

Chemical Sciences in the FY 2001 Budget

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While support for the chemical sciences is not an explicit focus of the federal government, research support for chemistry is provided through many agencies. The current budget proposal for FY 2001:

- would provide significant increases for most programs that support the chemical sciences;
- would provide a balanced portfolio of research support across the full range of chemistry subdisciplines; and
- recognizes the relevance of the chemical sciences to the core mission of several agencies as well as the contributions that chemistry can make in agency initiatives.

Chemistry is a central science that provides the fundamental understanding required to address many societal needs, including those that determine our quality of life and our economic strength. Chemistry is the science that tries to understand the properties of substances and materials and the changes they undergo. It seeks to understand why substances have different properties, and how these properties can be controlled and exploited. The study of chemistry has had a long and successful history, and now affects nearly all aspects of our life. Among others areas, chemistry is critical to the growth and safety of food sources, unlocking new sources of energy, improving health and conquering disease, strengthening national security, monitoring and protecting the environment, creating new materials for the electronics and information technology industries, and developing new methodologies and

tools for the biotechnology and pharmaceutical industries.

The federal government has made a strong commitment to support research in the chemical sciences. Its investments are highly leveraged by the private sector. The federal government is an important source of support, particularly for basic research in the chemical sciences. Universities, which receive much of this federal support, perform research and educate future chemical scientists and engineers, and thus play a crucial role in ensuring the future vitality of the research system and U.S. industry.

NATIONAL SCIENCE FOUNDATION (NSF)

Within NSF, the Chemistry Division of the Mathematics and Physical Sciences (MPS) Directorate supports approximately one-half of the Foundation's chemistry research. Support for chemistry research is also found in the Materials Research Division within MPS, and through the Molecular and Cellular Biosciences Division within the Biological Science Directorate. The Chemistry Division supports chemical research across the spectrum of opportunities, whereas other divisions support chemistry as it assists in the advancement of divisional objectives.

Under the proposed FY 2001 budget, research project support from the Chemistry Division would increase 10 percent to \$130 million, much of which would result from the proposed National Nanoscience Initiative (NNI). This increased funding would also be used to increase award size and lengthen grant duration. The budget proposal also would increase Chemistry Instrumentation and Infrastructure by 17 percent to \$162 million. The Information Technology (IT) initiative would increase funding for computational chemistry as well as increase support for interdisciplinary groups to integrate computation with measurements.

The FY 2001 budget request would also direct \$3.75 million to support up to three new Chemistry Centers for Advanced Molecular Characterization. In addition, funding for Materials Research Science and Engineering Centers would increase by \$6 million to support up to four new centers, including centers focused on materials research, and nanoscience and engineering.

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Chemistry would generally benefit from the requested increased funding for science and math teaching programs included in NSF's 21st Century Workforce Initiative. These programs would include the Centers for Learning and Teaching and the Graduate Teaching Fellowships in K-12 education.

NATIONAL INSTITUTES OF HEALTH (NIH)

As the principal supporter of biomedical research in the United States, NIH is a significant source of new biomedical discoveries that are leading to longer, healthier lives as well as reduced health-care costs due to prevention, early detection, and more cost-effective treatment of disease. The chemical sciences play a critical enabling role in these efforts, and accordingly NIH supports research in the chemical sciences to further the molecular understanding of disease and illness and to develop new techniques to advance biomedical research.

Increasingly, the ability to respond to new health challenges, such as AIDS or drug-resistant forms of tuberculosis, and to combat enduring afflictions such as diabetes, cancer, heart, and Alzheimer's disease, relies on an understanding of human and disease systems at molecular and chemical levels. Much of this understanding has accumulated through years of investigation in basic chemical and biological phenomena through the support of the National Institute of General Medical Sciences (NIGMS) and the National Center for Research Resources (NCRR).

NIGMS provides non-disease-specific basic research and training which complements advances in other NIH institutes. NIGMS is the largest single source of chemistry funding within NIH, traditionally providing approximately two-thirds of NIH's support for academic research in chemistry and one-third of its support for biochemistry. NCRR supports the state-of-the-art research infrastructure necessary to provide high-quality biomedical research. Of particular importance to chemical researchers is the Shared Instrumentation Grants program, which provides the necessary instrumentation to pursue research opportunities.

The FY 2001 budget request for NIH is \$18.8 billion, a 5.6 percent increase. The administration request would provide NIGMS with \$1.4

billion, a 5.5 percent increase, and NCRRT with \$714 million (including transferred HIV/AIDS funds), a 5.8 percent increase (see Table II-9).

DEPARTMENT OF ENERGY (DOE)

DOE supports fundamental research in the chemical sciences that seeks to improve the cost effectiveness and environmental impact of the production and consumption of energy and energy-related products. Most chemistry research at DOE is supported through two programs within the Office of Science: Basic Energy Sciences (BES) and Biological and Environmental Research (BER).

