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on

"Driving Innovation through Federal Investments"

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Madam Chair, Ranking Member Shelby, and Members of the Committee, it is my privilege to be here with you today to discuss the National Science Foundation's important role in innovation and discovery for the nation, in the context of the fiscal year (FY) 2015 Budget Request.

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 and national security. Sustained momentum in NSF's core programs is important 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. For all these reasons, the FY 2015 Budget Request provides increased support for the core fundamental research programs across NSF.

The President's FY 2015 Budget Request reflects wise stewardship of federal funding through innovative, targeted investments during these times of constrained budgets. The Request totals $7.255 billion, an increase of $83.08 million (1.2 percent) over the FY 2014 enacted level. The FY 2015 Request provides robust support for core programs in fundamental research and education in all fields of science and engineering. This investment moves our nation forward by connecting the science and engineering enterprise with potential economic, societal, and educational benefits in areas critical to creating high-quality jobs, growing the economy, and ensuring national security.

An additional $552.0 million is proposed through the Opportunity, Growth, and Security Initiative (OGSI) for NSF, recognizing that additional investment in FY 2015 can spur economic progress, promote opportunity, and strengthen national security. At NSF, OGSI will ensure strong support for core activities that transform the frontiers of learning and discovery. The additional investment provided through this initiative will accelerate progress in broad areas of science and engineering that address clearly defined national priorities, such as advanced manufacturing, clean energy, cybersecurity, cognitive science and neuroscience, and STEM workforce development.

We nonetheless remain deeply concerned about NSF's long-term ability to support the US science and engineering research enterprise if constrained funding levels continue. The President addresses this in the request currently before the Congress through the Opportunity, Growth, and Security Initiative. Sustaining this into future years will be even more important.

If reduced funding levels for NSF were to become a reality, the tangible impacts would be significant: fewer teachers would be trained in high quality math and science education; fewer students would graduate with real-world research experiences under their belts, and less research would occur throughout the country in critical areas such as cybersecurity, disaster resilience, and robotics. What is much more difficult to measure is what we will miss by leaving many of the most innovative ideas on the cutting room floor. We know we have a tremendous, untapped innovative capacity here in the United States. Tapping that capacity drives economic growth, future jobs, and the entrepreneurial spirit of our nation. The investments made by NSF are vital to keeping that world-leading capacity here at home.

NSF: Building a Foundation for Success

As the nation's fundamental research funding agency, NSF is unique. Our mission is as broad as science itself. We support all fields of fundamental science and engineering (S&E), keeping our nation's scientific enterprise focused on the furthest frontiers of research. We recognize and nurture emerging fields; encourage the most insightful ideas; and prepare future generations of scientists and engineers.

NSF's merit review process is widely regarded as the gold standard of scientific review and has been emulated in scientific communities around the world. Proposals submitted to NSF are subjected to a rigorous evaluation process to ensure that each proposal supported by the agency meets the highest standards in terms of intellectual merit and potential impact on society.
On average, about 50,000 experts participate in the merit review process, sharing the benefit of their expertise and providing their time to serve on review panels each year.

NSF is the primary source of federal funding for non-medical basic research at academic institutions, providing approximately 11,000 new awards annually. Competition for funding is intense, with only about one out of five proposals ultimately being approved. The preponderance of NSF support is allocated as grants or cooperative agreements to individual researchers and groups at colleges, universities, academic consortia and small businesses.

Through a variety of venues, NSF cultivates a world-class, diverse S&E workforce that is prepared to contribute to emerging scientific, engineering and technological fields. By integrating research and education, NSF prepares researchers and technicians in industries whose discipline and skill make technological breakthroughs possible. The agency also continually develops a growing cadre of knowledgeable teachers across the country to educate the next generation of technicians in science, technology, engineering and mathematics (STEM) fields. Moreover, NSF augments the nation's research capabilities through investments in advanced instrumentation and facilities.

For decades, NSF has supported scientists and engineers in their pursuit of world-changing discoveries and innovation that, in turn, created opportunities for private sector growth and for Americans to have good jobs. Since 1952, the first year that NSF awarded research grants, 212 Nobel Prize recipients, or roughly 70 percent of all U.S. Nobelists during that time period, have received NSF funding at some point in their careers. Today, their transformative work addresses society's grand challenges in the areas of energy, environment, and health, as well as national and economic security. The United States has a long history of investment in and deployment of technological advances derived from advances in basic research facilitated by NSF. For example, research funded by NSF at the National Center for Atmospheric Research and universities was instrumental in the development of Doppler radar, which regularly benefits most Americans through improved weather forecasting. NSF-supported fundamental research in physics, mathematics, and high-flux magnets led to the development of today's magnetic resonance imaging (MRI), employed ubiquitously throughout medicine.

