I. INTRODUCTION: STRATEGIC PLANNING IN A CHANGING LANDSCAPE

The National Science Foundation (NSF), created over 50 years ago, is the premier Federal agency supporting basic research at the frontiers of discovery, across all fields, and science and engineering education at all levels. Research supported by NSF—selected through competitive, merit-based review—has fueled many important innovations, stimulating economic growth and improving quality of life and health for all Americans. NSF actively participates in shaping an increasingly dynamic and vigorous science and engineering enterprise. Today, the President's American Competitiveness Initiative (ACI) has provided new vision for sustaining our nation's competitive edge through innovation, exploration, and ingenuity. The NSF Strategic Plan addresses this changing landscape and new vision, and will ensure our continued leadership in this new era.

A. Increasing Pace, Scope and Impact

Scientific discoveries are emerging at an accelerating pace in virtually every field, transforming the science and engineering landscape and opening entirely new territory for exploration. The generation of knowledge—requiring fresh ideas and creative people—takes place in a dynamic, complex, and competitive international environment.

Already visible on the horizon are path-breaking new avenues for investigation that were unimaginable only a few years ago. Building on decades of fundamental research, investigators are creating models of increasingly complex systems across multiple disciplines and scales. A deeper understanding of complex systems may help explain how networks of cells communicate, how species interactions create the biosphere, how simple human interactions collectively yield complex social behavior, and how basic physical forces power atmospheric and oceanic movements.

Science and engineering increasingly address global questions of significant societal importance. Today's research requires globally-engaged investigators working collaboratively across agencies and international organizations to apply the results of basic research to long-standing global challenges such as epidemics, natural disasters and the search for alternative energy sources.

Responsibilities

The National Science Foundation Act of 1950, as amended, authorizes and directs NSF to initiate and support:

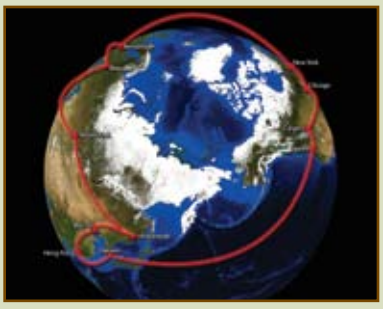
- Basic scientific research and research fundamental to the engineering process;
- Programs to strengthen scientific and engineering research potential;
- Science and engineering education programs at all levels and in all fields of science and engineering; and
- An information base on science and engineering appropriate for development of national and international policy.

NSF supports innovative and stimulating education initiatives from pre-kindergarten to postdoctoral levels.

Additional Responsibilities

Legislation and Presidential Directives added new requirements for NSF over time, including:

- Fostering the interchange of scientific and engineering information nationally and internationally;
- Maintaining facilities in the Antarctic and promoting the U.S. presence through supporting and managing a vigorous U.S. national research program in the Arctic and Antarctic; and
- Addressing issues of equal opportunity in science and engineering.



The Global Ring Network for Advanced Applications Development (GLORIAD) provides data exchange for scientists around the world.

B. New Modes of Investigation

The conduct of science and engineering is changing and evolving. This is due, in large part, to the expansion of networked cyberinfrastructure and to new techniques and technologies that enable observations of unprecedented quality, detail and scope. Today's science employs revolutionary sensor systems and involves massive, accessible databases, digital libraries, unique visualization environments, and complex computational models. Emerging areas of research exploit exciting new tools such as genomic sequencing, materials processing at nanoscales, and single-molecule chemistry. These advances have not only made it possible to reach the frontier faster; they have also increased by orders of magnitude the levels of complexity open to exploration and experimentation. Understanding complexity and learning how best to harness these new capabilities are both a challenge and a responsibility. The path is now open to address age-old questions that could not be approached before. Despite the unprecedented nature of these transformations, change of even greater magnitude is likely as understanding, tools and technologies continue to progress.

Discovery increasingly requires the expertise of individuals with different perspectives—from different disciplines and often from different nations—working together to accommodate the extraordinary complexity of today's science and engineering challenges. The convergence of disciplines and the cross-fertilization that characterizes contemporary science and engineering have made collaboration a centerpiece of the science and engineering enterprise. The Internet has clearly demonstrated, on local to global scales, that an integrated cyberinfrastructure will be of ever-increasing significance for any nation that aspires to reap the benefits of new knowledge and innovation in the future.

