



Committee on Professional Training

American Chemical Society 1155 Sixteenth Street, N.W. Washington, D.C.

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ACS supports the academic hiring process through Academic Employment Initiative activities at its Fall 2005 National Meeting. See page 3 for details.

ACS Guidelines Revision Process Underway

Promoting excellence in chemistry education is an important activity of the American Chemical Society. The 2004-2006 ACS Strategic Plan states that "ACS will foster and promote chemical education reform to insure that it reflects the current practice and impact of the discipline and the modern teaching techniques that help students learn chemistry and chemical engineering."

ACS Guidelines. The Committee on Professional Training plays a major role in maintaining excellence in chemistry education through the ACS approval program. The Society has charged the CPT with developing and administering guidelines for approving undergraduate chemistry programs. Graduates of ACS-approved chemistry programs may be certified by the program chair if they meet the ACS curricular guidelines.

The ACS guidelines have been very successful. There are currently 633 approved programs, including 196 research I institutions, 114 comprehensive universities, and 323 baccalaureate colleges. Additionally, 149 chemistry programs offer degree options in biochemistry, chemical physics, chemistry education, environmental chemistry, materials, and/or polymers. Thirty seven percent of the chemistry graduates from approved programs are certified as having completed the ACS-certified curriculum.

There are many benefits to institutions and departments offering an ACS-approved chemistry program. ACS approval publicly recognizes the excellence of an institution's chemistry program. Departments use the approval process to document their capabilities, identify areas for change, and leverage needed support from their institution. Faculty benefit from the commitment to professional growth required of approved programs. Students benefit from participation in a department having the capabilities and resources to meet the high standards of approval and from the recognition accorded to an ACS-certified degree.

Rationale for Change. The ACS approval program must keep pace with changes that are occurring in the chemistry profession and in education in order to maintain the utility and relevance of the guidelines. The Committee regularly modifies the ACS guidelines in response to the needs of the chemistry community. For example, it introduced a new requirement in 1999 that all certified majors

Envisioning Undergraduate Chemistry Education in 2015: A COMMUNITY DIALOG

Fall 2005 National ACS Meeting
Washington, DC

Tuesday, August 30, 8:30 am -12:00 noon

Join CPT for an ACS Presidential Event in which nationally recognized speakers lead the chemistry community in a discussion about defining and implementing the future direction of undergraduate chemistry education. Topics include: ACS Guidelines Revision, What Should a Chemistry Graduate Know, Increasing Diversity, Student Centered Learning, Cyber Infrastructure, The Role of Research, and Multidisciplinary Approaches. Group discussion and reporting out by the audience will be included. Mark your calendars now for this informative and influential event!

have a significant experience in biochemistry, and it revised the chemistry education option in 2003 in an effort to increase the number of high school teachers with chemistry training.

There are many new challenges for the chemistry profession today. Chemistry is becoming increasingly multidisciplinary as chemists need to interact with other disciplines to solve complex problems. Conversely, other professions are increasingly using chemistry and even teaching basic

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chemistry to their undergraduate students. There has been an explosion in chemical information, for which chemists need new tools and training. Chemical techniques, instrumentation, and modeling have all become significantly more advanced. The importance of understanding the role of chemistry as a global enterprise has increased.

Major changes are also taking place in higher education. Pedagogy is changing in order to take advantage of new research in how students learn. The student population is becoming more diverse in many ways, such as age, gender, ethnicity, and educational preparation. There are also ever-present questions about how to address depth vs. breadth, theory vs. applications, amount and type of laboratory work, and discipline-specific knowledge vs. ancillary skills, all within a finite undergraduate curriculum. Finally, many feel that greater flexibility in the ACS guidelines would allow different programs to serve different missions and would encourage innovation in chemistry programs.

In light of the changes occurring in both chemistry and education, CPT is beginning a major revision of the ACS guidelines for approval of undergraduate chemistry programs.

ACS Guidelines Revision Process. To begin the process of examining and revising

the ACS guidelines, CPT is seeking input from all sectors of the chemistry community. The Committee posed questions about the requirements for ACS approval to approved programs in the Fall 2004 *CPT Newsletter* (mailed to every chemistry faculty member of approved programs and available online at the ACS web site), to chemistry educators in the December 2004 *Journal of Chemistry Education* (volume 81, p. 1695), and to the entire chemistry community in a recent *C&E News Comment Column* (April 25, 2005, p. 42). To date, we have received over 30 detailed responses with more continuing to arrive.