In BES, the largest increases for chemistry research in the FY 2001 proposal would come from the NNI. The initiative would increase new funding for chemistry by \$32 million. Within the initiative, \$400,000 is proposed for new tools for nanoscale chemical research. Also included in the FY 2001 budget is a proposed 10 percent increase in facility funding, which would generally benefit chemistry. Specific to chemical research, the Combustion Research Facility would receive increased funding. A proposed \$2 million increase in computational chemistry is also contained in the FY 2001 budget proposal.

Chemistry would play an important role in the proposed Bioenergy and Biobased Products Initiative. BER would administer part of this initiative, receiving a total of \$174 million. This initiative aims to understand the basic chemistry of cellulose and other materials in biomass, and develop new thermal, chemical, and biochemical techniques for converting these materials into useful items.

DEPARTMENT OF DEFENSE (DOD)

DOD supports military-relevant basic research in the chemical sciences through the Air Force Office of Scientific Research, the Army Research Office, and the Office of Naval Research. Basic research funding, referred to as "6.1," is allocated for both intramural and extramural research conducted primarily at universities. Historically, DOD was one of the major supporters of physical chemistry. However, the decline in DOD's R&D budget over the past decade has significantly decreased the available support for physical chemistry.

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Nanoscience is not new for DOD, but the proposed NNI would add \$40 million to DOD's nanoscale research. Chemistry would play a significant role in the DOD's contributions to NNI. DOD would place a significant portion of its NNI-augmented program into three of the NNI Grand Challenges: Nano-Electronics, Optoelectronics, and Magnetics; Nanostructured Materials by Design; and Biosensor Devices for Communicable Disease and Biological Threat Detection. All of these research areas depend heavily on chemistry. For example, the NNI would encourage ongoing DOD research into new, highly functioning dendritic molecules, which have sensor applications and would aid in detecting chemical and biological threats.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

Within EPA, the Office of Research and Development (ORD) is the primary source of support for research. Chemistry plays an important role in much of EPA's decision-making processes and is critical to understanding and solving the nation's environmental challenges. ORD support of chemical research is important to EPA's ability to address the high-risk concerns of clean air and water.

A portion of the \$227 million proposed investment in climate change research included in the request would support chemistry.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST, through its intramural and extramural programs, delivers the underlying technological capabilities for areas of chemical processing and research, from nanotrace analyses and clinical testing to synthesis and catalysis.

Researchers at NIST's Chemical Science and Technology Laboratory focus, in part, on the research and technology needs of the \$390 billion U.S. chemical industry. NIST laboratories provide impartial expertise, test methods, and best-in-the-world calibration services that maximize efficiency, promote trade, and ensure confidence in the growing number of precision measurements needed for a variety of sectors including electronics, automotive, aerospace, food processing, and health care. In addition, the laboratories produce standards reference materials and data

needed to achieve lower detection limits, improve quality, productivity, and efficiency of chemical measurements. The laboratories also play an integral role in nanotechnology by developing measurements and standards for nanodevices, nanomagnetics, nanomanipulation, and nanocharacterizations. The \$332 million FY 2001 request for the intramural laboratory program is a 20 percent increase, and would begin to address the recent decline in support for the intramural laboratories.

NIST's Advanced Technology Program (ATP) promotes research that strengthens U.S. industries in high-risk technologies with a potential for broad economic impact. ATP projects that capitalize on advances in chemistry span many areas, including: catalysis and biocatalysis, energy storage and battery technology, separation technology, DNA diagnostics, and selective membrane and process technologies. The \$175 million FY 2001 request (up 21 percent), would allow for new focused competitions.

UNITED STATES DEPARTMENT OF AGRICULTURE (USDA)

USDA research seeks to improve environmental quality, food safety, agricultural productivity, and renewable chemical and energy resources. The Agricultural Research Service (ARS) supports chemistry research that advances the agricultural mission of the department. The \$894 million FY 2001 request, an 8 percent increase, would help support chemistry research and develop innovative technologies that could accelerate environmentally sound production practices, increase understanding of the influence of global climate change on food production, and improve air quality. ARS's role in research on bioenergy and biobased products could also lead to the development of chemicals, adhesives, lubricants, and building materials that will increase agriculture productivity.

The Cooperative State Research, Education and Extension Service (CSREES) provides the scientific foundation for an array of advances being made in agriculture and related industries. CSREES provides nominal funding for the university-based chemical sciences through a competitive, peer-reviewed extramural program. CSREES' National Research Initiative (NRI) would support fundamental chemical research in genetics, biobased products, food safety, and pest and disease management. The President's FY 2001 request of \$1.1 billion for CSREES includes a 26 percent increase for NRI (\$150 million).