

Update on the NSF Division of Chemistry *Strategic Directions: 2008-2012*

January 2010

Advancing Competitiveness

CHE is providing leadership to the community in identifying and promulgating industry/university collaboration mechanisms that work. CHE sponsored a series of workshops starting in December 2006 with academic and industrial leaders (Wrighton chair), a 2008 workshop on "Intellectual Property Issues Affecting Industry-University Partnerships," and a 2009 workshop on the impact of science research and development and how to "right-size" the national investment in chemistry (the report on the first workshop is available on the CHE website at http://www.nsf.gov/mps/che/c_publications_and_reports.jsp ; reports on the latter two workshops will be available by April 2010). The series has identified useful and important directions for future scholarship and implementation in these areas.

In order to partner with educators to help prepare students to become innovators, entrepreneurs and industrial chemists, CHE initiated a post-doctoral program called American Competitiveness in Chemistry Fellows resulting in 18 awards in FY08-09. CHE also supported an Innovation Workshop for 35 students and postdoctoral researchers in connection with the CCI Program.

Communicating the Value of Chemistry and Chemical Research to the Public

In an effort to engage our awardees by showcasing and publicizing the results of their NSF-funded work, CHE dedicated 50% of an FTE for a science assistant to write press releases and news items in conjunction with our Office of Legislative and Public Affairs (OLPA). These were picked up by the Washington Post, Scientific American, NOVA, ABC, CNN, NBC, Federal News Radio and FirstScience.com. An episode of the popular television show CSI Miami featured the transformative developments in mass spectrometry by one of our PIs, Graham Cooks of Purdue.

To generate content for OLPA activities including Hill briefings and budget documents, CHE posted a "Best Practices for Writing and Formatting Highlights" document to guide PIs in preparing highlights publicizing their research and educational activities <http://www.nsf.gov/mps/che/nuggets/highlight-writing.pdf>. The CCI program produced a "Highlights Road Show" – a half day workshop for PIs and students about writing highlights offered initially at several CCI sites.

CHE supported two pilot activities related to public science communication. A CHE awardee sponsored a competition in public communication of chemistry; the eight winners are posted at <http://research.chem.psu.edu/resgroup/>. Another awardee developed an intensive workshop in communicating chemistry to broader audiences <http://faculty.washington.edu/illman/>. This pilot was developed for postdoctoral researchers, but may be extended to other groups of chemistry researchers.

Increasing Global Engagement

Partnering with the NSF Office of International Science and Engineering (OISE), CHE expanded the International Collaboration in Chemistry program by adding Germany, China, U.K., France and Austria in FY2009, and 5 more countries (Japan, Russia, France, Luxembourg and Spain) in FY2010. Over the period 07-09, 51 collaborative projects were funded by CHE, resulting in a US investment of \$22.5M (not counting the corresponding investments by the partner countries.) CHE also cosponsored OISE-led international PIRE centers in chemistry.

The Division Director led the development of a group of chemistry funders in conjunction with IUPAC representing five countries, and CHE is participating in a joint IUPAC call for polymer proposals. A number of joint workshops were held with other countries to help develop collaborations, some with a focus on new investigators – US-China workshops on energy, materials and supramolecular chemistry; participation in a “sandpit” on synthetic biology with the UK and a joint Europe-US workshop on energy.

CHE encourages U.S. students to gain global experience by going abroad for part of their study by sending REU students to Asia, Europe and South America (~170 students conducted undergraduate research in 10 countries during 07-09). CHE is also engaged with the community in preparing for the International Year of Chemistry in 2011.

Increasing Grand Challenge Research through Centers

CHE has been successful in raising funds to support transformative basic chemical research on the “grand challenges” through the Centers for Chemical Innovation Program (CCI). Three Phase II centers have been established and are generating high profile accomplishments. Nine Phase I’s are in the pipeline, allowing groups to develop research, education, outreach, diversity, innovation and management foundations to compete for an effective Center. The CCI program has grown from \$3M to \$15.5M from 07-09, entirely on new funds and not taking from the other modes of funding in the division. The program has engaged the Science and Technology Policy Institute to plan an assessment of the program.

Broadening Participation

CHE sponsored (with DOE and NIH) a series of broadening participation workshops for top-50 department chairs (Gender in 2006, Minorities in 2007 and Persons with Disabilities in 2009) that produced reports for the community and inform CHE’s work in this area.

CHE has encouraged the academic community to develop departmental plans for broadening participation. The goal is to increase the pool of under-represented groups among the chemistry faculty. CHE now requires (as of 2008) a department plan for broadening participation as part of all its CRIF-MU proposals. The ACC-Fellows proposal also contains the Fellow’s plan for broadening participation.

CHE sponsors COACH, an organization working to advance women in academic chemistry departments, and more recently expanded to other disciplines such as physics and materials, and other countries. The REU Sites are also actively working to broaden the participation of talented undergraduates from underrepresented groups. The sites have varying strategies including strategic recruiting and partnering with minority-serving institutions. The outcomes are a cohort of 650 REU-supported undergraduates per summer, with 51% female participants and 30% from underrepresented groups.

CHE has its own plan for broadening participation on the CHE website <http://www.nsf.gov/pubs2007/nsf07021/nsf0721.pdf>, and reports yearly to the MPS front office and to the Division on the outcomes. CHE developed a panel presentation on implicit bias in evaluation that is presented at every CHE panel, and has been adopted by many NSF divisions.