CPT is interested in your comments on several points:

- What should an ACS-certified chemistry graduate know and be able to do?
- How should a chemistry curriculum balance required core courses with elective advanced courses?
- What should be the relative roles of traditional chemical disciplines (e.g., analytical, inorganic, organic, physical chemistry) and more recently developed interdisciplinary areas (e.g., biochemistry, environmental science, green chemistry, materials science) in chemistry education?
- What amount and type of laboratory work is appropriate for an ACS-certified graduate?

- What ancillary skills should be required of ACS-certified chemistry graduates?
- Are there any curricular impediments in the ACS guidelines for an undergraduate student pursuing an ACS-certified chemistry degree?

Please send your comments to CPT by email to cpt@acs.org with a subject of "ACS Guidelines Revision." The Committee values every comment, about these particular questions or any other issue related to the ACS guidelines, and will carefully consider each one.

The Committee will gather additional input from the Presidential Event it is organizing at the Fall 2005 National ACS Meeting in Washington, DC entitled "Envisioning Undergraduate Chemistry Education in 2015: A Community Dialog" (see front cover for details).

CPT will summarize and report on the comments it receives. These comments will inform the Committee's work on the guidelines as it develops proposed revisions. CPT will then publicize these proposals and seek additional response from the chemistry community.

Education is a shared concern of the entire chemistry community. CPT hopes to hear as many opinions as possible and looks forward to working together with all chemistry constituencies to develop the next revision of the ACS guidelines for undergraduate chemistry programs. ■

CPT Survey of 2001-2004 Enrollments in Selected Chemistry Courses

In the fall of 2004, CPT surveyed all ACS-approved programs to obtain data on academic and summer enrollments in selected chemistry courses, the total number of chemistry majors, and the number of majors with biochemistry concentrations for three years: 2001-02, 2002-03, and 2003-04. The survey results provide a snapshot of current college chemistry education. Analysis of the data leads to the following conclusions:

- The number of students in introductory and organic chemistry courses and the number of chemistry majors increased slightly and exceeded the growth in total undergraduate enrollments during this period.
- A large component of service teaching (nonmajor enrollments) was found, not unexpectedly, in introductory and organic courses, but also in the physical chemistry course listed in the survey.
- Fifty percent of chemistry departments offer courses in introductory and organic chemistry during the summer, but rela-

tively few students--5% and 15%, respectively, of the annual total enrollment in these courses--take advantage of these opportunities.

- Nearly 70% of chemistry departments offer a major with a biochemistry concentration with approximately a third of students selecting this focus.

The 419 institutions completing the online survey represent two-thirds of ACS-approved programs. This response rate did not vary with the type of institution as categorized by highest degree awarded, BA/BS only, MS, or Ph.D. Because of obvious errors in the reported data, five schools were excluded from the analysis. The results summarized here, consequently, represent 414 separate institutions with undergraduate enrollments totaling 3.9 million students or approximately 50% of students enrolled in 4-year baccalaureate programs in the United States. No effort was made to survey any of the 2-year institutions with annual enrollments of approximately 6 million students

nor non-ACS approved 4-year programs.

The courses of the survey were selected to assess service teaching (ST), the teaching of science literacy (SL), and the number of students preparing for careers as professional chemists (pipeline issues, P):

- First course in introductory chemistry for science majors (ST, SL, P),
- First course in introductory chemistry for health-allied (nonpremed) students (ST, SL),
- First course in introductory chemistry for nonscience students (ST, SL),
- Second semester/third quarter organic chemistry (ST, P) and
- First semester/quarter physical chemistry (ST, P).

