



**Dr. France Córdoba
Director
National Science Foundation**

**Before the
Committee on Appropriations
Subcommittee on Commerce, Justice, Science and Related Agencies
United States House of Representatives**

**on
The President's Fiscal Year 2017 Budget Request
for the National Science Foundation**

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Chairman Culberson, Ranking Member Honda, and Members of the Subcommittee, it is my privilege to be here with you today to discuss the National Science Foundation's (NSF) fiscal year (FY) 2017 Budget Request.

The cornerstone of NSF is the merit-based, competitive process that fosters the highest standards of excellence and accountability. The programs and practices which the hard-working and dedicated staff at NSF have created have been emulated around the world, and they have nurtured the creative talents of hundreds of thousands of scientists, engineers, students and educators in every part of the U.S. Their work has also supported the discoveries of some 217 American Nobel Prize winners who represent about 70% of all U.S. Nobelists since 1950.

NSF's comprehensive and flexible support of meritorious projects enables the Foundation to identify and foster both fundamental and transformative discoveries and broader impacts within and among fields of inquiry. NSF has the latitude to support emerging fields, high-risk ideas, interdisciplinary collaborations, and research that pushes – and even creates – the very frontiers of knowledge. In these ways, NSF's discoveries inspire the American public – and the world.

The NSF mission is to look toward the frontier – to identify the most innovative and promising new research and education projects. NSF specifically targets its investments in discovery research at the frontiers of science and engineering. Here, advances push the boundaries of innovation, progress, and productivity.

We identify such frontiers by sticking to our proven, “bottom-up” philosophy. The best ideas come directly from the scientific and engineering community. No better example comes to mind

than the recent first direct detection of gravitational waves by NSF's Laser Interferometer Gravitational-Wave Observatory (LIGO). This historic discovery first began to be funded by NSF in the 1970's as a transformational idea to prove one of the predictions of Einstein's theory of General Relativity. This detection will continue to push the boundaries of science and discovery for decades to come and illustrates the importance of NSF and its role in advancing discovery.

NSF is the only federal agency with a mandate to support research and education in every discipline. The results of frontier research have a long record of improving lives and meeting national needs. They are the very bedrock of economic growth; the path to sustainability in energy, agricultural, and environmental domains; the seeds of the next technology revolution; and the foundation for advances in medicine. Sustained momentum in NSF's programs is essential for progress in science and engineering. NSF's broad scope uniquely positions us to integrate the natural sciences and engineering with social, behavioral, and economic sciences to address the complex societal challenges of today.

The Foundation's annual budget represents just four percent of the total federal budget for research and development, but accounts for 24 percent of the total federal support for basic research conducted at U.S. colleges and universities, and this share increases to 60 percent when medical research supported by the National Institutes of Health is excluded. In many fields NSF is the primary source of federal academic support.

To fuel the innovations of the future, NSF continues to support fundamental research and education in all fields of science and engineering to maintain a global edge in the competition for new ideas and the most talented people. The core science and engineering disciplines form the "building blocks" for future innovations. NSF supports the new ideas and approaches needed to advance interdisciplinary research which is a hallmark of contemporary science and engineering. In all these activities, we keep a steady focus on the frontier, where discoveries, and discoverers, begin.

THE NSF FY 2017 BUDGET REQUEST

The FY 2017 Budget Request for the National Science Foundation (NSF) continues NSF's longstanding commitment to supporting research that drives scientific discovery, maintains America's global competitiveness, and builds the modern workforce that is critical for addressing the complex challenges that face the Nation. NSF is vital because we invest in basic research and people who make the discoveries that transform our future. Those discoveries are a primary driver of the U.S. economy, enhance our Nation's security, and give the country the competitive edge to remain a global leader.

