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Chairman Wolf, Ranking Member Fattah, and Members of the Subcommittee, it is my privilege to be here with you today. My testimony today will be the last time I am to address you and the Subcommittee in my official capacity as Director of the National Science Foundation. I have greatly appreciated the strong working relationship we have had over the past three years, and this moment is bittersweet for me.

As I indicated in my memo to NSF staff last month[1], it is with mixed emotions that I face this transition from one exciting professional journey to another, and from one remarkable institution fostering research and education to another. I am saddened by the prospect of leaving the National Science Foundation, an organization that has become the dominant part of my life for the past three years. At the same time, I am excited about the new opportunities and challenges as I assume the leadership of an outstanding university.

With the strong partnership of this Subcommittee, and despite the economic crisis and the lingering uncertainties that have ensued, NSF funding has sustained growth through the turbulent times of the recent past. The hard-working and dedicated staff at NSF have created the "gold standard" for science funding for more than six decades. The programs and practices they have established 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 200 American Nobel Prize winners who represent about 70% of all U.S. Nobelists since 1950.

Transitions such as the present one provide reasons to reflect on, and to take stock of, one's journey and to examine the key milestones encountered along the way. I would like to take this opportunity to share some of them with you, providing here excerpts from the letter to NSF staff last month. Although no list can be truly complete, I have reflected on a few accomplishments that, with the Committee's strong support, we have achieved in these last few years together. They are grouped in several major thematic areas: the OneNSF philosophy and creation of new

paradigms for cross-disciplinary interactions and organizational efficiency; addressing national priorities and grand challenges; support of major infrastructure projects; nurturing and expanding the innovation ecosystem; new models for global engagement; and principled commitment to human capital development and broadening participation. These activities have not only been launched successfully, but they have also established strong roots with support from a broad group of dedicated NSF staff. I therefore have confidence in their potential for continued success and growth in the years to come.

The OneNSF philosophy and the creation of new paradigms for cross-disciplinary interactions and organizational efficiency

- The intellectual and cultural flavors and associated activities in different offices and directorates of NSF are strongly influenced by the communities they serve in different fields of science and engineering. The OneNSF philosophy, introduced in 2011, seeks to facilitate greater coordination and collaboration among different entities within NSF and among different NSF-funded activities across the country and around the globe so as to extract the best value from investments. Many activities emerging from this approach also were designed to help mitigate barriers to successful interactions among different NSF communities.

- An example of the OneNSF approach to foster cross-disciplinary research involves the design of the new **Integrative NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) Program,** by a working group of program officers representing different parts of NSF. These innovative colleagues worked hard to create novel mechanisms to support transformative, high-risk ideas that might otherwise not be selected for funding by traditional means. Their work has produced several new solicitations for innovative funding schemes for small projects in interdisciplinary research, mid-scale research projects and support of best scholars. In July 2012, INSPIRE established nearly 40 new interdisciplinary projects in its first funding cycle, with collaborative support and engagement from every office and directorate at NSF.

- The OneNSF approach has also enabled **greater integration of the educational and research activities** of NSF. We are forging much stronger ties between the Education and Human Resources Directorate and the educational activities embedded within research directorates by integrating cutting-edge research programs into educational activities to inspire young minds.

- In order to improve organizational efficiency and to foster a more streamlined and effective integration of offices supporting infrastructure and directorates supporting scientific research, a **realignment** and consolidation of different units was announced in September 2012. This led to the creation of the new Office of International and Integrative Activities, and the merger of the Office of Cyber Infrastructure with the Computer and Information Science and Engineering Directorate, and the merger of the Office of Polar Programs with the Geo Sciences Directorate. The realignment was completed at the beginning of 2013.

Addressing national priorities and global challenges

- The establishment, in partnership with our sister agencies in the federal government, of a variety of multi-agency initiatives intended to enhance the technological strength, global competitiveness and economic wellbeing of the nation. A partial list of the major programs launched during the past two years includes: the **National Robotics Initiative, the Big Data Initiative, the Materials Genome Project,** the **Secure and Trustworthy Computing Program**, and **the Advanced Manufacturing Initiative**.

- Creation of pan-NSF activities through the **Science, Engineering and Education for Sustainability (SEES)** program, and the **Cyber-Infrastructure Framework for the 21st Century (CIF-21)** program.

