

**Testimony of
Dr. Arden L. Bement, Jr., Director
National Science Foundation**

**Before the
House Science Committee
February 15, 2006**

Chairman Boehlert, Ranking Member Gordon, and members of the Committee, thank you for this opportunity to provide you with some context for our FY 2007 budget request. It is always a pleasure to come before you, but it is a greater pleasure when we have a budget request such as the one before us today.

As you no doubt know, the President's request for NSF for 2007 is \$6.02 billion, or a 7.9 percent increase over the appropriation enacted last year. As part of the President's American Competitiveness Initiative, this request represents the first step in the Administration's firm commitment to doubling the NSF budget over the next 10 years.

The ACI encompasses all of NSF's investments in research and education. These investments – in discovery, learning, and innovation – have a longstanding and proven track record of boosting the nation's economic vitality and competitive strength.

Our focus for 2007 emphasizes four priorities. The first of these--*Advancing the frontier*-- is at the heart of everything NSF does. In a science and technology-based world, to divert our focus from the frontier is to put our nation's global preeminence in science and engineering at peril.

One of NSF's strong points is multidisciplinary integration at the frontier, where disciplinary boundaries blur and knowledge converges. To explore that territory, our strategy must be to keep *all* fields and disciplines of science and engineering healthy and strong.

Frontier research is NSF's unique task in pursuing the Administration's research priorities within the larger federal research and development effort. Over the years, NSF has advanced the frontier with support for pioneering research that has spawned new concepts and even new disciplines. The NSF budget provides strong support in fundamental research for activities coordinated by the National Science and Technology Council (NSTC).

NSF is the lead federal agency supporting NSTC's Networking and Information Technology Research and Development (NITRD) program. The '07 budget includes investments of \$904 million in NITRD—an increase of \$93 million.

A highlight of the Foundation's contribution to NITRD is a \$35 million investment—an increase of \$10 million—in Cyber Trust. Cyber Trust supports cutting-edge research to ensure that computers and networks that underlie national infrastructures, as well as in homes and offices, can be relied on to work even in the face of cyber attacks. It's part of a larger effort in cybersecurity research, which totals \$97 million.

NSF is also the lead in the multi-agency National Nanotechnology Initiative (NNI). NSF's '07 investment in NNI is \$373 million, an increase of \$29 million. Of that total, \$65 million will fund Nanoscale interdisciplinary research teams (NIRTs). These awards encourage team approaches to address nanoscale research and education themes, where a collaborative blend of expertise is needed to make significant contributions.

NSF will invest \$205 million—an increase of \$8 million—in the interagency Climate Change Science Program. NSF supports a broad portfolio of research activities that provides a comprehensive scientific foundation for understanding climate and climate variability. Climate has a pervasive effect on the U.S. through its impact on natural resources, the economy, and the environment, so this is work of great significance to the nation.

NSF investments in basic research in Homeland Security also increase by \$42 million to \$384 million. An important new effort will support a program of fundamental research on novel technologies for sensors and sensor systems to improve the detection of explosives, with a particular emphasis on Improvised Explosive Devices (IEDs).

Fundamental research can play a vital role in helping to stem this threat, and at the same time, advance the entire field of sensor research. A focal point of this \$20 million activity will be improving the sensitivity and fine resolution of sensors to recognize threats earlier than current technologies.

The International Polar Year (IPY) in 2007 to 2008 will mark the 50th anniversary of the International Geophysical Year. That was a year in which unparalleled exploration of Earth and space led to discoveries in many fields of science—and we hope to emulate that success. The U.S. vision for IPY, articulated by the National Academies,¹ urges the U.S. scientific community and federal agencies to participate as international leaders.

The Administration has asked NSF to lead U.S. IPY activities. In 2007, we will invest \$62 million to address major challenges in polar research. Key research programs include: Observing Environmental Change in the Arctic; Studying Ice Sheet Dynamics and Stability; and Life in the Cold and Dark.

Recent advances in elementary particle physics strongly suggest that we are on the verge of a revolution in our understanding of the nature of matter, energy, space, and time. NSF will expand its substantial investment in elementary particle physics by \$15 million. The opportunities for discovery today are greater than at any point in the last half-century, particularly for the study of dark matter, dark energy, and the physics of the universe.

A new research effort to address policy-relevant Science Metrics is funded initially at \$6.8 million, through the Social, Behavioral and Economic Sciences Directorate. The goal is to develop the data, tools, and knowledge needed to establish the foundations for an evidence-based science policy. NSF intends to pursue this in close cooperation with other agencies.

¹ *A Vision for the International Polar Year 2007-2008*; National Academies Press.

The National Science Foundation has been selected to play major roles in the President's American Competitiveness Initiative (ACI). These include:

- Investing in the generation of fundamental discoveries that produce valuable and marketable technologies;
- Providing world-class facilities and infrastructure that are essential to transform research and enable discovery; and
- Preparing the nation's scientific, technological, engineering, and mathematics workforce for the 21st Century while improving the quality of math and science education in America's schools.

In pursuit of these ACI goals, NSF will continue to make major contributions to America's innovation systems by advancing new scientific and engineering concepts.

These investments are all part of the request in the President's Budget to increase support for research and related activities by 7.7% to \$4.7 billion. This will enable NSF to support as many as 500 more research grants and provide opportunities for upwards of 6,400 additional scientists, students, post-doctoral fellows and technicians to contribute to the innovation enterprise.

A hallmark of NSF's approach is to develop the nation's talent pool by integrating research and education. This longstanding NSF practice facilitates the direct transfer of new knowledge to the private sector. It happens every time graduate students with experience working at the frontiers of discovery enter the work force. This is a strong suit in U.S. competitiveness, and it is one of NSF's greatest contributions to the nation's innovation system.