NSF's FY 2017 Budget Request is \$7.964 billion, an increase of \$500.53 million (6.7 percent) over the FY 2016 Estimate. This includes \$7.56 billion in discretionary budget authority and \$400 million in new mandatory budget authority. The FY 2017 Budget Request reflects a carefully chosen portfolio that supports the fundamental research that is NSF's hallmark and

creates and sustains key partnerships with other federal agencies, industry, and international entities. Through sustained, longstanding investments in all areas of science, engineering, and education, this submission ensures a robust return on investment for all American citizens. NSF's broad portfolio positions the agency to contribute productively and rapidly to important national challenges. For example, the Computer Science for All initiative, announced by the President on January 30, 2016, builds on ongoing NSF activities that foster rigorous and engaging computer science education in schools across the Nation. Similarly, a range of NSF-supported advances and innovations will help to launch the Administration's cancer "moonshot." These include fundamental research in biology, biochemistry, biophysics; data-driven discovery enabled by machine learning techniques and leveraging NSF-cyberinfrastructure; and engineered systems in nanotechnology, imaging, material science and robotics.

FY 2017 MAJOR EMPHASES

NSF's FY 2017 Budget Request includes two areas of major emphasis: Clean Energy R&D and strengthening support for core activities, with a special focus on support for early career investigators.

The President joined other world leaders at the recent Paris climate negotiations to launch "Mission Innovation", a landmark commitment to dramatically accelerate public and private global clean energy innovation, by investing in new technologies that will define a clean, affordable, and reliable global power mix. Through this initiative, the U.S. and 19 other countries have committed to doubling their governmental clean energy research and development investment over five years. Successful innovation in clean energy requires broad participation, including nontraditional approaches and innovators close to stakeholders that will benefit from clean energy solutions. Mission Innovation provides a robust framework to expand and better integrate clean energy research across agencies. The Budget for NSF includes \$512.22 million for investments in Clean Energy R&D. NSF's clean energy portfolio supports research and education in innovative renewable and alternative energy sources for electricity (solar, wind, wave, geothermal) and fuels (chemical and biofuels). NSF funding also addresses the collection, conversion, storage, and distribution of energy from diverse power sources, including smart grids; the science and engineering of energy materials; and energy use and efficiency, including for computing systems. Clean energy research addresses our advancement toward reliable and sustainable energy resources and systems that preserve essential ecosystems and environmental services, promote positive social and economic outcomes, and prepare society to responsibly adopt them.

New one-year mandatory funding totaling \$400 million will support the fundamental, curiosity-driven research that is NSF's principal contribution to the Nation's science and technology enterprise. In particular, this funding will support more scientists and engineers at the early stages of their careers – who bring particular expertise in data- and computationally-intensive activities – to quicken the pace of discovery and advance the leading edge of research and education. This funding will allow for an estimated 800 additional research grants to be made from a pool of highly-rated proposals that would otherwise be declined for lack of funding. This additional funding would bring NSF's FY 2017 funding rate to an estimated 23 percent.

FY 2017 CROSS-FOUNDATION INVESTMENTS

NSF continues to bring together researchers from all fields of science and engineering to address today's cross-disciplinary questions and challenges through Foundation-wide activities. In FY 2017, NSF continues to support its four FY 2016 cross-foundation investments.

Understanding the Brain (UtB) (\$141.62 million) encompasses ongoing cognitive science and neuroscience research and NSF's contributions to the Administration's Brain Research through Advancing Innovation and Neurotechnologies (BRAIN) Initiative. The goal of UtB is to enable scientific understanding of the full complexity of the brain in action and in context. Priorities include: brain-inspired concepts and designs; development of innovative technologies, tools and instrumentation, computational infrastructure, theory, and models to understand the brain; identification of the fundamental relationships among neural activity, cognition, and behavior; understanding how the brain responds and adapts to changing environments and recovers from lost functionality; and BRAIN workforce development and training for the next generation of neuroscientists and neuroengineers. Improved understanding of the brain will promote brain health; enable engineered solutions that enhance, replace or compensate for lost function; improve the effectiveness of formal and informal educational approaches; and lead to brain-inspired smarter technologies for improved quality of life. Basic research in these areas will also offer novel insights into how cognitive abilities develop and can be maintained and improved throughout the lifespan.