Furthermore, NSF provides a much-needed bridge between research and discovery that would otherwise be neglected and remain untapped by the commercial marketplace. In the 1970's, research on solid modeling by NSF-funded scientists at Carnegie Mellon University led to widespread use of Computer-Aided Design and Computer-Aided Manufacturing, which together have revolutionized much of the U.S. manufacturing industry. NSF encouraged investigations into design problems that neither private firms nor federal mission agencies were willing to address.

While discovery and innovation underpin our global leadership in science and engineering and consistently provide pathways for entrepreneurs, these activities are also first and foremost human endeavors. Thus, they demand the development of a highly skilled STEM workforce. NSF strives to ensure that students from diverse backgrounds, including women, underrepresented minorities, and persons with disabilities, have sufficient opportunities to engage in empowering learning experiences and inspiring research, no matter their economic circumstances. Sustaining such a world-class workforce is critical.

Federal investments in fundamental science and engineering and STEM training are increasingly important to help establish U.S. leadership in next-generation technologies, especially as other nations intensify their support of research, development, and education. It is crucial that we measure up due to unprecedented global competition for the world-class talent who generate innovative scientific ideas and make up the technical workforce. Despite the constrained budget environment, we must make reasonable investments today to secure our nation's future prosperity.

Examples of NSF Returns on Investments

The results of U.S. investments in science and technology have long driven economic growth and improved the quality of life for successive generations. Science and technology have generated new knowledge and industries, created new jobs, provided new sources of energy, developed new modes of communication and transportation and improved medical care.

The chart below, from an American Electronics Association (AeA) report[1] illustrates how some of today's ubiquitous technologies have been generated by federally-funded frontier research, and the tremendous role NSF has played in helping improve U.S. competitiveness and innovation.

Innovation Resulting from U.S. Federally Funded Research

Innovation	Funder
The Internet	DARPA/NSF
Web Browser	NSF
Bar Codes	NSF
Fiber Optics	NSF
Routers	NSF
MRI	NIH/NSF
Doppler Radar	NSF
Speech Recognition	NSF/DARPA
Nanotechnology	NSF
Computer Aided Design	NSF/DARPA
Global Positioning Satellites	DARPA
The Mouse	DARPA

Notes:
NSF = National Science Foundation
DARPA = Defense Advanced Research Projects Agency
NIH = National Institutes of Health

The AeA report describes how often times it can take 20 years for the results of fundamental research to reach the marketplace. For example, federal funding of solid-state physics and ceramics and glass engineering in the late 1960s created the knowledge base for widespread development and use of fiber optic cable in the 1990s. Much of this seminal work was performed by private industry as well.

[1] Losing the Competitive Advantage? The Challenge for Science and Technology in the United States; American Electronics Association, February 2005.

In 1952, Caltech professor Max Delbruck used one of NSF's first grants to invent molecular biology techniques that enabled one of his students, James Watson, to determine the molecular structure of DNA. Since then, an entire biotechnology industry has bloomed and prospered, with profits reaching $5.2 billion in 2012.

In the 1960s and '70s, NSF provided formative funding for fundamental mathematical and process innovations for manufacturing that industry considered too risky to fund. These led directly to rapid prototyping—and revolutionized how products are designed and manufactured.

In the 1980s, NSF supported the very first computer science departments in U.S. universities, bringing computer science into the research mainstream, and providing a training ground for the first and subsequent generations of computer scientists and entrepreneurs. Today, NSF provides over 80 percent of total federal support for research in computer science conducted in the nation's universities and colleges. Jobs related to computer and information technologies are among the most rapidly growing in the nation according to Bureau of Labor Statistics projections.

In the 1990s, NSF supported pioneering research in the emerging field of nanotechnology. Between 2001 and 2010, NSF-supported centers and networks created 175 start-ups and developed collaborations with over 1,200 companies.

The following inventions, innovations and discoveries provide a sense of the innumerable ways NSF-supported research has served our society.

