

Chemical Sciences in the FY 2003 Budget

*Michael J. Eichberg, Laura M. Gerum, Heather N. Hill,
Bradley R. Smith, Caroline Trupp Gil,
American Chemical Society*

Chemistry is a central science that seeks to understand the properties of different substances and how these properties can be controlled and exploited. Because an understanding of chemistry is often required for federal agencies to fulfill their missions, support for chemical research is found throughout government programs. In the current FY 2003 budget proposal:

- Chemistry would benefit from the proposed increase for the Department of Energy's Office of Science, the National Institutes of Health, and the National Research Initiative program at the U.S. Department of Agriculture;
- Support for chemistry would remain strong at the National Institute of Standards and Technology; but
- In remaining federal agencies and programs, total support for research in chemistry would decline.

Scientists in academic, government, and industry laboratories perform federally funded chemical research. The results of this research are utilized by government and leveraged by industry to develop various products and services that improve quality of life and help maintain our economic strength. Among a variety of benefits, successes in chemistry have led to effective health and pharmaceutical products, the growth and safety of our nation's food and water supply, the expansion and improvement of our energy sources, new materials for the electronics and information industries, and key technologies for national defense.

The federal government has a particularly important role in the basic chemical sciences performed largely at the university level. It is at this level and to a large extent with these funds that the nation's future chemical scientists and engineers are trained. Thus, a continued federal investment in the chemical sciences is necessary in order obtain to benefits from future chemical advances.

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 and about 20 percent of the federal government's support for academic chemistry research. Funding for chemistry also can be found in other NSF divisions including the Materials Research and Physics Division, the Molecular and Cellular Biosciences Division, the Atmospheric Sciences and Earth Sciences Divisions, the Advanced Computational Research Division, and the Chemical and Transport Systems Division.

While total R&D at NSF would rise by 3.5 percent in the proposed FY 2003 budget (see Table II-7), research project support from the Chemistry Division at MPS would decrease by \$2.1 million, or 1.3 percent. Most of the \$160.8 million requested by the Division would fund research in the NSF priority areas of Information Technology Research, Nanoscale Science and Engineering, and Biocomplexity in the Environment, as well as support the Chemistry Centers and the Science and Technology Center for Environmentally Responsible Solvents and Processes. The Division would also continue to increase the average grant size, a critical step towards improving the return on NSF investments in chemistry. However, the number of grant awards would fall. These developments may negatively affect the Chemistry Division's ability to fund chemistry research that falls outside of the priority areas.

Training in chemistry would benefit from the requested increased funding for stipends for the Graduate Research Fellowships, the Graduate Teaching Fellowship in K-12 education and the Integrative Graduate Education and Research Traineeship programs. The proposed \$200 million investment in the Math and Science Partnerships Initiative would further enhance chemistry teaching and curricula where such programs exist. (For more information on the NSF budget, see Chapter 7.)

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NATIONAL INSTITUTES OF HEALTH (NIH)

As the principal supporter of biomedical research in the United States, NIH is a significant source of new discoveries that are leading to longer, healthier lives. 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 anthrax and drug-resistant forms of tuberculosis, and to combat enduring afflictions such as diabetes, cancer, 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 that complement 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 in 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 (SIG) program, which provides the necessary instrumentation to pursue research opportunities.

The FY 2003 budget request for NIH is \$27.3 billion, a 16 percent increase. The administration request would provide NIGMS with \$1.88 billion, a 9 percent increase, and NCRR with \$1.09 billion, a 7.8 percent increase (see Table II-9; for more information on NIH, please see Chapter 8).

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. The

Office of Science at DOE is the sole supporter of heavy-element chemistry and the primary supporter of homogenous and heterogeneous catalysis, photochemistry, radiation chemistry, separations and analysis and gas-phased chemical dynamics. Most chemistry research at the Office of Science is supported through two programs: Basic Energy Sciences (BES) and Biological and Environmental Research (BER).

Although total science R&D at DOE would increase by only 0.5 percent in FY 2003, the research activities at BES are proposed to rise 6.6 percent, in part due to decreases in its construction line (see Table II-11). Nine areas vital to the chemical sciences are proposed to receive increases. Research in condensed matter physics, material synthesis and process and catalysis would increase due to the nanotechnology initiative. Materials chemistry and photochemistry, two BES activities with relevance beyond nanotechnology, would also see their funding grow. Additional funding for two core mission areas, separations science and heavy element chemistry, are also proposed to receive increases. In addition, funding for the Spallation Neutron Source and Nanoscale Science Research Centers would indirectly provide long-term benefits for chemistry. (For more information on the nanotechnology initiative, see Chapter 24. For more information on DOE, see Chapter 9).

