

## Chemical Sciences in the FY 2005 Budget

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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 2005 budget proposal:

- Support for chemistry would remain strong at the National Institutes of Health (NIH);
- support for chemistry at the National Science Foundation (NSF) would remain steady, with chemists benefiting from proposed increases in stipends, and small proposed increases in the Chemistry Division sustaining chemical research support;
- support for chemistry at the Department of Energy (DOE) would likely benefit from the Administration's focus on hydrogen research;
- decreases in Department of Defense (DOD) Science and Technology program would reduce chemistry support.
- In addition, continued interagency efforts in nanotechnology and hydrogen research would likely advance chemical research.

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. Support for chemistry research can also 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.

The MPS Chemistry Division supports chemical research across the spectrum of opportunities, whereas other NSF divisions support chemistry as it assists in the advancement of divisional objectives. It provides about 20 percent of the federal government's support for academic chemistry research.

Under the proposed FY 2005 budget, the chemistry budget would increase by 2.0 percent from the proposed 2004 budget, bringing its budget to \$188.9 million (see Table II-7).

Chemistry would generally 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. NSF is increasing the average grant size by \$3,000 in 2005. This increase will bring the average annual amount to \$142,000. In addition, the 2005 budget allows the NSF to increase the number of graduate education fellowships from 5,000 to 5,500. The stipend level will remain at \$30,000 annually. (For more on NSF, see Chapter 7.)

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### **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.

The development of chemical and biological defense technologies has been 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 2005 budget request would decrease DOD basic research (“6.1”) and applied research (“6.2”), which would likely decrease chemical research (see Table II-2). (For more on DOD, 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 Administration has proposed \$689 million for the overall EPA Science & Technology (S&T) account, a decrease of \$92 million (see Table II-17). The EPA’s S&T account supports laboratories and programs that contribute, in many cases, to multiple goals and objectives

across the whole of EPA. The President's budget request would cut 35 percent of extramural research funded through the Science to Achieve Results (STAR) program, including elimination of all extramural research on pollution prevention. This would have detrimental implications for research in the green chemistry field. (For more on EPA, see Chapter 13.)

#### **DEPARTMENT OF ENERGY (DOE)**

Department of Energy 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. DOE, through the Office of Science, 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 DOE is supported through two Office of Science programs: Basic Energy Sciences (BES) and Biological and Environmental Research (BER). The Administration proposed a \$3.4 billion budget for the Office of Science, a 2.0 percent decrease. Within the proposed budget, BES will receive an increase of 5.2 percent, while BER would experience a reduction of 21.8 percent (see Table II-11).

Chemistry would benefit from the large proposed increases in hydrogen energy research, which would increase 262 percent to \$29 million in FY 2005. Likewise, increases in nanoscience (\$211 million in FY 2005, a 3.9 percent increase), genomics (\$80 million, 11 percent), and to a smaller extent, climate change initiatives (\$134 million, 1 percent), Advanced Scientific Computing Research (\$204 million, 1 percent), and workforce development for teachers and scientists (\$7.7 million, 19 percent), would likely increase support for the chemical sciences. (For more on DOE, see Chapter 9.)

#### **NATIONAL INSTITUTES OF HEALTH (NIH)**

The FY 2005 budget request for NIH is \$28.6 billion, a 2.6 percent increase over the FY 2004 level (see Table II-9). 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

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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 diseases 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. The Administration requested \$2.0 billion for NIGMS, a 2.9 percent increase (see Table II-9).

NCRR supports the state-of-the-art research infrastructure necessary to provide high-quality biomedical research. Of particular importance to chemical research is the Shared Instrumentation Grants (SIG) program, which provides the necessary instrumentation to pursue research opportunities. The FY 2005 budget proposes a 7.2 percent reduction, bringing NCRR's budget to \$1.1 billion (see Table II-9). This would negatively impact NCRR's ability to support research infrastructure.

The Roadmap for Biomedical Research which focuses on support for high-risk, interdisciplinary research across the Institutes, promises to be generally supportive of the chemical sciences. The President's budget request would fund Roadmap activities at \$237 million, an 85 percent increase over FY 2004. (For more on NIH, see Chapter 8.)

### **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. The Administration budget would decrease science and technology funding in FY 2005 by 15.7 percent to \$482 million.

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. CSTL is part of the larger NIST laboratories program. 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, 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 proposed \$418 million FY 2005 request for the intramural laboratory program research and development represents a 26 percent increase and would address critical infrastructure and national security needs.

The Administration's decision to eliminate funding for the Advance Technology Program (ATP) would hamper research in a variety of chemically related high-risk technologies. This is the second consecutive year the White House has proposed ending ATP. (For more on ATP and NIST, see Chapter 13.)