As a priority within our overarching mandate *to prepare the STEM workforce for the 21st century*, NSF will continue to emphasize programs aimed at tapping the potential of those underrepresented in the science and engineering workforce--especially minorities, women, and persons with disabilities. Support for this priority will total over \$640 million in '07.

Three highly successful programs form the core of this investment: the Louis Stokes Alliances for Minority Participation (LSAMP), the Alliances for Graduate Education and the Professoriate (AGEP), and the Centers of Research Excellence in Science and Technology (CREST). These programs increase by \$16.2 million—or 24 percent.

Broadening participation also applies to institutions. In '07, we will increase efforts to ensure that the U.S. enjoys a strong capability in science and engineering across all regions of the country. NSF will invest \$100 million in EPSCoR, the Experimental Program to Stimulate Competitive Research.

Providing world-class facilities and infrastructure is our third priority for 2007. NSF has a long-established role in providing state-of-the-art infrastructure to meet major research

challenges. Our strategy is to invest in tools that promise significant advances in a field of research and to make them widely available to a broad cross-section of investigators.

Total funding in the Major Research Equipment and Facilities Construction (MRFEC) account is \$240.45 million. This investment funds five on-going projects and two new starts.

The two new projects are the feature attractions of our major equipment investment in 2007: the Alaska Region Research Vessel (ARRV) and the Ocean Observatories Initiative (OOI). Both projects will help to fulfill the Administration's 2004 U.S. Ocean Action Plan, developed in response to the U.S. Commission on Ocean Policy.

ARRV is a ship that will dramatically improve access to Arctic waters. With an operating year as long as 300 days, this ship could accommodate some five hundred researchers and students annually. A variety of complex regional and global ecosystem and climate studies require a technologically advanced oceanographic platform to conduct field research at the ice edge as well as in ice up to three feet thick.

OOI is an integrated observatory network, distributed among coastal and deep-sea sites, that will help advance our understanding of oceanographic and geological features and processes. With these fundamentally new tools for local, regional and global ocean science, researchers and students will now have continuous, interactive access to the ocean.

As our facilities increase in sophistication and capability, so does the amount of data they produce. The sheer volume of information is overwhelming our current computational capacity.

Cyberinfrastructure is a key factor in addressing this problem—and also in establishing and continuing global research excellence for many years to come. It remains a significant NSF priority. In 2007, funding for cyberinfrastructure research and development will reach \$597 million—an increase of \$77 million, or 15 percent.

NSF will invest \$50 million to begin the acquisition of a leadership-class high performance computing system. This will be our first step on the road toward computation and data processing and storage, for petascale-level science and engineering. It will be a major milestone in NSF's multi-year plan to provide and support a world-class computing and data management environment that will make the most powerful high performance computing assets broadly available to the science and engineering community.

NSF's fourth priority for '07 is perhaps the most compelling: *Bolstering K-12 Education*. Today's youngsters face a world of increasing global competition. We depend on the excellence of U.S. schools and universities to provide them with the wherewithal to meet this challenge and to make their own contributions to America's future.

We clearly need to do more to build strong research foundations and foster innovation in K-12 science and mathematics education. In line with Administration's focus on this vital national priority NSF will invest \$104 million in a new effort named Discovery Research K-12

that aims to strengthen K-12 science, technology, engineering, and mathematics education. We will refocus our efforts on a vital cluster of research in three well-defined grand challenges:

- Developing more effective science and mathematics assessments for K-12;
- Improving science teaching and learning in the elementary grades; and
- Introducing cutting-edge discoveries into K-12 classrooms.

We will also increase funding for the Graduate Teaching Fellowships in K-12 Education—better known as GK-12—by nearly 10 percent to \$56 million, supporting an estimated 1,000 graduate fellows. By pairing graduate students and K-12 teachers in the classroom, this program has been particularly successful in encouraging effective partnerships between institutions of higher education and local school districts and in exposing young minds to role models.

Although the Education and Human Resources account increases \$19 million, or 2.5% over last year, this does not reflect the total investment in education activities at NSF. After accounting for various base changes, such as a planned \$17 million phase down in the Math and Science Partnership program, and contributions from the research account, K-12 investments actually increase by over 10% and investments in undergraduate education increase by over 6%. The budget request proposes significant increases in all other Congressionally mandated programs, such as graduate fellowships and traineeships, research experiences for undergraduates and teachers, faculty early career development, Robert Noyce scholarships, advanced technology education in two-year colleges, and informal science education.

Today, I have only mentioned just a few of the FY 2007 investment highlights. With this first installment of the ten-year commitment to double NSF's budget, we will be able to capitalize on the many areas of emerging promise already on the horizon.

That means generating quality programs year, after year, after year—and continuing to lead the federal momentum toward more robust business practices as we put tax dollars to work for the nation. We are proud of the leadership we've provided through the President's Management Agenda. As is highlighted in the budget, NSF is one of three agencies recognized as models of excellence in Grants Management, and we are committed to upholding that tradition.

The President's American Competitiveness Initiative makes clear the larger rationale for investments in science and engineering. This is to put knowledge to work—to improve the quality of life and enhance the security and prosperity of every citizen. NSF is committed to cultivating a science and engineering enterprise that not only unlocks the mysteries of the universe but that addresses the challenges of America and the world.

Mr. Chairman, I hope that this brief overview conveys to you NSF's commitment to advance science and technology in the national interest. I am very aware and appreciative of the Committee's long-standing bipartisan support for NSF, and I would be happy to respond to any questions that you have.