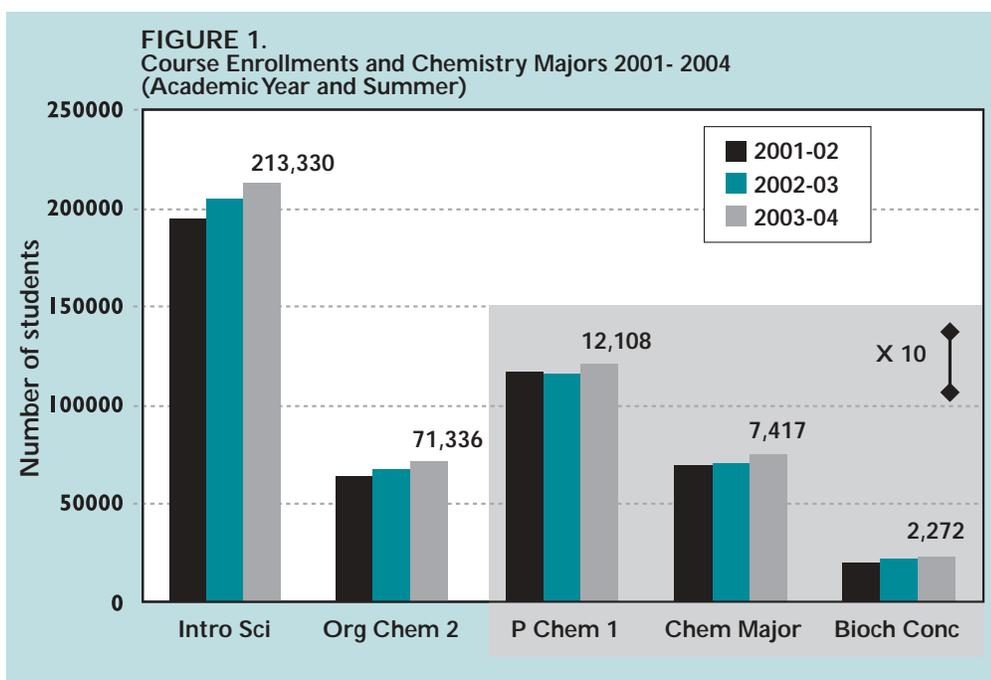
In addition, the survey asked for the total number of chemistry majors as well as those with a biochemistry concentration to evaluate the importance of this particular sub-discipline. Comparison of course offerings and student enrollments during the academic year with those in the summer measures

the extent of summer school teaching. The percentage of the total undergraduate population enrolling in chemistry courses and majoring in the field assesses the level of interest in this discipline.

We report here average values of the composite data from all 414 institutions. We also examined each course/program for three categories of institutions grouped by the size of its undergraduate enrollment: <2500 (108 schools), >2500 to <10,000 (171), and >10,000 (135). A more detailed report of the survey data, including a grouping by school size, will be available by the fall of 2005 to aid individual departments in evaluating and strengthening their programs.

Essentially all institutions teach introductory courses for science (intro sci) majors with half offering an introductory course for health-allied students and two-thirds offering one for nonscience students during the academic year (AY). In the 2003-2004 AY, slightly over 200,000 students were enrolled in intro sci with approximately 60,000 in each of the two other courses. Although over 55% of institutions offered intro sci in the summer, the maximum number of students enrolled (in 2004) was 5.5% of the AY enrollment. A smaller percentage of institutions (about 25%) taught the other two types of intro courses in the summer with enrollments approximately 10% of those during the AY. The percentage of the total undergraduate population enrolled in any one of these three introductory courses increased from 7.5% in AY 2001-02 to 8.1% in AY 2003-04. The group of small schools (<2500 students) reported the highest percentage of students studying chemistry at this level during the three academic years: 9.22, 9.60, and 9.73%, respectively.

Figure 1 summarizes the total annual enrollments (AY plus summer) in courses



normally taken by chemistry majors, the total number of majors, and those majors with a biochemistry concentration (Bioch Conc). These histograms indicate that the number of students studying chemistry at every level has increased during this three-year period. Approximately a third of chemistry majors have a concentration in biochemistry, although 70% of the 414 institutions in the survey offer this focus for majors (data not shown).

Comparison of the enrollments of students in these courses for science students with the number of chemistry majors provides insight into the extent of service teaching as well as the efficiency of educating future chemists. In 2004, nearly 30 students were enrolled in the entry-level course (intro sci) for each student majoring

in chemistry ($213,300/7,417 = 28.8$). The ten-fold larger enrollments in second semester/quarter of organic (Org Chem 2) relative to the number of majors ($71,336/7,417 = 9.6$) reflects the high student interest in biology and premedical studies, as well as in chemistry. Although some members of the science education community regard courses in physical chemistry to be accessible only to chemistry majors, the importance of this course to students in other disciplines is indicated by a ratio of enrollments in the first semester/quarter of physical chemistry (P Chem 1) greater than 1 ($12,108/7,417 = 1.6$ in 2004). The survey results, consequently, highlight the role of chemistry in educating the technical workforce of the 21st century. ■

The ACS Academic Employment Initiative: A New Avenue for Faculty Recruiting

Charles P. Casey, ACS Immediate Past President, University of Wisconsin-Madison and **Jerry Bell**, Senior Scientist, American Chemical Society

During the Sci-Mix poster session at the 2004 ACS National Meeting in Philadelphia, more than 120 graduate student and postdoctoral candidates for faculty positions presented research posters as part of the ACS Academic Employment Initiative (AEI). Faculty members from many colleges and universities took advantage of this opportunity to get acquainted with several candidates they might consider for positions in their departments. The aisles that were full of activity for the entire two hours of Sci-Mix, were still full when the

session-ending signal was given, and only reluctantly did the AEI candidates and recruiters finally leave when the lights were turned out.