Airwave Auctions

Investments in basic research often yield unexpected benefits as well. NSF's support of game theory, abstract auction theory, and experimental economics provided the Federal Communications Commission (FCC) with its current system for apportioning the airwaves. Since 1994, FCC "spectrum auctions" have netted over $60 billion in revenue for the federal government and more than $200 billion in worldwide revenue. Although the payoff was unexpected at the time NSF started supporting game-theory research, the payoff is many times greater than the total investment NSF has made in social and behavioral sciences, where this research was funded.

Defining our Universe

In March 2014, NSF-funded scientists, using the BICEP2 telescope in Antarctica, detailed what appears to be the first direct evidence of gravitational waves generated by cosmic inflation. Gravitational waves are a key but elusive prediction of Albert Einstein's general theory of relativity first postulated nearly 100 years ago. If these findings are confirmed, they will help us better understand how our Universe burst into existence. This discovery made headlines around the world.

Novel Nanomaterials

NSF-funded researchers won the Nobel Prize for their discovery of buckyballs—clusters of 60 carbon atoms that resemble a soccer ball. Although measured in just nanometers, or

1 billionth of a meter, buckyballs led the way to creating the strongest materials in the world. Numerous products such as surface coatings to improve wear resistance and drug delivery systems have come from this research. Novel nanomaterials also have applications as sensors, catalysts, and optical and magnetic devices. These developments have fueled rapid growth in the nanotechnology product industry, which is estimated to be valued at more than $2.5 trillion in 2014.

3-D Printing

One of the first practical 3-D printers was patented by NSF-funded researchers at MIT in 1993. Unlike earlier attempts, their machine had evolved to create objects made of plastic, ceramic and metal. The MIT-inspired 3-D printers are now in use all over the world by the aerospace, architecture, automotive, construction, engineering and medical industries. 3-D printing contributed to more than $2.2 billion in global industry in 2012 and is forecast to double by 2015. The technology has evolved not only to include the ability to print in full color, but the first affordable, simple-to-use, home 3-D printers are now available. This consumer-friendly printer, which utilizes the original NSF-supported technology, has received both an American Technology Award for outstanding achievement in Technology Manufacturing and Popular Mechanics 2012 Breakthrough Award for the first 3-D printer designed for the consumer.

Printing Organs, Saving Lives

Almost 115,000 people are waiting for an organ transplant, but fewer than 5,000 transplants take place each year. Bioprinting in 3-D may change that. Organovo Inc., which was founded by NSF-supported biologists, has developed the world's first commercial 3-D bioprinting platform for organs, one of *TIME* magazine's "Best Inventions of 2010." In addition to being used for organ transplants, printed organs will greatly reduce the costs of drug development because they can be used to screen new drugs before clinical trials.

Barcodes

NSF-funded research helped perfect the accuracy of scanners to read barcodes in order to speed shoppers' check-outs and track consumer buying trends. Information gleaned from barcodes helps all industries—from supermarkets to airlines—by determining what products are marketed and, sometimes more importantly, how, to whom and for what price goods are sold. The Department of Veterans Affairs (VA) implemented Bar Code Medication Administration (BCMA) point-of-care in its facilities, cutting overall hospital medication error rates by up to 70 percent.

Closing the Ozone Hole

Within months of the first reports that chlorofluorocarbons might be damaging the world's protective layer of stratospheric ozone, NSF delivered sensors to Antarctica to measure ozone loss. In the U.S. alone, protecting our planet's stratospheric ozone will produce $4.2 trillion in health benefits and prevent 6.3 million deaths from skin cancer from 1990 to 2165, according to the Environmental Protection Agency.

Any Device Anywhere

As part of its start-up funding, Qualcomm received a Small Business Innovation Research award from NSF. Over 21,000 employees and 170 locations later, this company has forever changed the face of digital wireless telecommunications products and services. Qualcomm is now worth more than $100 billion.

Building a Stronger Bulletproof Vest

Spider silk fibers combine enormous strength and elasticity. NSF-supported scientists are unlocking the secrets of silk for a range of human applications, including surgical sutures, artificial ligaments and tendons, automotive air bags and even improved bulletproof vests. The ultimate goal: to give military and law enforcement lighter, more flexible and effective ballistic protection.

Bomb-proofing Airports

NSF-funded researchers developed an ultra-short pulse laser that underpins BioPhotonics Solutions, a company that sells technology to laser manufacturers. In airport screenings, one of the company's newest lasers detects combustible materials, such as powdered ammonium nitrate, in amounts 1/1000th smaller than a grain of sugar.

