

Clinton Administration Announces FY2001 S&T Budget Initiatives

In his speech delivered at California Institute of Technology on January 21, President Clinton announced that he would include a \$2.8 billion increase in the "Twenty-First Century Research Fund" in his FY2001 budget proposal. He said that these investments will enable increased support in all scientific and engineering disciplines, including biomedical research, nanotechnology, information technology (IT), clean energy, and university-based research. The special initiatives in his announcement includes a new \$497 million National Nanotechnology Initiative (see separate article); a \$675 million increase in the National Science Foundation, which is double the largest dollar increase in NSF's history; and over \$600 million increase in IT research.

For NSF, the budget request includes \$4.6 billion for research and education investments. Research funding will be used for Information Technology Research, Nanoscale Science and Engineering, and Biocomplexity in the Environment, while education funds will go toward Centers for Teaching and Learning to equip the U.S. educational infrastructure to provide a strong foundation for science and technology (S&T). NSF represents 4% of Federal research and development (R&D) spending, but supports roughly half of the nonmedical basic research conducted at colleges and universities.

The proposal provides \$2.268 billion for IT R&D, \$605 million more than last year's appropriations and a billion dollars more than the FY1999 appropriation. The largest increases above FY2000 funding are proposed for NSF, which is leading the interagency effort (+\$223M), the Department of Defense (DoD) (+\$126M), the Department of Energy (DOE) (+\$150M), the National Aeronautics and Space Administration (NASA) (+\$56M), and the Department of Health and Human Services (+\$42M).

In biobased technologies, the proposal calls for a new initiative in which biobased industries use agricultural, forest, and aquatic resources to make an array of commercial products including fuels, electricity, chemicals, adhesives, lubricants, and building materials. The initiative provides an increase of more than \$93 million over the amounts available for FY2000, including \$49 million directed toward DOE.

For more on the President's budget proposal released February 1, visit the *MRS Bulletin* website (www.mrs.org/publications/bulletin/) for links to charts and assessments.

National Nanotechnology Initiative (NNI) Receives Top Priority in President's S&T Budget Proposal

President Clinton's FY2001 budget request includes a \$227 million (84%) increase in the government's investment in nanotechnology research and development (R&D). The Administration is making this major new initiative, called the National Nanotechnology Initiative (NNI), a top priority in science and technology (S&T).

This initiative builds upon previous and current nanotechnology programs, including some early investment from some of the participating agencies, including the National Science Foundation (NSF), the Department of Defense (DoD), the Department of Energy (DOE), National Institutes of Health (NIH), National Aeronautics and Space Administration (NASA), and Department of Commerce's National Institute of Standards and Technology (NIST) (see Table I). About 70% of the new funding proposed under the NNI will go to university-based research, which will help meet the growing demand for workers with nanoscale science and engineering skills.

The research strategy is balanced across the following funding mechanisms: fundamental research; grand challenges; centers and networks of excellence; research infrastructure; as well as ethical, legal, and social implications and workforce pro-

grams (see Table II). Long-term fundamental nanoscience and engineering research will build upon a fundamental understanding and synthesis of nanometer-size building blocks with potential breakthroughs in areas such as materials and manufacturing, nanoelectronics, medicine and healthcare, environment and energy, chemical and pharmaceutical industries, biotechnology and agriculture, computation and information technology, and national security. This investment will provide sustained support to individual investigators and small groups doing fundamental, innovative research and will promote university-industry-federal laboratory and interagency partnerships.

Grand Challenges is to fund interdisciplinary research and education teams, including centers and networks that work for major, long-term objectives. Projects would include making materials and products by building them up from atoms and molecules. Bottom-up manufacturing should require less material and pollute less; developing materials that are 10 times stronger than steel, but a fraction of the weight for making land, sea, air, and space vehicles lighter and more fuel efficient; and doubling the energy efficiency of solar cells.