For the AEI Sci-Mix poster session at the 2005 ACS National Meeting in Washington, DC, 29 August 2005, more than 170 graduate student and postdoctoral candidates for faculty positions will be presenting research posters as part of their search for faculty positions. Please accept our invitation to be among the college and university faculty members who will be taking advantage of this effort to broaden the academic hiring process by making it easier for you to meet and interact with several job candidates in a short time and in a relatively informal setting. Job candidates in

Philadelphia noted that they had learned about institutions they had not heard of or previously considered, so the information flow goes both ways in this forum.

If you will be seeking candidates for an academic position during the 2005-06 academic year, the AEI poster session is a good way to learn more about potential candidates than you can from just a résumé. Before coming to the Sci-Mix, you can read each presenter's abstract on line, as well as a very brief biographical sketch providing a bit of background and an indication of the sort of position the candidate is seeking. To learn how to obtain this information about the poster presenters, contact the ACS Office of Graduate Education at (202) 872-4588 or by email to aei@acs.org. ■

CPT Hosts Workshop on Increasing Participation of African American Students in Chemistry with HBCUs and African American-Serving Institutions

The American Chemical Society, along with the profession of chemistry more broadly, has become increasingly concerned with its relative lack of diversity. In 2002, a Task Force on Minorities in Academe was appointed by the ACS Board of Directors to consider ways to increase the number of minority faculty in chemistry at institutions of higher education, especially the top 50 research universities. This Task Force, chaired by the late Dr. Stanley C. Israel of Texas State University, considered its charge in the broader context of crucial decision-making junctures along the educational and professional pathway that leads to a successful academic career. One of the goals this Task Force defined for its work was to increase the number of underrepresented undergraduate minority students choosing to pursue graduate work in chemistry. A number of specific recommendations emerged from the work of this Task Force. Among them, one was for the Committee on Professional Training (CPT) to host workshops with representatives from minority-serving institutions to understand the incentives and barriers to ACS approval at these institutions with the goal of formulating a strategy for increasing the number of chemistry programs at such institutions that hold ACS approval. The ACS Board of Directors endorsed this recommendation from the Task Force and instructed CPT to hold such workshops. Toward that end, CPT organized and held a workshop with representatives from Historically Black Colleges and Universities (HBCUs) and African American-serving institutions in November of 2004.

The specific goals for this workshop were:

- To discuss challenges associated with recruitment and retention of African American undergraduate students in chemistry and what ACS in general, and CPT specifically, might do to improve the profession's success in this arena;
- To educate CPT about the current state of chemistry departments at institutions with large African American undergraduate populations, the strengths of these programs, and the challenges of these programs with respect to maintaining program excellence;
- To devise a strategy for identifying and disseminating practices that work in developing strong chemistry programs that educate significant numbers of African American students; and



- To develop other specific recommendations for CPT (or other ACS governance groups) of actions that would facilitate greater participation of African American undergraduate students in chemistry.

Through this workshop, CPT specifically sought to initiate a dialogue with the African American chemistry community on steps to engender greater participation of African American undergraduates in chemistry and to increase participation of African American-serving institutions in the ACS approval process.

Participants at this workshop were recruited from a cross-section of HBCU and other African American-serving institution chemistry departments, with representation from both ACS-approved departments and those departments not holding ACS approval of their programs. Institutions were chosen to be geographically representative. In addition to HBCU representatives and representatives from other African American-serving institutions, workshop participants included six members of CPT, five ACS staff members, and several distinguished guests including Ms. Madeleine Jacobs, Executive Director of the ACS, Dr. Charles P. Casey, President of the ACS, Dr. Marquita Qualls, President of the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCCHE), and Dr. Arthur Ellis of the National Science Foundation.

The workshop consisted of three sessions with one or more short presentations and subsequent breakout discussions for extended consideration of issues. The three sessions of this workshop and the speakers in each were

as follows. Session 1 focused on 'Challenges and Strategies in Recruiting and Retaining African American Undergraduate Students in Chemistry'. The speakers for this session were Dr. Joseph S. Francisco (CPT and Purdue University), Dr. Fred Humphries (Florida A&M University), Dr. Sandra McGuire (Louisiana State University), and Dr. Hossein Nanaie (Claflin University). Session 2 was on 'Incentives and Barriers to ACS Approval of Undergraduate Chemistry Programs'. Speakers for this session included Dr. Carlos Gutierrez (CPT and California State University – Los Angeles), Dr. Ralph Turner (Florida A&M University), Dr. Cornelia Gillyard (Spelman College), Dr. David Kanis (Chicago State University), and Dr. George Williams (Savannah State University). The final session considered 'Strategies for Increasing Participation of African American Undergraduate Students in Chemistry and Increasing ACS-Approved Chemistry Programs at HBCUs and African American-Serving Institutions' with Dr. Robert Hilborn (Amherst College & Chair, National Task Force on Undergraduate Physics) as the speaker.

