

**CHEMISTRY****\$244,670,000**

The FY 2009 Request for the Division of Chemistry (CHE) is \$244.67 million, an increase of \$50.45 million, or 26.0 percent, over the FY 2008 Estimate of \$194.22 million.

**Chemistry Funding**  
(Dollars in Millions)

	FY 2007 Actual	FY 2008 Estimate	FY 2009 Request	Change over FY 2008 Estimate	
				FY 2008 Estimate Amount	Percent
<b>Chemistry</b>	<b>\$191.22</b>	<b>\$194.22</b>	<b>\$244.67</b>	<b>\$50.45</b>	<b>26.0%</b>
Major Components:					
Research and Education Grants	167.51	165.61	201.88	36.27	21.9%
Centers Programs	9.60	13.42	25.26	11.84	88.2%
Instrumentation/Facilities	14.11	15.19	17.53	2.34	15.4%

Totals may not add due to rounding.

**About CHE:**

Chemistry is a bold and creative science that finds efficient ways to prepare Nature's compounds and to make new ones that have never existed before. Investment in basic molecular sciences is a major contributor to the \$637 billion U.S. chemical industry. Approximately one third of the industrial output of the U.S. derives from the chemical industry, which in turn requires more than 2,000 PhD graduates per year to operate efficiently. The Chemistry Division plays a crucial role in the vitality of the basic research enterprise, especially in academic laboratories, and needs increased resources to sustain, expand and improve the community's ability to perform transformative and translational research in chemistry.

Approximately 50 percent of the CHE portfolio will be available for new research grants in FY 2009. The remainder will fund previous continuing commitments on grants, as well as grants for instrumentation and education. In FY 2007, CHE received 1,248 research proposals and made 341 competitive awards for a success rate of 27 percent.

**CHE priorities for FY 2009:**

*The Centers for Chemical Innovation (CCI)* program represents a new mode of support for transformative basic chemical research on "grand challenges." The CCI Program was initiated as a pilot in 2004 (as *Chemical Bonding Centers*) with several ambitious goals: to support high risk, transformative science; to energize the chemistry research community to tackle grand challenges; and to creatively engage the public. The change to *Centers for Chemical Innovation* reflects the addition of innovation as a key feature expected from these centers. Major themes from the ACI are targeted, such as sustainable technologies, nanotechnology, and molecular electronics.

*ACI Fellows (ACI-F)* in chemistry will provide consistent bridges across career transitions to the top ranked young talent in chemistry. ACI-F would launch young scientists into the professoriate – from their postdoctoral fellowship to their starting years as junior faculty. Goals include broadening participation and encouraging best practices in departmental culture. ACI-F will increase research capacity in targeted ACI areas such as nanotechnology and energy security.

*Science and Engineering Beyond Moore's Law:* One way to move beyond Moore's Law will use molecules or small assemblies of these as components of electronic devices. Ultimately, the goal is to develop a new generation of computer chips in which single molecules or small groups of them self-

assemble into pre-designed structures to store information and function as devices. Intensive synthetic effort guided by rigorous theoretical studies is vital to accomplish the effort.

*Quantum Information Science:* Quantum computing using NMR spectroscopy and entangled states is an area of interest. Quantum effects in nanoparticles are being discovered and modeled effectively, which could find uses in information science and technology. If new paradigms of computing emerge as competitive technologies, the discoveries enabled by funding molecular electronics research will be crucial for successful implementation of these ideas.

*Adaptive Systems Technology* in CHE will use the chemical circuitry in cells as dynamic building blocks that are combined in precise ways to function, for example, as small chemical factories. The research would involve identifying chemical networks and their necessary vehicles and then inserting them biocompatibly in other cells or artificial structures. Recent advances have increased the capability to mimic and expand upon nature.

*Transformational Facilities and Infrastructure:* The Chemical Research Instrumentation and Facilities (CRIF) program has four tracks through which CHE addresses its priorities in Shared Instrumentation, Instrumentation Development, Facilities, and Cyberinfrastructure. A concerted effort to develop the next generation of *chemical imaging tools* will have a significant impact on our ability to understand complex biological processes, molecular electronics, chemical processes on catalytic surfaces, and environmental processes, as well as sensors for national security.

*Cyber-enabled Discovery and Innovation:* The goal of CDI-Chemistry is to stimulate new collaborations that will lead to transformative methods to model complex molecular structures, including excited electronic states. Systems of interest cross many scales of time, energy, and space and involve, for example, weak intermolecular interactions functioning in an environment composed of many thousands of solvent molecules. Development of multi-scale simulation methods for large numbers of interacting elements is at the forefront of simulation science.

**Changes from FY 2008:**

- CCI increases by \$12.5 million to \$20.0 million, reflecting the establishment of three additional Phase II centers and six new Phase I centers. Strong support is needed especially because of the budget reduction (one Phase II Center) in FY 2008.
- Other research and education grants increase by \$36.27 million to a total of \$201.99 million. \$29.22 million is dedicated to interdisciplinary programs to fund curiosity-driven fundamental chemistry research. CHE will support: molecular electronics and Science and Engineering Beyond Moore's Law with an investment of \$1.75 million; Quantum Information Sciences with \$2.0 million; Adaptive Systems Technology with \$1.0 million; Cyber-enabled Discovery and Innovation with an increase of \$800,000; and ACI-Fellows with an increase of \$1.50 million. The Science and Technology Center is phasing out, decreasing by \$660,000.
- Funding for learning increases by \$1.85 million to \$11.93 million in a mix of individual and group activities ranging from undergraduates through professors. Discovery Corps Fellowship support will increase by \$500,000 (postponed in FY 2008 due to budget constraints). Its focus will change to integration of research and service aimed at communicating chemistry's value to the public. Undergraduate Research Collaboratives will increase by \$840,000 (program was postponed in FY 2008 due to budget); REU support will increase by \$510,000.
- Instrumentation/Facilities increase by \$2.34 million to a total of \$17.53 million, including new investments in cyber-enabled chemistry, multi-user facilities, and instrument development for chemical imaging.