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# Committee on Professional Training

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

## In This Issue . . .



**You are invited to the next CPT open meeting during the ACS National Meeting, Atlanta, GA on Sunday, March 26, from 12 Noon–2:00 PM. Light lunch will be served.**

**Academic Employment Initiative (AEI) panel discussion on "Academic Hiring: How Do You Get the Job?"**
**See page 4 for details.**

**YCC/CUR symposium: "Starting a Successful Research Program at a Predominantly Undergraduate Institution"**
**See page 5 for details.**

# Progress Report on the ACS Guidelines Revision

To promote high standards of excellence in chemical education, the Committee on Professional Training (CPT) is charged by the American Chemical Society (ACS) with developing and administering guidelines for the approval of undergraduate chemistry programs. The ACS Guidelines are regularly updated to reflect the current state of the chemistry profession and chemistry education. The field of chemistry is undergoing major changes, as chemists interact closely with other disciplines, study more complex problems, use more advanced instrumentation, and work in a global context. Undergraduate education is also rapidly changing, with new pedagogical approaches, more emphasis on process skills such as communication and teamwork, and an increasingly diverse student body. As a result of these changes, CPT is undertaking a major revision of the ACS Guidelines for approval of undergraduate chemistry programs. This report summarizes the progress made in reviewing and revising the ACS Guidelines.

Initial planning for the ACS Guidelines revision process began in the fall of 2004, with CPT developing a course of action. The first step was to inform the chemistry community of the process and broadly solicit input on important issues. The second step will be to draft a summary of these issues and possible responses, which will be publicized with a request for further comments from the chemistry community. The third step will be to incorporate these comments into a proposed set of new guidelines, which will be publicized with a request for additional feedback. Finally, using the feedback provided by the community, CPT will release the next major revision of the ACS Guidelines.

The first stage of publicizing and inviting public comment on the ACS Guidelines revision process has been ongoing for one year. In addition to items in the *CPT Newsletter* (Fall 2004, p.1, and Summer 2005, p.1), which is mailed to each faculty member at every ACS-approved chemistry program, articles were published in the *Journal of Chemical Education* (December 2004, p. 1695) and *Chemical & Engineering News* (April 25, 2005, p. 42) to inform the educational and industrial chemistry communities of the process and invite their responses to a list of specific questions about the direction of the guidelines revision. So far, more than 74 pages of thoughtful comments have been received via e-mail in response to this call for community input, and additional comments are always welcome.

Symposia, oral presentations, and open meetings about the guidelines revision process are also being held at national meetings. At the Fall 2005 ACS National Meeting in Washington, DC, CPT organized—and the Society Committee on Education and the Division of Chemical Education co-sponsored—a Presidential Symposium on "Envisioning Undergraduate Chemistry Education in 2015: A Community Dialog." At the event, Marye Ann Fox (University of California, San Diego), Isiah Warner (Louisiana State University), and Eileen Lewis (Cañada Community College) described approaches in chemistry education that are known to be effective but are not yet widely implemented. Gabriela Weaver (Purdue University), Sitta Sittampalam (Eli Lilly), and Arthur Ellis (National Science Foundation) highlighted innovative ways in which chemistry education is changing. A novel aspect of this symposium was the inclusion of two 30-minute group discussion sessions. More than 70

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## ACS Directory of Graduate Research 2005 is now available!

The DGR 2005 (item 39753, US $89 each) can be ordered from the ACS Office of Society Services or the ACS Online Store. For more information, call 1-800-227-5558 or 1-202-872-4600, or send e-mail to help@acs.org

**NEW for 2005!** DGRweb, the searchable, online version of the DGR, is now available free of charge at http://chemistry.org/education/DGRweb DGRweb 2005 also includes access to the complete 1997, 1999, 2001, and 2003 databases.

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audience members discussed and reported out various strategies for the effective education of undergraduate students. These comments are part of the community input that is informing the Committee's work. A more detailed report of this Symposium will be published in the January 2006 issue of the *Journal of Chemical Education*. At the same national meeting, an oral presentation was given at the "Physical Chemistry Curriculum Reform Update" symposium, at which about 30 attendees were updated on the status of the guidelines revision process and then offered their comments on the issues important to them.

CPT holds an open meeting on Sunday at noon at every national meeting, in which the chemistry community is invited to ask questions and offer comments to the Committee. At the ACS National Meeting in Atlanta (March 2006), CPT will hold an extended open meeting for discussion of issues related to the guidelines revision. A light buffet lunch will be served, and the Committee encourages you to attend this open meeting if you are in Atlanta for the ACS National Meeting. In addition, plans are being made for a session on the ACS Guidelines revision at the next Biennial Conference on Chemical Education (BCCE) meeting to be held in the summer of 2006 at Purdue University.