Discussions at the workshop made clear that many problems that exist in undergraduate chemistry education at HBCUs and other African American-serving institutions lie within the realm of these institutions and the African American communities and are outside the control of the ACS. Thus, greater mobilization of the HBCU community and greater involvement of NOBCCHE in facilitating development of undergraduate chemistry at these institutions was deemed critical. Representatives from these institutions

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generally voiced satisfaction with the goals of the ACS approval program and the standards for excellence of undergraduate chemistry programs defined by CPT. However, a need for increased flexibility in the guidelines for approved programs that recognizes and accommodates the different educational environment in this cohort of institutions was articulated.

In addition to specific recommendations for CPT, recommendations directed toward other governance groups within ACS were also articulated by workshop participants.

In addition to these overarching conclusions, the workshop generated an expansive list of valuable and insightful recommendations for specific actions that could be taken, either by CPT or by other governance groups within the ACS, to improve the state of undergraduate education of African Americans in chemistry. These recommendations are described in detail in the full report and only briefly presented here. The most important recommendations for CPT were in categories related to the ACS guidelines for approved programs, the application process for ACS approval, and CPT communication with HBCUs and African American-serving institutions. In addition, several recommendations for ways to improve undergraduate education in chemistry for African Americans emerged for other ACS governance groups including the ACS Board of Directors, the ACS Committee on Minority Affairs, and the ACS Society Committee on Education.

Examples of recommendation to CPT related to the ACS guidelines for approved programs include developing greater flexibility in the guidelines to allow sharing of resources such as major instrumentation and chemical information (e.g., Chemical Abstracts and journal subscriptions) between institutions and developing a list of skills that students graduating from approved programs should possess. Recommendations related to the process for applying for ACS approval included providing more informal guidance and mentoring for programs applying for ACS approval (e.g., develop and post on the CPT web site a list of frequently asked questions about the ACS approval

process, develop samples of completed applications for ACS approval), and developing a web-based, informal application for ACS approval that would receive formal CPT feedback as the initial stage of the application process.

Other recommendations included ways that might enhance CPT communication with this population of institutions. Specifically, CPT was urged to capture the perspective of those HBCUs and African American-serving institutions not represented at the workshop, possibly by holding a workshop on ACS approval at a NOBCCChE meeting, and providing the CPT Newsletter to all faculty at four-year institutions awarding baccalaureate degrees in chemistry, approved or not.

Finally, it was recommended that CPT work with NOBCCChE and the National Task Force on Undergraduate Physics in a comprehensive study of undergraduate chemistry and physics programs at HBCU and African American-serving institutions similar to the study recently completed in physics entitled Strategic Programs in Undergraduate Physics (SPIN-UP). Such a study might involve having CPT take a leadership role in studies that would help define "what works" and "best practices" in producing minority graduates in chemistry, having CPT members make site visits to "thriving" HBCU departments, collecting better statistical data on numbers of African American degree recipients in chemistry from all institutions, both approved and not

approved, and identifying the salient attributes of HBCU and other African American-serving institution chemistry departments and their needs.

In addition to specific recommendations for CPT, recommendations directed toward other governance groups within ACS were also articulated by workshop participants. Several examples include recommendations to develop educational materials specifically targeting minority communities, make at least some Project SEED and ACS Scholars funds available for solely merit-based scholarships, removing the qualifier to demonstrate need as an evaluative criterion, in order to attract the best and brightest students to chemistry, invigorate chapters of the Student Affiliates of the American Chemical Society at HBCUs and other African-American serving institutions to aid in student recruitment and retention, and arrange a symposium at a national ACS meeting on service learning as a vehicle for improving the perception of chemistry in minority communities.

The full final report from this workshop is in final preparation for printing and will be made available this summer on the CPT web site (www.chemistry.org/education/cpt). Copies of this report will be mailed to the department chairs of all ACS-approved chemistry programs and all HBCUs (approved and nonapproved). Additional copies can be requested by contacting the Office of Professional Training at cpt@acs.org. ■

Certificates for ACS Certified Graduates

Chemistry majors who receive a baccalaureate degree from an ACS-approved program and complete a curriculum described in the ACS guidelines may be certified to the Society for membership purposes by the head or chair of the approved institution. Please contact the office by email at cpt@acs.org for instructions on requesting certificates.



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