

Chemical Sciences in the FY 2006 Budget

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Chemistry is a central science that seeks to understand the composition and structure of different substances and their properties and reactions. Because an understanding of chemistry is often required for federal agencies to fulfill their missions, support for chemical research is found throughout many government programs. In the current FY 2006 budget proposal:

- Support for chemistry would increase at the National Institute of Standards and Technology (NIST) through significant increased funding of the intramural research and development programs;
- Support for chemistry at the National Science Foundation (NSF) would increase slightly but grant success rates are expected to drop;
- Support for chemistry at the Department of Energy (DOE) would see moderate increases in Administration priority areas such as hydrogen energy research and climate change initiatives;
- Support for chemistry at the Department of Defense (DOD) would likely decrease with proposed cuts in basic and applied research;
- Support for chemistry at the National Institutes of Health (NIH) would increase slightly with proposed increases at the National Institute of General Medical Sciences (NIGMS);
- Construction begins on the Linac Coherent Light Source and four NanoScale Science Research Centers will begin operations. These facilities will enable world-class research in emerging chemical fields.

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, continued federal investment in the chemical sciences is necessary in order to benefit 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 a wide spectrum of topics, whereas other NSF divisions support chemistry as it assists in the advancement of divisional objectives. The Chemistry Division provides about 38 percent of the federal government's support for academic chemistry research.

Under the proposed FY 2006 budget, the chemistry budget would increase by 1.1 percent from the enacted 2005 budget, bringing its budget to \$181 million (see Table II-7). This modest increase would not offset the increase in award size due to inflation. Thus, in combination with increased proposal submissions, the grant success rate is expected to drop slightly in the coming fiscal year.

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In October 2004, the National Science Foundation announced elimination of mandatory cost-sharing requirements for some programs, such as large centers and major instrumentation programs. The policy stated that universities had to come up with funding to supplement an NSF award and, in some cases, match the NSF award. This policy change allows smaller institutions to enter the competition but will also increase the number of competitors and grant size. Grant success rate in the instrumentation program is expected to drop from nearly 40 percent to about 30 percent as a result of this new policy. (See Chapter 7 for more on the NSF budget.)

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 2006 budget would decrease DOD basic research (“6.1”) and applied research (“6.2”), which would likely decrease chemical research. (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 \$761 million for the overall EPA Science & Technology (S&T) account, an increase of \$17 million over the enacted 2005 level (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 2 percent from 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 the EPA budget, see Chapter 13.)

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. 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 proposes a \$3.5 billion budget for the Office of Science, a 3.8 percent decrease. Within the proposed budget, BES would receive an increase of 3.7 percent, while BER would experience reduction of 21.7 percent (see Table II-11).

Especially exciting for chemistry will be the start of construction for the Linac Coherent Light Source, a world-class facility based at Stanford Linear Accelerator Center, which will provide laser-like radiation in the x-ray region of the spectrum when it becomes operational in 2009. This facility will provide 10 billion times the brightness of current coherent light sources, giving insight as never before into catalysis, chemical processes, protein folding, and molecular assembly. Additionally, four NanoScale Science Research Centers (NSRCs) will begin operations at Oak Ridge, Lawrence Berkeley, Sandia, and Argonne National Labs.

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The NSRCs are user facilities for the synthesis, processing, fabrication, and analysis of materials at the nanoscale level. They are designed to enable the nanoscale revolution by situating multiple research disciplines, multiple techniques, and a wide variety of state-of-the-art instrumentation in one building. (For more on NSRCs, see Chapter 24.)

The following priorities would be increased in the FY 2006 Office of Science budget: Hydrogen energy research (\$32.5 million, up 11.4 percent), Genomics (\$94.7 million, up 11.4 percent), and Climate Change initiatives (\$132 million, up 2.8 percent). The following programs would be cut: Advanced Scientific Computing Research (\$207 million, down 10.9 percent), and Workforce Development for teachers and scientists (\$7.2 million, down 6.5 percent).

NATIONAL INSTITUTES OF HEALTH (NIH)

The FY 2006 budget request for NIH is \$28.7 billion, a 0.5 percent increase over the FY 2005 enacted 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 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 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. Within NIGMS, the Division of Pharmacology, Physiology, & Biological Chemistry carries out vital chemical research into both pharmacology and the

chemistry of life. The Administration requests \$2.0 billion for NIGMS, a 0.6 percent increase (see Table II-9).

NCRR supports the state-of-the-art research infrastructure 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 2006 budget proposes a 1.3 percent reduction, bringing NCRR's budget to \$1.1 billion, and would negatively impact NCRR's ability to support research infrastructure. (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's budget would reduce the NIST budget in FY 2006 by 23.9 percent to \$532 million (see Table II-14).

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 standard 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 strong \$421 million FY 2006 request for the intramural laboratory research and development program represents a 12.9 percent increase over FY 2005 and would address critical infrastructure and national security needs.

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