Touch Screen Technology

No-pressure keyboards ubiquitious in Apple Inc. products were originally developed by a University of Delaware researcher with EPSCoR support from NSF. To help people with hand disabilities, he imagined a keyboard that required a softer touch. His innovation led to the startup company, FingerWorks, which created some of the world's first tablet computers with multi-touch technology. Apple acquired FingerWorks, and the rest is history. Apple sold more than 55 million iPhones in the final quarter of 2013 equipped with a touch keyboard.

Improving Efficiency in Solar Cells

NSF EPSCoR-supported Ph.D. students at the University of Arkansas, Fayetteville have developed methods to make solar panels more efficient while reducing production costs. Their startup company, Picasolar, recently won the Massachusetts Institute of Technology Clean Energy Prize for its patent pending technology. Improving silicon solar cell efficiency by as much as 15 percent, this technology has the potential to save solar panel manufacturers as much as $120 million annually.

Implantable Devices

Almost 26 million Americans, or 8.3 percent of the U.S. population, suffer from diabetes. Three-dimensional printing offers mass-manufactured, implantable blood glucose sensors. Original prototypes made from standard filament were toxic when implanted inside the human body. Researchers found a novel way to replace such toxic substances with naturally occurring riboflavin, or vitamin B2, thereby making the devices safe for implant. NSF-supported biological engineering students received international training in this field at one of Europe's leading science institutes.

Extending the Shelf Life of Food and Medicine

The NSF Science and Technology Center for Layered Polymeric Systems created new and improved plastic wraps to enhance them as gas barriers and protectors. The ultra-thin wraps, comprised of 256 alternating polymer layers, are not only thinner and stronger than standard wraps, they dramatically reduce gas permeability by a factor of two to three. These wraps increase the shelf life of foods, electronics and medicines.

Just "Google" It

During the Internet's infancy, NSF recognized the need for searchable interfaces for the growing collection of online information and supported the Stanford Integrated Digital Library Project. Two graduate students, Larry Page and Sergey Brin, working on this project developed a new way to search the Web by using page ranking. Today, this methodology is at the core of the search engine used by Google, which is worth more than $300 billion and employs over 45,000 people.

Expanding the Internet

NSF helped make the Internet a reality and continues to make it safer, faster and more accessible. In 1985, NSF initiated NSFNET, the first large-scale use of Internet technologies, which linked researchers to the nation's supercomputing centers. Since then, NSF's investments in computer science has helped shape the growth and operation of the modern Internet, fostered international network connections and funded the development of the world's first freely-available Web browser, Mosaic. Along the way, NSF helped transition the network into the self-governing and commercially viable Internet we know today.

Combining Human and Computer Intelligence

Any time you are required to decipher a set of graphically distorted alphanumeric characters on a website, you are likely encountering a reCAPTCHA, a technology initially supported by NSF. One set of characters is used as a security measure to ensure user authenticity, while the other is an image that optical character recognition software could not decipher. By entering reCAPTCHA characters taken from newspaper archives when logging onto the web site, readers helped digitize 20 years of *The New York Times* in less than three months.

Pond Scum Lights Up the Brain

How are algae helping scientists understand complex connections in the human brain? Researchers found unique algal proteins that generate an electric current when hit by light. NSF-funded neuroscientists selectively inserted these proteins into target neurons, enabling the researchers to turn them on and off by exposing them to light. Now widely used, this process called optogenetics is helping researchers identify the functions of target neurons. It is being used to advance understanding of neurological disorders such as schizophrenia and Parkinson's disease, which collectively affect 3.4 million Americans.

Into the Eye of a Storm
Researchers used NSF-supported advanced computing resources to develop a new, high-resolution hurricane forecasting system that incorporates Doppler radar data from planes flying into storms. The forecasts improve storm intensity predictions by an average of 20 to 40 percent over standard official forecasts. This prediction system may become part of the operational forecasting system used by the National Hurricane Center in future emergencies.

The Sky's the Limit
Cloud computing provides on-demand access to data, storage, software and other computing utilities over the Internet. Applications that use this methodology include Gmail and Dropbox, which cumulatively have more than 600 million users. The virtualization software that enables cloud computing resulted from the work of a NSF-funded researcher, who also co-founded VMware, Inc. The company, which provides cloud software and services, is now worth more than $35 billion.

