Inspector General (OIG) and the National Science Board (NSB), which are provided in separate appropriations.

## **iTRAK**

NSF will continue to modernize its financial management systems through the implementation of iTRAK. iTRAK will transition NSF from its legacy financial system to a fully integrated financial management solution. In FY 2014, the total request for iTRAK is \$2.60 million.

### **Promoting Efficient Spending**

Efforts are underway in multiple accounts to reduce administrative costs through efficiencies in response to the Administration's Promoting Efficient Spending initiative (Executive Order 13589) and *Promoting Efficient Spending to Support Agency Operations* (OMB M-12-12). Travel costs across NSF will be held at no more than \$27.67 million in FY 2014, an amount \$5.60 million below FY 2010 levels. This is accomplished through strategic efficiencies that achieve savings while preserving the travel necessary for mission-critical oversight and management responsibilities. In addition, NSF will also employ strategic sourcing of administrative support contracts, specifically for printing and wireless devices.

## **PERFORMANCE AND EVALUATION**

NSF embraces the use of goals to drive performance improvements. In FY 2014, NSF has set ten performance goals so that NSF can strategically monitor and oversee progress being made on the Foundation's most important activities: priority program investments, research infrastructure investments and key management initiatives. NSF's goals are:

- **Ensure that Key Program Investments are on track:** Meet critical targets for several key program investments: CEMMSS, CIF21, I-Corps, INSPIRE, SaTC, and SEES. Progress will be monitored using a set of common milestones and indicators.
- **Ensure that Infrastructure Investments are on track:** Ensure program integrity and responsible stewardship of major research facilities at varying stages of their lifecycle. This involves construction project monitoring, response to advisory reports, and deployment of the first implementation of the NSF Public Access system.
- **Use Evidence to Guide Management Decisions:** The Foundation will use evidence-based reviews to guide management investments.
- **Improve Undergraduate Education:** The Foundation will establish an NSF-wide undergraduate STEM education program that is evidence-based and evidence-building.
- **Enhance National Graduate Research Fellowships:** NSF will enhance the Graduate Research Fellowship program to provide a wider range of career development opportunities.
- **Promote Career-Life Balance Policies and Practices:** NSF aims to promote policies and practices that support more fully utilizing the talents of individuals in all sectors of the American population, principally women, underrepresented minorities, and persons with disabilities.
- **Foster an Environment of Diversity and Inclusion:** The Foundation seeks to foster an environment of diversity and inclusion while ensuring compliance with the agency's civil rights programs.
- **Modernize Financial System:** iTRAK is the Foundation-wide effort to transition NSF from its legacy financial support system to a fully integrated financial management shared services solution to ensure continuous improvement and achieve high levels of customer service.

- **Make Timely Award Decisions:** NSF aims to inform applicants whether their proposals have been declined or recommended for funding within 182 days, or six months of deadline, target, or receipt date, whichever is later.
- **Enable Increased Use of Virtual Merit Review:** NSF seeks to incorporate technological innovations into the merit review process by expanding the use of virtual merit review panels.

## **CUTS, CONSOLIDATIONS, AND SAVINGS**

NSF's FY 2014 Request follows a thorough examination of programs and investments across NSF to determine where the potential exists for more innovative investments. In addition to last year's proposals, this Request includes six terminations; two reductions; and one consolidation, totaling \$36.86 million below the FY 2012 Enacted level.

**Nanoscale Science & Engineering Centers (NSECs)** (-\$18.61 million): six NSEC centers are terminated due to center graduations and a transition to the Nanosystems Engineering Research Centers (NERCs) program. NSF will continue to support five continuing NSECs in FY 2014.

Two programs are eliminated within the Directorate for Mathematical and Physical Sciences (MPS). **CCAT** (formerly the Cerro Chajnantor Atacama Telescope) **Design and Development** (-\$1.50 million total) concludes in FY 2013. Future NSF contributions to construction and/or operations will depend on a successful proposal to a competed midscale activities program. The **International Materials Institutes (IMI)** (-\$1.58 million total) were concluded after an internal evaluation of program achievements found that despite the success of individual projects, the collective effort has not made the intended impact.

**Virtual Organizations** (-\$5.0 million total) has achieved its programmatic goals to support scientific research to advance understanding of the effectiveness of virtual organizations and how they can enable and enhance science and engineering research and education. The transition to supporting application of virtual organizations to science and engineering communities is now underway in multiple programs within the Directorate for Computer and Information Science and Engineering.

The **Sensors and Sensing Systems (SSS)** program (-\$3.0 million) is reduced because there are other programs both within NSF and at other agencies that principal investigators can apply to for support. The program will be refined to have a narrower and more targeted focus.

**University Radio Observatories (UROs)** (-\$1.80 million) is being superseded scientifically by NSF's Atacama Large Millimeter/submillimeter Array (ALMA). It is expected that UROs will be eligible to compete for future funding in a broader midscale activities program.

The Directorate for Education and Human Resources (EHR) will shepherd two major realignments to the current NSF STEM Education portfolio in order to use existing resources more effectively through a streamlined and consolidated approach. The new **Catalyzing Advances in Undergraduate STEM Education (CAUSE)** program includes undergraduate programs in EHR as well as Research and Related Activities (R&RA) directorates. NSF will take a leadership role in the coordination of government-wide graduate STEM education programs while developing national fellowship and traineeship programs.

As part of NSF's realignment of its STEM Education portfolio, two programs are terminated within the Directorate for Geosciences (GEO). The goals of the **Geoscience Teacher Training (GEO-Teach)** (-\$2.0 million) program continue to be served through other STEM education initiatives at NSF. The **Centers for Ocean Science Education Excellence (COSEE)** (-\$3.37 million) is terminated as the

program has fulfilled its original goals. GEO will turn its attention to new educational initiatives through CAUSE.

### **Concluding Remarks**

Mr. Chairman, let me close with the words of the scientist and statesman Benjamin Franklin, “An investment in knowledge pays the best interest.”

We take for granted such technological marvels as lasers, computers, the Internet, wireless communications, weather-observing satellites, advanced medicines, and others. And yet those technologies would not exist without the scientific discoveries that made them possible. Those discoveries have fostered long-term economic growth, educated the next generation of scientists and engineers, and addressed critical national needs.

NSF-empowered discoveries have returned unimagined dividends to the American people. To keep those benefits flowing, we need to constantly replenish the wellspring of new ideas and train new talent while serving as good stewards of the public trust. This is the fundamental and continuing mission of NSF.

The Foundation plays a vital role in ensuring that America remains at the epicenter of the ongoing revolution in research and discovery that is driving twenty-first century economies. More than ever, the future prosperity and well-being of Americans depend on sustained investments in science and engineering, and NSF will continue to be central to that effort. The FY 2014 budget request acknowledges the Foundation’s pivotal role in ensuring America's future.

Mr. Chairman and members of the Subcommittee, I hope that this overview has given you a taste of just how very important the National Science Foundation and its activities are to the future prosperity of the United States. I look forward to working with you in months ahead, and I am happy to answer any questions you may have.