The FY 2003 BER budget proposes to increase the Genomes to Life program by \$15 million and requests \$3 million for the new Climate Change Research Initiative (CCRI), which would be beneficial to some chemistry sub-fields. (For more information on CCRI, see Chapter 15).

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 (CSTL) focus, in part, on the research and technology needs of the 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

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addition, the laboratories produce standards reference materials and data needed to achieve lower detection limits, and improve the quality, productivity, and efficiency of chemical measurements. The laboratories also play an integral role in nanotechnology by developing measurements and standards for nanodevices, nanomagnetics, and nanocharacterizations. The \$348 million FY 2003 request for the intramural laboratory program represents a 24 percent increase and would address the infrastructure and facility needs. CSTL would receive a 15 percent increase.

The administration's decision to continue the Advance Technology Program (ATP) will help support research in a variety of chemically related high-risk technologies.

DEPARTMENT OF DEFENSE (DOD)

DOD supports military-relevant chemical research through the Army, Navy, and Air Force research organizations and through defense-wide research agencies such as the Defense Advanced Research Projects Agency (DARPA). Basic research funding, referred to as "6.1," is allocated for both intramural and extramural programs.

Chemistry is important in many areas of basic research at DOD. For example, the Air Force Office of Scientific Research (AFOSR) conducts programs in molecular dynamics, theoretical and polymer chemistry, and surface science. These efforts serve the needs of the Air Force for new lightweight materials, better understanding of atmospheric processes, more energetic and efficient propellants, improved corrosion prevention capabilities, and the development of improved electro-optic technologies.

Even before last fall's bioterrorist attacks, the development of chemical and biological defense technologies was a priority in the military. Research in chemistry is essential in this effort, such as for the discovery of new countermeasures and improved detection capabilities.

The FY 2003 budget request provides a slight decrease of 0.8 percent for the military's "6.1" research accounts. The Army and Navy "6.1" accounts would receive increases of 2.4 and 1.3 percent respectively, while the Air Force would incur a 3.2 percent cut (see Table II-5). Thus, chemical research would likely remain flat or decline. The defense-wide

basic research programs would decline 2.8 percent, although increases in the Chemical and Biological Defense Program and DARPA “6.1” accounts could mean an increased investment in certain chemistry fields. (For more information on DOD R&D, see Chapter 6.)

ENVIRONMENTAL PROTECTION AGENCY (EPA)

At EPA, the Office of Research and Development (ORD) supports most of the fundamental research that underpins the Agency’s efforts to protect public health and the environment. Because chemistry plays a central role in much of EPA’s decision-making processes and in solving the nation’s environmental problems, ORD engages in a great deal of chemical research. These efforts include addressing concerns about potentially harmful components of air, water, and food and the development of green chemistry and engineering approaches for less environmentally damaging processes and materials.

The proposed level of funding for ORD in FY 2003 is \$627 million, an increase of almost 6 percent (see Table II-17; for more on the EPA budget, see Chapter 12). However, 12 percent of the ORD request would be used to address homeland security research. While some of this funding will support chemically related research, such as new strategies for the cleanup of buildings contaminated by biological and chemical agents, the budget for ongoing ORD core and problem-driven research programs would be significantly decreased.

Though the extramural Science To Achieve Results (STAR) program’s grant funding would remain steady at \$100 million, the STAR fellowships would be eliminated. These fellowships are important because they work in combination with the research grants to provide new data and train future scientists. Also, EPA would continue to participate in the U.S. Global Climate Research Program (USGCRP), portions of which support chemistry, with steady funding of \$22 million (see Table I-10; for more on USGCRP, see Chapter 15).

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. It is uncertain

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how the \$1.1 billion FY 2003 R&D request, a 16 percent decrease, would influence ARS research (see Table II-13). A strong budget for ARS would support chemistry research and develop innovative technologies could accelerate environmentally sound production practices, increase the understanding of the influence of global climate change on food production, and improve air quality. The FY 2003 budget may diminish ARS's role in research on bioenergy and biobased products. These products could 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 administration's FY 2003 request of \$565 million for CSREES R&D programs, which includes a doubling of the NRI budget to \$240 million, would be a 2 percent increase (see Table II-13; for more on the USDA budget, see Chapter 11).