- Soon after the earthquake in Christchurch in New Zealand (which is a key launching pad for NSF activities in Antarctica) and the disaster involving the combined effects of earthquake, tsunami and nuclear reactor failure near Sendai in Japan in 2011, NSF quickly funded a number of **RAPID research projects** to facilitate time-sensitive and critical research interactions between U.S. scientists and their counterparts in New Zealand and Japan, respectively. These interactions have generated valuable research information on such topics as risk analysis, emergency preparedness, disaster mitigation, etc. NSF sponsored a workshop on "**Reckoning with the Risk of Catastrophe**" in October 2012 in partnership with the German National Science Foundation. These activities, in concert with existing NSF-funded networks such as the **Incorporated Research Institutions for Seismology (IRIS)** and the **George E. Brown, Jr. Network for Earthquake Engineering and Simulation (NEES)**, provide a national and international framework to generate much-needed scientific knowledge and infrastructure to respond to natural and human-made disasters.

- NSF serves as the Chair of the **Interagency Arctic Research Policy Committee (IARPC)**, a subcommittee of the National Science and Technology Council (NSTC). We have worked with the principals of other federal agencies and their working groups, to develop a five-year, national **strategic plan** for coordinated research in the Arctic region.

- NSF serves as the co-chair of the NSTC **Committee on STEM Education (Co-STEM)**, and have engaged the principals of a number of federal agencies and their staff to create the first detailed inventory of targeted STEM programs across the federal government. Various working groups of Co-STEM are also collaborating to develop a strategic plan. Efforts to harmonize the definitions and activities of a multitude of programs aimed at broadening participation across the federal government have also been initiated.

Support of Major Infrastructure Projects

- Despite the severe economic downturn, NSF has shown unwavering commitment to support the U.S. research community through a number of major infrastructure projects. New projects that have received significant funding during the past several years include: the **National Ecological Observatory Network (NEON)**, the **Ocean Observatory Initiative (OOI)**, the **Atacama Large Millimeter/sub-millimeter Array (ALMA) facility** in Chile (the official opening of which I participated in just last week), and the **Advanced Technology Solar Telescope (ATST)**.

- In order to support cutting-edge research in computational modeling and simulation, three new NSF-funded supercomputing facilities have been established within the past year. These include: the **NCAR-Wyoming Supercomputing Center**, the **Blue Waters Project** at the National Center for Supercomputing Applications at the University of Illinois, and the **Stampede supercomputer** at the Texas Advanced Computing Center at the University of Texas in Austin.

- The construction and launch of the R/V **Sikuliaq** in October 2012, on time and on budget, to provide a state-of-the-art research vessel for scientific exploration of the Arctic for hundreds of scientists and students every year for several decades to come.

- Concurrently with the selection of a new contractor to manage the U.S. Antarctic Program (USAP) for the next decade, we benefited from two key reports: the **National Research Council Report** on science drivers for the USAP, and the **Blue Ribbon Panel Report** with recommendations for more and better science in Antarctica through increased logistical effectiveness. The NSF "Tiger Team" commissioned in response to these reports has already developed a robust set of action plans with clear timelines for implementation of key recommendations.

Nurturing and expanding the innovation ecosystem

- NSF has long played a key role in fostering innovation through the SBIR (Small Business Innovation Research) and related programs, Industry-University Collaborative Research Centers, and Engineering Research Centers. The launch, in July 2011, of the **NSF Innovation Corps (I-Corps) Program**, expands NSF's rich history of supporting innovation arising from fundamental scientific discoveries. The I-Corps Program provides a unique mechanism to extract considerable further value from basic research by providing opportunities for NSF-funded researchers and students to tap into a new, virtual innovation ecosystem at the national level. Within its first two years of existence, I-Corps would support approximately 300 projects and five outstanding groups of institutions and networks of mentors that will serve as the geographically diversified hubs of the national innovation ecosystem. The I-Corps program has also drawn significant interest from other federal agencies, with ARPA-E now partnering with NSF to support several I-Corps projects.

- The **I-Corps** program also helped establish a new paradigm for **public-private partnerships** by partnering with two non-profit foundations with significant experience in fostering innovation.

New Models for Global Engagement

- The launch, in October 2011, of a coherent set of policies and streamlined practices to leverage NSF-funded research within the U.S. with significant new resources from around the globe through the **Science Across Virtual Institutes (SAVI) Program**. Since its launch, 17 SAVI programs have been created involving dozens of countries and hundreds of American researchers, educators and students across the spectrum of activities covered by NSF.

