CHEMISTRY $210,540,000

The FY 2008 Request for the Chemistry Division (CHE) is $210.54 million, an increase of $19.44 million, or 10.2 percent, over the FY 2007 Request of $191.10 million.

Chemistry Funding
(Dollars in Millions)

	FY 2006 Actual	FY 2007 Request	FY 2008 Request	Change over FY 2007 Request Amount	Percent
Materials Research	**$180.78**	**$191.10**	**$210.54**	**$19.44**	**10.2%**
Major Components:					
Research and Education Grants	157.60	167.39	180.27	12.88	7.7%
Centers Programs	8.08	9.60	14.92	5.32	55.4%
Instrumentation/Facilities	15.10	14.11	15.35	1.24	8.8%

Totals may not add due to rounding.

About CHE:

Extraordinary research opportunities exist today in molecular science that build on our increasing understanding of matter, from its quantum properties to the formation of complex molecular assemblies. Chemistry is inherently interdisciplinary; important practical challenges provide the motivation for considerable academic creativity. The chemical enterprise that results from basic research investments is a major contributor to the U.S. economy.

Approximately 45 percent of the funding requested will be available for competitive research grants in FY 2008, with the remainder supporting continuing commitments on research grants from prior years and the other aspects of the portfolio. The CHE portfolio in FY 2006 consists of 79 percent individual and small group awards, 13 percent shared instrumentation, 4 percent educational projects, and 4 percent centers. The funding rate for proposals in CHE was 26 percent in FY 2006.

CHE priorities for FY 2008:
The Chemical Bonding Centers Program addresses major themes in the ACI such as sustainable technologies, nanotechnology, and molecular electronics. These centers foster interdisciplinary and transformational basic research with very high impact potential. The program philosophy encourages highly creative ideas at the cutting edge to develop new concepts that can lead to fundamental changes and new technologies.

Nanoscience, Complexity and Molecular Basis of Life Processes (MBLP): The co-evolution of nanoscience and personalized medicine and biotechnology requires synthesis of sophisticated molecular systems and understanding the interactions of molecules with these systems. To date studies have focused primarily on pairs of molecules; not much is known about more complex assemblies and the consequent phenomena resulting at larger scales. The goal is to program information at the molecular level through synthetic chemistry in order to induce self-assembly and cooperativity and eventually lead to the desired emergent properties. An ultimate goal would be to prepare carefully designed compounds and allow them to self-assemble into self-replicating systems. Self-assembly could lead to the formation of complex materials or devices with unique properties and provide clues to biological processes.

Science Beyond Moore's Law: An important and potentially transformative frontier in molecular science involves the design and synthesis of single-molecule electronic devices. Single-molecule transistors and diodes have already been synthesized and characterized and shown to act as regular devices. These

systems work reproducibly and efficiently once they are constructed, but their assembly, connectivity and external addressability remain as major challenges. Other innovative structures need to be designed and synthetic and self-assembling schemes are necessary to produce more efficient and reproducible molecular devices. The potential to revolutionize the size and power of computers and other electronic devices based on molecular electronics is enormous, in perfect alignment with ACI goals.

Sustainability: Chemistry is an essential underpinning of major innovations in green technologies required for society to achieve a sustainable environment. This effort aligns with ACI, which calls for capabilities and technology platforms that will ensure innovation in key areas. There is global recognition that there is an urgent need to produce commodity chemicals not from petroleum but from carbon-neutral sources, such as biorenewable materials. Entirely new approaches need to be developed for the synthesis of chemicals and materials and for the utilization of energy and our natural resources. Study of the unique reactivity of environmental interfaces – for example between water and solids – is critical to understanding both natural biogeochemical cycles and those that have been altered by human activity. Scalable, cyber-enabled models can take molecular observations to regional and global outcomes. This mission is well-suited to NSF, with its emphasis on fundamental transformative research.

Cyber-enabled Discovery and Innovation: While computational modeling and simulation have always been part of chemical inquiry, the quality of science that has emerged from this approach has improved dramatically so that modeling, algorithms, software and simulation now are essential components to gain insights into chemistry. Particularly helpful are simulations of unrealizable systems such as ultrashort-lived key intermediate species that defy detection or of chemical species too dangerous to work with in the laboratory. Networking of remote instruments and facilities couples the people and instruments needed to synthesize and characterize new molecular systems.

Preparing the Workforce of the 21st Century: ACI calls for increased support for young investigators. CHE will increase support for CAREER and Discovery Corps Fellows, as well as continuing partnerships with EHR with the goal of preparing a diverse chemical workforce. CHE will participate in the MPS ACI Fellows pilot through activities requiring industrial collaboration, serving to increase research capacity in targeted ACI areas such as nanotechnology, cyber discovery, quantum science, energy security, and sensors. CHE funding for workforce activities increases by $3.80 million to $31.73 million in a mix of individual and group activities ranging from undergraduate students through junior professors.

Transformational Facilities and Infrastructure: The Chemical Research Instrumentation and Facilities (CRIF) program has four distinct tracks through which CHE addresses its priorities in Shared Instrumentation, Instrumentation Development, Facilities and Cyberinfrastructure. The broad range of chemistry's computational techniques and data types and its large number of independent data producers pose unique challenges. 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, chemical processes at catalytic surfaces and environmental processes, as well as sensors for national security.

Changes from FY 2007:

- Chemistry Centers increase by $6.0 million to $9.0 million total, reflecting establishment of one additional Phase II CBCs and three new Phase I centers. The STC will phase down by $0.68 million.
- Research and education grants increase by $12.88 million to $180.27 million total. Funding for Cyber-enabled Discovery and Innovation will increase by $1.2 million. CHE will support molecular electronics and Science Beyond Moore's Law with an investment of $3.0 million.
- Instrumentation/Facilities increase by $1.24 million to $15.35 million total, including new investments in cyber-enabled chemistry, multi-user facilities and instrument development.