Risk and Resilience (\$43.15 million) investments aim to improve predictability and risk assessment and increase preparedness for extreme natural and man-made events in order to reduce their impact on quality of life, society, and the economy. NSF is uniquely positioned to support such improvements that require multidisciplinary expertise in science, engineering, and education, such as understanding the dynamic processes that produce extreme events, how people respond to extreme events, and how to engineer resilient infrastructure, including in the context of smart and connected communities. One supporting program is Critical Resilient Interdependent Infrastructure Systems and Processes, which directly addresses the need for the resilient and reliable infrastructure that is critical to U.S. economic competitiveness and national security. Another is Prediction of and Resilience against Extreme Events, which aims to enhance the understanding and prediction of, as well as resilience and sustainable responses to, extreme events and geohazards, and their impact on natural and human systems.

Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS) (\$62.18 million) is an NSF-wide investment that aims to understand, design, and model the interconnected food, energy, and water system through an interdisciplinary research effort that incorporates all areas of science and engineering and addresses the natural, social, and human-built factors involved. Throughout NSF, activities address food, energy, or water, such as Water Sustainability and Climate and Hazards; Coupled Natural and Human Systems; and Basic Research to Enable Agricultural Development. INFEWS, however, is the first program to study the interconnected food-energy-water nexus. The need for this program is increasingly urgent, as growing U.S. and global populations, changes in land use, and increasing geographic and seasonal variability in

precipitation patterns are placing an ever-increasing stress on these critical resources. NSF, through INFEWS, is uniquely poised to focus not only on the fundamental science and engineering questions at this nexus, but to train the next generation of researchers in this interdisciplinary area.

NSF INCLUDES (Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science), is an integrated, national initiative to increase the preparation, participation, advancement, and potential contributions of those who have been traditionally underserved and/or under-represented in the science, technology, engineering, and mathematics (STEM) enterprise. In FY 2017, NSF investment in this key priority is \$16.0 million. Building on activities underway in FY 2015 and FY 2016, NSF will proceed to full implementation of NSF INCLUDES in FY 2017. Investments aim to produce, through alliances organized within a national network, rapid progress on changing the balance of diversity in science and engineering, have significant national impact for the participation of underrepresented groups, stimulate the community, forge new partnerships, and catalyze new approaches. NSF INCLUDES will build on and amplify other NSF investments in broadening participation.

FY 2017 ONGOING NSF-WIDE PRIORITIES

NSF invests in a number of ongoing Foundation-wide programs that focus on addressing the most pressing challenges that face our Nation today. Foundation-wide programs and priorities bring together researchers from all fields of science and engineering to work on projects no one field can address on its own. These interdisciplinary investments are carefully balanced with a longstanding commitment to the fundamental research that addresses grand challenges and furthers basic scientific knowledge.

- **Cyber-Enabled Materials, Manufacturing, and Smart Systems (CEMMSS)** (\$257.12 million) aims to integrate a number of science and engineering activities across the Foundation – breakthrough materials, advanced manufacturing, and smart systems, which includes robotic, cyber-physical, and autonomous systems. It will address pressing technological challenges facing the Nation and promote U.S. economic competitiveness in a variety of sectors. In FY 2017, CEMMSS continues to leverage key interagency activities, including the Administration’s Materials Genome Initiative, Advanced Manufacturing Partnership, and the National Robotics Initiative. Through CEMMSS, NSF also invests in Advanced Manufacturing (\$175.74 million) to advance cutting-edge manufacturing, as described in the *National Strategic Plan for Advanced Manufacturing*.
- **Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education (CIF21)** (\$100.07 million) accelerates and transforms the process of scientific discovery and innovation by providing advanced cyberinfrastructure that enables new functional capabilities in computational and data-enabled science and engineering across all disciplines. CIF21 has a planned sunset at the end of FY 2017, but efforts will inform a subsequent, focused set of activities for FY 2018 as a part of the Administration’s new National Strategic Computing Initiative (NSCI).