- NSF's leadership role in the hosting of the **Global Merit Review Summit** in Arlington, VA, at the invitation of the White House and the creation of the **Global Research Council (GRC)** in May 2012. This summit brought together, for the first time, the heads of major research funding agencies from nearly 50 countries representing the developing and developed world, and established a new paradigm for harmonizing global science. This event demonstrated the convening power as well as the leadership role of NSF on a global stage. Subsequent to the establishment of GRC, more than a hundred countries have participated in five regional meetings held across the globe by our overseas partners to prepare the principles of research integrity and a multi-year process for collectively addressing the complex issue of public access to publications and data. The next GRC annual meeting will take place in Berlin in May 2013 with NSF serving a pivotal role along with the organizers, Germany and Brazil.

- **An implementation agreement with the European Research Council**, signed in July 2012, to provide new international opportunities for scientific collaboration for a large cohort of early career American researchers with their European counterparts from 27 countries. This program will enable **NSF CAREER awardees and post-doctoral fellows** to work with leading scientists and gain access to research infrastructure in prominent institutions throughout Europe through a streamlined "one-stop shop" process and financial support from partner organizations. It is very encouraging to note that more than 750 indications of interest have already been received from Europe to host these early career scientists even before the program has officially begun.

- The creation of a new model, in December 2012, to provide international experience for American graduate students through the **Graduate Research Opportunities Worldwide (GROW) Program**. This program, announced in conjunction with the 60th Anniversary of the prestigious NSF Graduate Research Fellows (GRFs) Program, will enable many hundreds of graduate students to spend extended research stays at strategically selected overseas partner institutions. The program will also offer new mechanisms for financial support, in partnership with overseas funding agencies, for U.S. graduate students who will work with key collaborators in foreign countries. Since its launch less than two months ago with eight partner countries, the program has attracted many additional

overseas funding agencies to collaborate with NSF. At steady state, the GROW program will leverage several tens of millions of dollars of overseas support to host NSF-funded GRFs in their host institutions abroad.

- The creation, in July 2011, of the **Partnership for Enhanced Engagement in Research (PEER) Program** in collaboration with the U.S. Agency for International Development to link, strategically and in a well-coordinated manner, American scientists with counterparts from developing countries. Within a year of creation of this unique partnership, some 42 projects have been funded through this program. The NSF PEER program is also serving as a model for other agencies to create similar activities tailored to their mission.

- Continued leadership in fostering international collaborations for U.S. scientists, engineers, educators and policy makers with overseas counterparts through such activities as the **Belmont Forum**, **Partnerships for International Research and Education (PIRE) Program**, the **Human Frontiers Program**, **joint funding of projects through the G8**, and **East Asia Pacific Student Internship (EAPSI) Program**, to name just a few among a large number of NSF programs. These activities not only connect early career and established scientists with their counterparts abroad, they also address such global challenges as environmental change, access to clean water, and the mobility of young researchers across national borders.

Principled commitment to human capital development and broadening participation

- *Principled commitment to support the development of young talent for the future scientific health of the country*. This passionate adherence to a core principle, unanimously endorsed by our senior leadership team and staff, has helped **double the number of NSF Graduate Research Fellowships (GRFs)** to 2,000 per year since 2010 (from the prior year) even during the worst financial crisis of our lifetime. These policy decisions, coupled with new programs such as **GROW**, are intended to address the critical need for future science and engineering workforce for the nation. In addition, adjustments have been made to allow for much-needed increases in tuition subsidy and stipend for GRFs. This commitment for human capital development also helped preserve strong support for **NSF CAREER awards and post-doctoral fellowships**.

- *Unwavering commitment to broadening participation and diversity*. Leveraging NSF's experience with such programs as **ADVANCE** and by incorporating best practices for enhancing diversity in the scientific workforce, we launched, in September 2011, the **NSF Career-Life Balance Initiative.** Hosted by First Lady Michelle Obama, this marked the first-ever NSF event held at the White House, and included a joint statement by the leadership of NSF, the Association of American Universities and the Association of Public and Land-grant Universities to work together to foster greater diversity. The importance of the policies and practices accompanying this initiative to be equally applicable to NSF staff was highlighted in a special event held at the NSF building several months later.

Conclusion

It has been my extraordinary honor to lead the National Science Foundation, which is blessed with a marvelous cohort of highly talented and devoted staff, as well as hundreds of thousands of innovative grantees and investigators from every field of science and engineering. I am grateful for the opportunity to serve the country in this capacity and to be the beneficiary of many wonderful life experiences as I witnessed, and played a small role in helping to advance, science over the past several years.

Mr. Chairman, I am most grateful for the strong working relationship with you, with Ranking Member Fattah, and with your Subcommittee. I thank you for your leadership and for the warmth that you have shown me during my tenure at NSF.

I look forward to answering any questions you may have.

[1] Director's memo to NSF staff and contractors, "Transition" dated February 5, 2013