Centers and Networks of Excellence will encourage research networking and shared academic users' facilities. These nanotechnology research centers will play

Table I. Funding for Nanotechnology Research by Agency

Agency	FY 2000 (\$M)	FY 2001 (\$M)	Percent Increase
NSF	\$ 97M	\$ 217M	124%
DoD	\$ 70M	\$ 110M	57%
DOE	\$ 58M	\$ 96M	66%
NASA	\$ 4M	\$ 20M	400%
NIST	\$ 8M	\$ 18M	125%
NIH	\$ 32M	\$ 36M	13%
TOTAL	\$ 270M	\$ 497M	84%

Table II. Funding by NNI Research Portfolio

	FY 2001
Fundamental Research	\$ 195M
Grand Challenges	\$ 110M
Centers and Networks of Excellence	\$ 77M
Research Infrastructure	\$ 87M
Ethical, Legal, and Social Implications and Workforce	\$ 28M
TOTAL	\$ 497M

an important role in development and utilization of specific tools and in promoting partnerships in the coming years.

Research Infrastructures will be funded for metrology, instrumentation, modeling and simulation, and user facilities. The goal is to develop a flexible enabling infrastructure so that discoveries and

innovations can be rapidly commercialized by the U.S. industry.

Ethical, Legal, Societal Implications and Workforce Education and Training efforts will be undertaken to promote a generation of skilled workers in the multidisciplinary perspectives necessary for rapid progress in nanotechnology. The impact

nanotechnology has on society from legal, ethical, social, economic, and workforce preparation perspectives will be studied. The research will help locate potential problems and provide ways to intervene efficiently in the future on measures that may need to be taken. □

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MRS Supports National Nanotechnology Initiative

In a letter to Neal Lane, Assistant to the President for Science and Technology, MRS President Harry A. Atwater supported the National Nanotechnology Initiative (NNI) on behalf of the Materials Research Society. President Clinton announced this initiative as a key priority in his FY2001 budget proposal for science and technology (S&T) (see Washington News, page 8). According to the National Science and Technology Council (NSTC), a Cabinet-level council established by an executive order in 1993, discoveries in the next 10–20 years at the nanoscale promise revolutionary commercial applications across a wide range of areas, with relevance to manufacturing, healthcare, the environment, and national security. To ensure that the Federal Government is evaluating ways to make strategic research and development (R&D) in this emerging field of nanoscale, NSTC's Interagency Working Group on Nano-Science, Engineering and Technology initiated efforts to formulate R&D priorities for nanotechnology that could establish the basis for a national investment strategy. NSTC has posted two reports that define nanotechnology, describe its revolutionary impact on many aspects of society, and provide a vision for the way researchers in this field can begin to collaborate in this multidisciplinary environment: *Nanotechnology: Shaping the World Atom by Atom* (www.whitehouse.gov/WH/EOP/OSTP/NSTC/html/iwgn/IWGN.Public.Brochure/welcome.htm) and *IWGN Workshop Report: Nanotechnology Research Directions* (www.whitehouse.gov/WH/EOP/OSTP/NSTC/html/iwgn/IWGN.Research.Directions/toc.htm).

Representing a Society that promotes interdisciplinary, goal-oriented basic research on materials of technological importance, Atwater issued a letter to the White House expressing MRS's enthusiasm for this Initiative.

Letter sent by the Materials Research Society

January 19, 2000

Dear Dr. Lane,

As the elected representative of the 13,000-member Materials Research Society, I am writing to enthusiastically endorse the National Nanotechnology Initiative. This relatively new and exciting area of science and engineering holds tremendous promise for discoveries and inventions across a wide variety of areas. We see in nanotechnology opportunities for the development of new knowledge, techniques and devices with applications ranging from medicine to computers and telecommunications to aerospace. The ability to control materials near the atomic level to alter properties, tailor their behavior, and to build unseen devices will bring about a revolution that is currently unimaginable. The multidisciplinary nature of nanotechnology is particularly well-recognized by the MRS, in that our members work in cross-disciplinary arenas including biology, biochemistry, solid state physics, materials science, mechanical engineering, and many more. Their work includes much that is already occurring in the fledgling area of nanotechnology, such as biomimetic structures, nano-scale machines, and smart materials. It is expected that the National Nanotechnology Initiative will also provide for the education and training in this area of the scientists, engineers, managers, and leaders of tomorrow. As nano-science and engineering is expected to become another fundamental technology, it is vital that we have both the best-trained practitioners and lay citizenry that must participate in making related social decisions.

Please accept our wholehearted support for the National Nanotechnology Initiative. We are looking forward to working with the President and Congress to build a bipartisan effort to make the Initiative a success.

Very sincerely yours,



Harry A. Atwater
President, Materials Research Society