- **NSF Innovation Corps (I-Corps™)** (\$30.0 million) improves NSF-funded researchers' access to resources that can assist in bridging the gap between discoveries and speed knowledge transfer to downstream technological applications and use at scale. In FY 2017, NSF will continue to support I-Corps™ Nodes and I-Corps™ Sites to further build, utilize, and sustain a national innovation ecosystem that helps researchers effectively identify viable market opportunities and augments the development of technologies, products, and processes that benefit the Nation.
- **Research at the Interface of Biological, Mathematical, and Physical Sciences (BioMaPS)** (\$29.81 million) involves the Directorates for Biological Sciences and Mathematical and Physical Sciences, and it seeks to advance discovery at the intersections of these established disciplines. Research includes activities such as development of models, informed by statistical physics that establish the mechanisms linking the biological function of chromosomes to their cellular structure.
- **Science, Engineering, and Education for Sustainability (SEES)** (\$52.48 million) supports investments to increase understanding of the integrated system of supply chains, society, the natural world, and alterations humans bring to Earth, in order to create a sustainable world. FY 2017 is the last year in which funding will be formally associated with the SEES portfolio; however, through the planned sunsetting, SEES continues to support important scientific contributions and will make significant progress towards achieving programmatic goals through projects currently underway. Several SEES components with significant community interest will be continued through core programs.
- The **Secure and Trustworthy Cyberspace (SaTC)** (\$149.75 million) investment aims to build the knowledge base in cybersecurity that enables discovery, learning and innovation, and leads to a more secure and trustworthy cyberspace. Through a focus on long-term, foundational research, SaTC will develop the scientific foundations for cybersecurity research for years to come. SaTC also focuses on the training of the next generation cybersecurity workforce, especially for government. SaTC aligns NSF's cybersecurity investments with the national cybersecurity strategy.

ADDITIONAL HIGHLIGHTS

NSF continues to emphasize investments in important or emerging areas that have been developed in recent years. For example:

- NSF aims to increase the operational efficiency of **U.S. activities in the Antarctic** (\$23.50 million) by continuing progress on a multi-year commitment toward more efficient and cost-effective science support as recommended by the U.S. Antarctic Program Blue Ribbon Panel report, *More and Better Science in Antarctica through Increased Logistical Effectiveness*. Emphases include investing in cargo-carrying capabilities for the South Pole heavy traverse, adding to its ability to deliver fuel, as well as continued investment in vehicle fleet and lifecycle capital equipment purchases to modernize Antarctic inventories and ensure facilities efficiency. This includes targeted investment in information technology infrastructure upgrades such as network management hardware, as well as design work for a new satellite earth station to move the primary communications facility from Black Island to McMurdo

Station. Included in the total investment for FY 2017 is \$5.0 million for the Antarctic Infrastructure Modernization for Science (AIMS) preconstruction planning project.

- In FY 2017, support for several of NSF's **astronomy and astrophysics** facilities investments reaches a decision point. A 2012 portfolio review was conducted under the auspices of the Advisory Committee for the Directorate for Mathematical and Physical Sciences in order to align budget realities with the 2010 National Research Council decadal survey, "*New Worlds, New Horizons in Astronomy and Astrophysics*." Based on these recommendations, NSF is developing potential divestment options for several facilities. In a constrained budget environment, this is the best path to doing new things on the frontiers of astronomy.
- As the CIF21 investment sunsets in FY 2017, NSF will develop a subsequent, focused set of activities aligned with the Administration's new **National Strategic Computing Initiative (NSCI)** (\$33.20 million) in order to focus efforts on advancing the Nation's computational infrastructure for science and engineering research. The rich topic of "Big Data", encompassing data science, data assimilation, data management, data policy, community building, and workforce development, will remain a strategic focus under the new NSF Data for Scientific Discovery and Action (D4SDA) activity, which will span research and research infrastructure.

