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Remarks
American Mathematical Society's Committee on Science Policy
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Good morning. I'm pleased to be able to meet with you, as your ally in communicating to the nation the importance of the mathematical sciences.

I'd like to spend a few minutes bringing you up to date on NSF and addressing some ways we can strengthen our outreach to the public and policymakers. Then I look forward to a dialogue to address your questions and concerns.

In the job of NSF director, I'm reminded every day how much the United States depends on investments in research and education to stimulate and sustain our economy. These investments are a national priority because they contribute not only to economic growth and societal well-being, but also to the increasing demands of homeland security.

In recognition of the nation's changing course, the National Science Board has pledged to prepare a new "vision" for NSF in the 21st century. The Board's foresight will inform NSF's own update of its strategic plan.

For the foreseeable future, our strategy will be informed by constraints on the discretionary portion of the federal budget.

For FY 2006, the National Science Foundation is requesting $5.605 billion. That's $132 million, or 2.4 percent, more than in FY 2005.

This modest increase allows us to assume some new responsibilities and meet our ongoing commitments, without much room for growth.

The request includes a sustained level of funding for the Division of Mathematical Sciences, at $200 million, and funds from other NSF directorates that support interdisciplinary programs involving mathematics.

In this environment, all of us – government and researchers alike – are called on to operate more efficiently and effectively. So setting priorities will be more important than ever.

When we can identify our highest priorities and show policymakers how they meet national needs, we build confidence that research and education are worthwhile investments.

The American Mathematical Society -- and all of you -- are part of the effort to demonstrate the return on the nation's investment in science. I am grateful for your efforts and urge you to continue working within the mathematical sciences community to set firm priorities and communicate them with one voice.

In this budget year, one of NSF’s priorities will be strengthening the core research that has built the U.S. science and engineering endeavor into a strong force for growth and change.

As you well know, the core disciplines lay the foundation for meeting national needs and solving global problems. And the health of the core disciplines underscores the ability to perform quality interdisciplinary work.

Policymakers and the public increasingly recognize mathematics as a critical component of scientific knowledge, in fields ranging from astronomy to meteorology to seismology, and as the connecting link between disciplines.

This awareness can be credited, at least in part, to the outreach by NSF and its partners over the last few years, regarding the critical need to boost NSF spending on the mathematical sciences -- just to sustain our national expertise.

When we show how mathematics contributes to activities that people take for granted -- from law enforcement to tracking disease to routing messages over the Internet -- people listen.

What is less well known is the need to continue the fundamental, high-risk research for which there is no clear and immediate application. Today's imaginative formula may prove to be just the breakthrough needed to secure a computer program, compare digitized fingerprint records, or harness a benign energy source.

Identifying mathematics as an NSF priority area helped raise public awareness of all of these needs and was instrumental in increasing the level of funding. This, in turn, has allowed us to strengthen the core discipline, improve the training of the future workforce, and to launch new, interdisciplinary programs.

Since 2003, the additional funds have helped NSF boost its support for graduate assistants, undergraduate students, and postdocs, with higher stipends and support for more people.

The Vertical Integration of Research and Education program, or VIGRE, has further enhanced our track record in preparing the workforce. VIGRE has created mechanisms for mathematicians-in-training at various levels to support each other, and for students and faculty to work more closely together.

The results are encouraging. Since the VIGRE program was launched in 1999, NSF has more than doubled the number of U.S. graduate students receiving research support -- one of the primary goals of the program.

Here's just one example of how a program like VIGRE can have a synergistic effect. Since it was implemented at UCLA, the total number of graduate students in mathematics rose from 112 to 204. The number of undergraduate degrees awarded also rose, from 153 to 222, contributing further to the professional pipeline.

We're seeing similar trends at other VIGRE schools. By emphasizing mentoring and preparation of students for the research profession, VIGRE is helping to change the culture of academic mathematics. The results are synergistic: we are seeing more interaction among faculty and students, and undergraduate research is blooming.

These are the success stories that resonate with policymakers and the public -- people who want to know that their investments in research and education are worthwhile.

Other important examples of investments that pay off come from the application of mathematics to emerging, interdisciplinary research.

It is not always easy to convince the public that number theory or optimal geometry can be as critical to the nation as, for example, microbiology.

So when high-risk research pays off in unexpected applications, the message becomes clear -- the nation benefits by supporting all aspects of science and engineering.

Conformal mapping was for many years the purview of pure mathematicians. Its unexpected application to visualizing and mapping the brain expanded the research circle to include computer scientists, neuroscientists, and visualization specialists.

The transformation of classical theorems of mathematics into computational tools has made it possible for biomedical researchers and clinicians to rapidly pinpoint and compare changes taking place in the brain.

Topology -- another traditional domain of the mathematician -- has become a useful construct for understanding the function of living things. Mathematicians are now working with molecular biologists to untangle the complicated structure and folding of protein molecules, and how this structure facilitates the storage, retrieval, and use of information at the cellular level.

The possibilities presented by the partnerships between the mathematical sciences and the life sciences, alone, demonstrate good reasons to sustain public support for research.

In times of budget constraints, we are also expected to devise new ways to leverage our resources.

We have to sharpen our focus on programs with a proven track record, and where possible, integrate programs across NSF's directorates. We must also coordinate our efforts with other agencies and institutions, which is something we do routinely at NSF.

One of our programs is a collaborative effort among NSF's mathematical sciences and biological sciences programs, and the National Institute for General Medical Sciences. Our joint research, for example, is helping to provide key information on the functions of the human genome, using the mathematical techniques of pattern recognition.

Information technology is the tool that increasingly allows us to cross traditional boundaries and apply fundamental research to real problems.

Vast quantities of data are pouring into digital databases. They represent observations from multiple perspectives, often in real time, on scales ranging from the nanoscale to the atmospheric.

With the rapid advance of cyber-tools, we are finding new ways to store, analyze, and visualize data and to share it across disciplines and institutions.

Just as essential are the growing partnerships between mathematicians and the information and computer sciences community.

The combination of the two professions is opening doors to many unexpected capabilities -- such as in imaging.

For the first time, automated image recognition is an attainable goal. When a sensor or surveillance camera detects the presence of a person or an object, it will be able to process the information and potentially make an identification.

A combination of digital tools and a statistical framework for modeling the appearance of objects is enabling such progress. The applications can range from medical diagnosis to homeland security.

These are just a few examples of how we can demonstrate measurable results, even in a constrained budget environment.

I admire the work that you do in this regard, from publicizing research activities to engaging in policy discussions.

Continued success, however, will depend on all of us -- NSF and the entire mathematical sciences community.

KC Cole, a science and math reporter for the Los Angeles Times, has said: "Math speaks its own language - one that doesn't easily translate into English."

Yet we must attempt the translation. To keep mathematics at the forefront of science and engineering and to sustain public support, we must clearly communicate both critical needs and brilliant results.

Together, we can transform our resources into a first-rate research and education enterprise.

I look forward to working with you.

And now, I will be pleased to answer your questions and hear more about your activities.