Search-and-rescue Robots
NSF-funded search-and-rescue robots were on-site at Ground Zero within 24 hours of the September 11 attacks to search for survivors. Since then, the robots have evolved to include caterpillar-like crawlers slinking through rubble, mini-helicopters hovering above wreckage and small boats inspecting structures in water. To date, rescue robots have been deployed in more than 30 disasters.

Screening Counterfeit Pharmaceuticals
Worldwide sales of illegal, ineffective, counterfeit pharmaceuticals are likely to top $75 billion this year—a 90 percent increase in the past five years. NSF-supported researchers have optimized mass spectrometers—complex chemical screening devices—to aid in the identification of counterfeit medications. The production of counterfeit drugs, particularly those used to treat malaria and diabetes, is rampant in subtropical and tropical locations. NSF-supported research will help protect the lives of millions endangered by the sale of these fake medicines.

Improving Vision
The world's first ultrafast, ultra-accurate "laser scalpel" was developed by physicists and ophthalmologists at NSF's Center for Ultrafast Optical Science. Called IntraLase, it replaced the old LASIK system that required a blade. It developed into a Small Business Innovation Research award, a company was formed, and IntraLase was acquired for $808 million in 2007. So far over 5 million procedures have been performed using this method, improving the vision and quality of life for millions of Americans.

Donor Exchanges
Nearly 20,000 kidney transplants take place in the U.S. each year, and 4,000 patients die each year as a result of an incompatible donor match. NSF-funded researchers won a Nobel Prize for creating a computational technique that greatly expands the pool of safe

exchanges for donors and recipients. As a result, paired transplants have risen dramatically.

Reducing Infections

NSF-supported researchers' discovery of bacteria living on rocks revealed how patients develop deadly blood infections from implanted cardiac devices. This research is leading to medications to prevent those infections, which affect 40,000 U.S. patients annually, at a cost of nearly $1 billion.

Reducing Crime

NSF-funded anthropologists and mathematicians have reapplied algorithms that predict earthquake aftershocks to create a crime prediction model, deducing where and when property crimes are most likely to occur. After police implemented the model in a Los Angeles precinct, property crime decreased 12 percent over a six-month period. This technology is transforming police work in Los Angeles, where 10,000 police officers protect over 4 million residents.

Jellyfish Revolutionize Biotechnology

NSF-funded biologist Osamu Shimomura wanted to know what caused certain jellyfish to glow green. The protein he found in the jellyfish, called green fluorescent protein (GFP), revolutionized how scientists study cells. GFP markers allow researchers to track specific biological activities such as the spread of cancer, the production of insulin and the movement of HIV proteins. In 2008, Shimomura received the Nobel Prize in Chemistry for the discovery and development of GFP.

911: Astronomy to the Rescue

The National Emergency Number Association estimates that there are 240 million 911 calls in the U.S. each year. Research in radio astronomy has created technology that enables specification of the location of a 911 call with an accuracy of 500 feet. This same technique, called interferometry, also locates faulty transmitters that disrupt communication satellite operation.

Opening Hearts

Coronary artery disease, the major cause of heart attacks, afflicts more than 700,000 Americans and costs the nation nearly $110 billion in treatments annually. NSF-funded researchers developed mathematical tools to better understand and control interactions between arterial walls and blood flow. Subsequently, scientists improved stents to help open narrowed arteries, and they later formed a biotechnology company based on this technology. Endologix Inc., which markets new heart stents, is publicly traded on NASDAQ, with a current value of nearly $950 million.

Managing Crop Pests: An Eye for Aphids

The 275,000 soybean farms in the U.S. account for more than 50 percent of the world's soybean production. But a new pest from Asia, the soybean aphid, has reduced yield by 10-15 percent. The standard approach to managing these plant pests is to manually count the number of insects, a tedious and time-consuming process. When the count reaches a critical threshold, farmers apply a treatment. NSF-funded mathematicians have developed a new image-analysis technique that can rapidly count soybean aphids. The new automated method provides accurate, efficient aphid counts so growers know if, and when, they need to treat their soybeans with pesticides—saving growers time and resources and reducing chemicals in the environment.