EDUCATION AND STEM WORKFORCE

NSF's education and STEM workforce investment, centered in the Directorate for Education and Human Resources (EHR), funds activities that support students, teachers, researchers, and the public. The EHR investment in core STEM education research is critical to building the Nation's knowledge base for improving STEM learning. In keeping with the Administration's priorities and the strategic goals for STEM education as described in the Federal STEM Education Strategic Plan,¹ NSF's investments for FY 2017 focus on the following priorities:

- The **CyberCorps®: Scholarship for Service (SFS)** program (\$70.0 million) supports cybersecurity education and research at higher education institutions. SFS also focuses on workforce development by increasing the number of qualified students entering the fields of information assurance and cybersecurity, which enhances the capacity of the United States higher education enterprise to continue to produce professionals in these fields to secure the Nation's cyberinfrastructure. In FY 2017, \$25.0 million of the total funding will lay the groundwork for SFS alumni to be available over the course of their careers to serve the federal government to help respond rapidly to cybersecurity challenges.
- **Computer Science for All (CS for All)** (\$20.0 million) will build on ongoing efforts to enable rigorous and engaging computer science education in schools across the Nation. Funds will support the development and assessment of prototype instructional materials, scalable and sustainable professional development models, approaches to preservice preparation for computer science teachers, and teacher resources. CS for All will also fund

¹ National Science and Technology Council. Federal Science, Technology, Engineering, and Mathematics (STEM) Education 5-Year Strategic Plan www.whitehouse.gov/sites/default/files/microsites/ostp/stem_stratplan_2013.pdf

research that will add to knowledge of effective approaches to the teaching and learning of computer science across grades K-12.

- The **Improving Undergraduate STEM Education (IUSE)** (\$109.0 million) initiative supports the development of the STEM and STEM-capable workforce by investing in the improvement of undergraduate STEM education, with focus both on attracting and retaining students, and on degree completion..
- Through the **Advanced Technological Education (ATE)** (\$66.00 million) program, NSF is able to reach technicians in undergraduate programs preparing for the high-technology fields that drive our Nation's economy. The ATE program is actively engaged in connecting community college educators funded by the program to the Institutes for Manufacturing Innovation within the National Network for Manufacturing Innovation.
- The **Graduate Research Fellowship (GRF)** (\$332.16 million) program recognizes students with high potential in STEM research and innovation and provides support for them to pursue multidisciplinary research. GRF fellows may participate in Graduate Research Opportunities Worldwide (GROW), which provides opportunities to conduct research with international partner countries and organizations, and Graduate Research Internship Program (GRIP), which provides professional development through research internships at federal agencies. An NSF-wide strategic plan for investment in graduate education will be released in FY 2016.
- The **NSF Research Traineeship (NRT)** (\$58.63 million) program invests directly in the development of the STEM workforce, and in the improvement of the education of tomorrow's STEM workforce. NRT funds proposals to test, develop, and implement innovative and effective STEM graduate education models, to promote interdisciplinary and broad professional training of graduate students, and to foster fundamental research advances in support of national priorities. NRT thus provides a mechanism for developing a knowledge base about the implementation and impact of innovative graduate traineeship programs and graduate education policies.

MAJOR RESEARCH EQUIPMENT AND FACILITIES CONSTRUCTION

In FY 2017, NSF requests funding to begin construction of one new project, the Regional Class Research Vessel (RCRV), and to continue construction of two projects, the Daniel K. Inouye Solar Telescope (DKIST) and the Large Synoptic Survey Telescope (LSST).