Addressing Funding Needs of Investigators across Career Stages

The community voiced concerns about possible under-representation of Mid-Career Faculty (MCF, 10-25 years post-PhD) proportionate to the pool. This aspect of the plan has not been studied yet. One possible approach is to encourage high risk/high reward (transformative) research especially for MCF.

Assessing the Impact of the Broader Impacts Review Criterion

CHE engaged a research contractor, AIR, Inc., to conduct a pilot study. Forty-five CHE awards were chosen randomly and the contents of the proposals, review materials, annual and final reports were studied. The study was brought to the attention of the National Science Board in December 2009 as an example of one approach towards this challenging problem. CHE will decide on next steps.

Updating the Division of Chemistry Structure

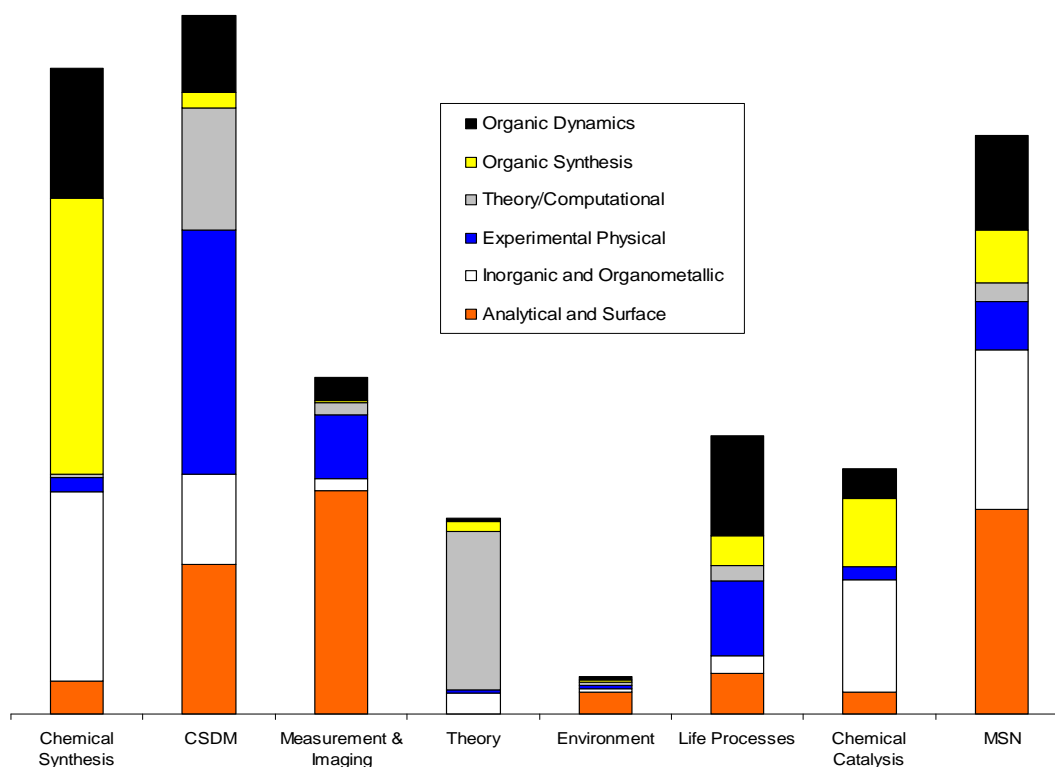
The 2004 and 2007 CHE COV's suggested that CHE consider updating its structure. The goal is to structure CHE to best anticipate and respond to scientific needs and to achieve transformative research in chemistry. CHE obtained community input at ACS Town Hall Meetings (2007, 2008, 2009), survey of chemistry department chairs and through the web. The landscape of research in chemistry was described through a scientometrics (citations index) study providing maps of chemical research. Multiple groups were consulted both internally (advisory committees, other divisions, policy office, etc.) and externally including other federal agencies that fund chemistry. CHE staff designed the realigned structure and handled the implementation and communication at all levels. The realignment resulted in eight new programs implemented in July 2009. The response that CHE received from the community was largely positive and the initial implementation has been successful. Four programs in particular provide point sources for

interdisciplinary work falling at borders within the NSF, enabling more effective interactions with other divisions.

The eight new programs are

- Chemical Catalysis (CAT)
- Chemical Measurement and Imaging (CMI)
- Chemical Structure, Dynamics and Mechanisms (CSDM)
- Chemical Synthesis (SYN)
- Chemistry of Life Processes (CLP)
- Environmental Chemical Sciences (ECS)
- Macromolecular, Supramolecular and Nanochemistry (MSN)
- Theory, Models and Computational Methods (TMC)

Additional information on the realignment, including program descriptions for the new programs, is available on the CHE website: <http://www.nsf.gov/chem>. An analysis of the anticipated redistribution of proposals is shown below. This analysis has allowed us to plan our scientific staffing and ensure that these new programs have the appropriate mix of staff expertise.



CHE noted that the most interdisciplinary activity occurred at the borders of the division with the Divisions of Molecular and Cellular Biology (MCB) and Materials Research (DMR). Joint program officers were hired that had appointments 50% time in each division (CHE-MCB in 2008-2009 and CHE-DMR in 2010). The experiment with the CHE-MCB joint officer was very productive and led the way to the formation of the Chemistry of Life Processes program in CHE.