Fantastic fMRI

Each year, millions of people in the U.S. get an MRI or magnetic resonance imaging scan. NSF-funded researchers helped develop this important diagnostic procedure that allows doctors to view internal structures. Now, NSF-funded researchers are upping the game and working to refine fMRI, or functional MRI technology. This new approach allows scientists to view both structure and function. Over the last decade, fMRI has enabled scientists to study the formation of memories, language, pain, learning and emotion. This technology is helping researchers predict behaviors, including the propensity to develop addictions or commit a violent crime.

A Sensitive Nose for Explosives

With funding from NSF and the Office of Naval Research, researchers developed a powerful tool that simply and quickly analyzes surfaces for the presence of a common explosive. The tool, Desorption Electrospray Ionization Mass Spectrometry, offers rapid detection of trace amounts of the explosive triacetone triperoxide (TATP). TATP has been used by terrorists for numerous bombings, including the 2005 bombing of London subway trains and the 2011 "shoe bomber." It has recently appeared as a weapon in the Middle East. The detection of the explosive by this new method, which is now available to the military, is both highly selective and takes less than five seconds.

Catching Bacteria and Criminals

DNA fingerprinting, an essential tool in the courtroom since 1986, identifies individuals based on their genetic profiles. This crimefighting technology was made possible by the NSF-funded discovery of a bacteria in hot springs at Yellowstone National Park. An enzyme from these bacteria underpins a technique called polymerase chain reaction, which is one of the most important tools in the biotechnology industry, worth over $95 billion today.

A Botanical Lab Rat

Among the 250,000 species of flowering plants, one small weed has become a veritable rock star to scientists: *Arabidopsis thaliana*. Since 1990, NSF has led the effort to identify the sequence, location and function of every gene in this weedy mustard. *Arabidopsis*, the first plant to have its entire genome sequenced, paved the way for the sequencing of over 90 other plant genomes and made possible the genetic engineering of crops with improved disease resistance, enhanced nutritional value and increased yields. For example, NSF-funded researchers have genetically modified tomatoes to express up to 25 times more folate than normal—enough to provide an individual's complete daily requirement in one serving.

Unraveling Cancer
Researchers have been working for decades to understand why normal cells suddenly go haywire and turn into cancer cells. Enter telomerase—the enzyme normally responsible for preventing chromosomes from shortening as we age. However, 80 to 90 percent of cancer cells have abnormally high telomerase activity, prolonging their lives. NSF-funded scientists have uncovered the 3-D structure of the enzyme, helping researchers develop drugs that target cancer cells directly.

Conclusion

Madam Chair I hope these brief examples of what basic research can do to help U.S. competitiveness are compelling. But, it is important to note that in our efforts to advance the frontier, we also aim to enhance development of the nation's talent pool by integrating research and education. This may be basic research's most profound, and lasting, impact.

For even if none of the breakthroughs I have described ever occurred, we still would have been providing students with significant research experiences throughout their schooling. The world-class scientists, technologists, engineers, and mathematicians trained through the integration of research and education transfer new scientific and engineering concepts from universities directly to the entrepreneurial sector as they enter the workforce. This capability is a strong suit in U.S. competitiveness, and one of NSF's greatest contributions to the nation's innovation system.

NSF will continue its role as the nation's innovation engine. The fuel for that engine is fundamental research. Scientific research, with its long-term perspective, strong emphasis on disciplinary excellence, and multi-disciplinary interactions, is a critical foundation for both transformational science and economic competitiveness. For all these reasons, the FY 2015 Budget Request provides robust support for the core fundamental research programs across NSF.

The FY 2015 Budget Request for the National Science Foundation continues the tradition of a thoughtful and strategic balance between core research activities both within and across disciplinary boundaries and activities that address emerging areas and clearly identified national priorities. Bolstering and advancing the types of core investments that have been central to the agency's past success reflects a wise stewardship of NSF's federal funding and ensures a strong return on taxpayer investment. In addition, specific investments identified for FY 2015 align NSF's portfolio with overarching challenges and opportunities facing the Nation. This balanced approach ensures that NSF will continue to foster research that catalyzes the development of scientific discovery, promotes creation of new knowledge, and builds human capacity for the workforce of tomorrow.

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. Robust NSF investments in fundamental science and engineering research and education 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.

Madam Chair and members of the Committee, 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 well-being of Americans depend on sustained investments in our science and technology. NSF has been and continues to be central to this endeavor.

This concludes my testimony. I thank you for your leadership, and I will be pleased to answer any questions you may have.