- The **Regional Class Research Vessel (RCRV)** (\$106.0 million) project will initiate construction of two ships to meet anticipated ocean science requirements for the U.S. East Coast, West Coast, and Gulf of Mexico consistent with the recent report, *Sea Change: 2015-2025 Decadal Survey of Ocean Sciences*.² The RCRV project is a major component in the plan for modernizing the U.S. Academic Research Fleet (ARF).³

² www.nap.edu/catalog/21655/sea-change-2015-2025-decadal-survey-of-ocean-sciences

³ National Ocean Council. Federal Oceanographic Fleet Status Report, 2013
www.whitehouse.gov/sites/default/files/federal_oceanographic_fleet_status_report.pdf

- The **Daniel K. Inouye Solar Telescope** (\$20.0 million) will enable the study of magneto-hydrodynamic phenomena in the solar photosphere, chromosphere, and corona at unprecedented spatial, temporal, and wavelength resolution to gain information on the creation, interaction, and ultimate annihilation of solar magnetic fields. Determining the role of magnetic fields in the outer regions of the Sun is crucial to understanding the solar dynamo, solar variability, and solar activity, including flares and coronal mass ejections. These can affect civil life on Earth through the phenomena generally described as “space weather” and may have impact on the terrestrial climate. FY 2017 is year nine of an eleven year construction process. In FY 2017, the Coudé rotator platform will be commissioned and accepted. The installation of the Telescope Mount Assembly (TMA) electrical systems will be completed, and commissioning and acceptance testing of the TMA will begin. The Coudé lab room will be complete and various components of the Coudé optics system installed. The first of the five first-light instruments, the visible broadband imager (VBI), will be delivered, assembled and will begin initial checkout.
- The **Large Synoptic Survey Telescope** (\$67.12 million) will be an 8-meter-class wide-field optical telescope designed to carry out surveys of the entire sky available from its site. LSST will collect nearly 40 terabytes of multi-color imaging data every night and will produce the deepest, widest-field sky image ever. It will image the entire visible sky twice per week, as well as issue alerts for moving and transient objects within 60 seconds of their discovery. The LSST surveys will result in a comprehensive data set that will enable hundreds of other fundamental astrophysical studies by the entire research community. FY 2017 is year four of a nine-year construction process. In FY 2017, work on the summit facility will be completed with the installation of the dome. The telescope structure will be factory tested and shipped to the site for installation. Integration of the innovative primary-tertiary mirror into its support cell will begin, and polishing of the secondary mirror will be finished. The camera cryostat will be made, the first sensor raft will be completed, and the camera’s active support structure will be delivered. The data management project expects to deliver its initial archive and finalize the interface to the dedicated education and public outreach system.

ORGANIZATIONAL EXCELLENCE

NSF seeks to integrate mission, vision, and core values to efficiently and effectively execute our activities and provide the flexibility and agility required for all aspects of its operations. This goal incorporates a culture of continuous improvement to ensure effective, inclusive, and accountable programs and merit review processes that provide the greatest value for taxpayer dollars.

In FY 2017, the primary drivers of the increase for the Agency Operations and Award Management (AOAM) account are the headquarters relocation, the 1.6 percent cost-of-living adjustment and related salary and benefit increases, and information technology investments supporting DATA Act requirements, implementation of electronic invoicing, system updates, and increased security. AOAM also supports operational activities to ensure the Foundation has sufficient resources to fully fund ongoing operational requirements and maintain essential

services as we approach the transition to the new NSF headquarters. These include strengthening capabilities in administrative services and human resource management.

CUTS, CONSOLIDATIONS, SAVINGS, AND LOWER PRIORITY PROGRAM

NSF's FY 2017 Request follows a thorough examination of programs and investments across NSF to determine where the potential exists for more innovative investments. This Request includes two proposed terminations, one reduction, and two administrative savings, totaling \$46.10 million.