The changes brought about by revolutionary discoveries and technologies are also altering global economic and social landscapes. Frontier research, innovation, technological infrastructure and an educated population are powerful forces for economic growth and social prosperity. This recognition is raising national aspirations and shifting science, engineering and technology from the periphery into the mainstream of policy attention and action. To maintain the U.S. position at the forefront of discovery and innovation, the ACI includes a commitment to double investment over 10 years in key Federal agencies—including NSF—that support basic research in the physical sciences and engineering.

C. Improving Education and Workforce Development

Scientists and educators are working collaboratively to increase the effectiveness of math and science education. Discovery-based learning—from hands-on activities in kindergarten to public participation in research sample collection—is becoming an integral feature of formal and informal education at all levels. As new practices take root, they are transforming education research and practice in ways that are not yet well understood. Science, technology, engineering and mathematics (STEM) education at all levels continues to benefit from information, communications and other new technologies, with their potential for more engaging and inclusive learning and discovery. Access to interactive data sets, simulations, and up-to-date research results, as well as the opportunity to interact with researchers, has increased rapidly in K-12 classrooms and in complementary informal science education venues.

The current science and engineering workforce is aging. To meet continuing, strong demand, it will be important that every American has an opportunity to achieve in mathematics and science. Women, minorities and persons with disabilities remain underrepresented in STEM professions while they are an increasing percentage of the overall U.S. workforce. Alternative and diverse approaches to excellence in education and mentoring

NSF Proposals and Awards

Each year, NSF oversees about 35,000 active awards directly supporting more than 175,000 people—teachers, students and researchers at every education level and across all disciplines in science and engineering. Merit review results in about 10,000 new awards each year from over 40,000 proposals submitted by the research and education communities.

NSF supports a wide range of research and education in dozens of disciplines throughout the nation and the world.

create opportunities to tap America's potential. Additionally, some regions of the country are still building the critical mass of research and innovation capacity that can propel them into the mainstream of the knowledge economy.

The U.S. has long benefited from an open-door policy that welcomes science and engineering talent from abroad. Other nations are now adopting this policy, as well as providing incentives for students to pursue their education at home or to return from abroad. Increasing international competition and workforce mobility, combined with a surge in international collaboration in science and engineering research, continue to alter the science and engineering landscape worldwide. To lead within this broader global context, the U.S. science and engineering workforce must build greater capacity for productive international collaboration.

D. Taking Action

The National Science Foundation's Strategic Plan takes a focused approach to meeting the opportunities and challenges presented by key factors on the science and engineering horizon. NSF acts as a change agent to shape this dynamic environment positively. We will support transformational research and promote excellence in science and engineering education in ways that will fuel innovation, stimulate the economy, and improve quality of life. We will also nurture the vibrant and innovative science and engineering enterprise necessary to achieve these goals and stimulate broader participation in this enterprise throughout the nation. Working to broaden participation in science and engineering reinforces NSF's mandate to fund the best ideas from the most capable researchers and educators, now and in the future.

The strategic goals in this plan look toward and beyond today's horizons. They provide an overarching framework for progress in fundamental research and education that leaves ample room to experiment and adapt to changing circumstances. A set of programs, derived from our strategic goals, will be evaluated by the Office of Management and Budget (OMB) Program Assessment Rating Tool (PART[1]) process. NSF is committed to the highest standards of accountability, and takes responsibility for sustaining the highest degree of public trust.

1. See www.expectmore.gov

Materials World Network

As the world's economies grow increasingly interdependent, international research partnerships are growing in importance. The ability to develop collaborations that create new value for the partners is often the limiting factor for progress in critical areas of science, engineering and technology. NSF supports international partnerships that foster cooperation, build global research capacity, and advance the frontiers of science for the benefit of all.

A case in point is the Materials World Network, a global community of researchers and educators working across borders and disciplines, in developed and developing countries, to accelerate materials discovery and design. From the first alloying of bronze to the plastics revolution to the advent of biomaterials, the design of materials to fit our needs has transformed society. Now, materials scientists are on the brink of another revolution—designing and engineering materials by building in special properties, atom by atom. Such new materials may help to increase energy efficiency, promote green manufacturing, improve health care, develop information and communications systems, and provide modern and reliable transportation and civil infrastructure. To maximize the global benefits, NSF together with partners from abroad established the Network, which now reaches nearly every region of the world. The Network brings together a diverse community to address global challenges through materials research, technology, and education. Strategic project areas include research, education, facilities, and cyber-infrastructure.

NSF sponsors and encourages many international collaborations such as this 2005 meeting in Morocco.