- **Enhancing Access to the Radio Spectrum (EARS)** (-\$16.0 million) is a cross-cutting program initiated in FY 2012 whose purpose was to fund interdisciplinary research that enhances the efficiency with which radio spectrum is used and/or leads to greater access to wireless services for all Americans. EARS was a partnership of the Directorates for Computer and Information Science and Engineering (CISE), Engineering (ENG), Mathematical and Physical Science (MPS), and Social, Behavioral, and Economic Sciences (SBE) to support research in new wireless communications and spectrum sharing architectures and services. In FY 2017, CISE, ENG, and MPS will terminate investment in EARS, but will continue ongoing support of research for wireless communication, spectrum sharing, and mobile computing as well as the development of wireless and spectrum testbeds. SBE's support concluded in FY 2014.
- **Integrated NSF Support Promoting Interdisciplinary Research & Education (INSPIRE)** (-\$25.35 million) was aimed at strengthening NSF's support of interdisciplinary, potentially transformative research within the directorates by complementing existing efforts with a suite of innovative Foundation-wide activities and funding opportunities. Based on external reviews of the INSPIRE portfolio, coupled with evidence from ongoing cross-cutting programs among directorates, NSF has determined that targeted funding is not necessary to encourage the kinds of projects supported through INSPIRE. Starting in FY 2017, each directorate will continue support for interdisciplinary research through core and cross-cutting programs, coordinating with other directorates and divisions, as necessary, for internal review of these projects.
- **National Solar Observatory (NSO)** (-\$3.50 million) is reduced as part of the planned transition away from existing NSO facilities (NSO Integrated Synoptic Program, Dunn Solar Telescope, and McMath-Pierce Solar Telescope) and toward the Daniel K. Inouye Solar Telescope (DKIST).
- **Strategic Human Capital Support Contracts** (-\$810,000) funding is decreased due to NSF's planned investment in business intelligence and other tools, supported in the FY 2016 Request, which are anticipated to reduce the cost of contract support.
- **Information Dissemination** (-\$440,000) costs associated with maintenance and support of the NSF website are decreased due to a recent retirement of dated infrastructure and the conversion of content to modern platforms.

Concluding Remarks

Mr. Chairman, I've touched on just a handful of programs found in NSF's diverse and vibrant portfolio. NSF's research and education activities underpin the nation's innovation enterprise. America's present and future strength, prosperity and global preeminence depend directly on fundamental research. The scientific and economic record of the past 30 years is proof that an investment in R&D is an investment in a secure future.

NSF's portfolio is continually evolving as we identify and pursue new research at the frontiers of knowledge. An essential part of our mission is to constantly re-think old categories and traditional perspectives. This ability is more important than ever, as conventional boundaries constantly shift and disappear – boundaries between national goals, between disciplines, between science and engineering, and between what is basic and what is applied. NSF, with its mandate to support all fields of science and engineering, is uniquely positioned to meet the needs of researchers exploring human knowledge at these interfaces, whether we're organizing interdisciplinary conferences, enabling cyber-sharing of data and information, or encouraging new collaborations and partnerships across disciplinary and national borders. No other government agency comes close to our flexibility to support STEM education and high-quality basic research.

With intense global competition for knowledge and talent, we must focus our attention on finding the sophisticated solutions that will ensure a prosperous, secure, and healthy future for the nation and the world. We must continue to pursue new understanding about the universe, and our planet within it. Robust NSF investments in discovery research have returned exceptional dividends to the American people, expanding knowledge, improving lives, and ensuring our security. 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. That is the fundamental and continuing mission of NSF.

Mr. Chairman and members of the Subcommittee, I hope my testimony explains how the Foundation plays a vital role in ensuring that America remains at the epicenter of the ongoing revolution in research, innovation, and learning that is driving 21st century economies. More than ever, the future prosperity and wellbeing of Americans depend on sustained investments in our science and technology. NSF has been and continues to be central to this endeavor.

I hope that this overview has given you a taste of how 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 the months ahead as we continue to advance science and engineering in the national interest, and I thank you for your leadership.

I will be pleased to answer any questions you may have.