In the summer of 2005, CPT held a special meeting to review the community input received thus far and to identify recurring issues for consideration during the guidelines revision process. These issues included:

- The simplicity and understandability of the ACS Guidelines
- Flexibility of approaches to meet the ACS Guidelines
- Encouraging innovation among chemistry programs
- Balancing "foundation" and "in-depth" coursework
- Allowing different programs to serve their specific missions
- Revisiting the laboratory hour requirement
- The importance of process skills (e.g., teamwork and communication)
- Consideration of pedagogy in course delivery
- Department infrastructure requirements
- Faculty capacity
- The value of a certified degree
- Self-assessment for the sake of sustained program improvement.

As before, opinions and input on these issues continue to be most welcome. Please send comment to CPT by e-mail at cpt@acs.org with "ACS Guidelines Revision" in the subject line.

The summer meeting also included sessions by five subgroups to reevaluate the goals of the approval process, outline the characteristics of excellent chemistry programs, describe possible ways of assessing program excellence, improve the value of a certified degree track, and perform a Strength/Weaknesses /Opportunities/Threats (SWOT) analysis of the current ACS Guidelines. Each topic was discussed by the subgroups, conclusions were reported out orally, and summaries of the issues and conclusions were written. The meeting concluded with the development of an implementation plan for the second step of the guidelines revision process.

The second step in the guidelines revision process is for CPT to draft a summary document describing the characteristics of ACS-approved programs, identifying key issues related to ACS approval of undergraduate chemistry programs, and proposing possible guidelines revisions. The outcomes from the special CPT meeting in summer 2005 will form the basis of this document, which will be widely circulated for comment by the chemistry community. These comments will inform the Committee's work as it then embarks on the third and final step in the revision process, developing a proposed set of new guidelines, which again will be publicized to obtain feedback before the final version is released.

CPT welcomes and encourages your involvement in the development of the next revision of the ACS Guidelines. Education is a shared concern of the entire chemistry community, and CPT wants to work together with all chemistry constituencies and hear as many opinions as possible during this process. Please send your comments to cpt@acs.org. ■

# Incorporating Safety into the Chemistry Curriculum

**Robert H. Hill, Jr. and George H. Wahl, Jr.,**
*ACS Division of Chemical Health and Safety*

Do you believe safety is important? Do you believe chemists should be skilled in safety? Do you believe our new chemists should learn safety as an integral part of their education? Isn't it difficult to answer "No" to any of these questions? Well what are you doing to ensure that this happens? We believe that safety is vital to all of chemistry and that the best way to teach safety is to weave it throughout the entire chemistry curriculum. Every student needs to develop both specific safety skills and a strong positive attitude toward safety.

Safety is no different from many of the other aspects of the typical chemistry curriculum. By learning how to recognize hazards, assessing the risks of those hazards, and learning how to manage those hazards, students are exercising *critical thinking* skills. Pulling a phrase from a great safety book, students need to develop the habit of asking themselves, "What would the prudent person do in this situation?"[1] Safety is NOT the mere memorizing of a list of Do's and Don'ts! Rather it involves the intellect in some of the most important critical thinking that any student will ever be called upon to do. Students who develop a safety ethic will easily adapt to almost any laboratory situation they might encounter in academia, government, or industrial facilities.[2]

The ACS Committee on Professional Training (CPT) provides the following guidance: "Discussions of current health and safety issues must be an integral part of the chemistry curriculum. Students should develop a high degree of safety awareness, beginning early with discussions of the potential hazards associated with chemicals and laboratory equipment. Recognized safety practices should be stressed both in the classroom and laboratory discussions.... [Students] should be able to recognize potential hazards, minimize their risk and exposure to hazardous materials, and be prepared for the worst possible situations."[3]

**Recognized safety practices should be stressed both in the classroom and laboratory discussions....**

Though CPT has provided guidance, safety has not been systemically incorporated into curricula, and too many students are not receiving the safety education they need, resulting in a lack of skills, knowledge, and awareness in safety among chemistry majors and graduates.[4–6] The impact of this is substantial: Employers are hiring chemists without strong positive attitudes toward safety and without the basic safety skills needed to deal with problems in their new workplaces, new employees are challenged to meet their new employer's expectations of competency and skill in safety, and chemistry teachers in secondary schools, lacking an adequate chemical safety education, are required to teach and maintain safety within their laboratories.

What can we do about this? If having a strong safety education is important, then we have to find a way to fill this gap in chemists' education. This is best done by incorporating the components of safety into chemical education and then evaluating or testing students' skills in this area, as with other areas

of chemistry. With assistance from the ACS Division of Chemical Health and Safety (CHAS), CPT has developed a supplement on "Safety and Safety Education," which includes a list of major safety topics that chemistry majors should understand.[7] It also emphasizes the importance of building a culture of safety awareness.

Presently, most safety teaching is in laboratory settings and often focuses on specific rules and safety considerations associated with specific experiments. These are important elements of safety and need to be continued. In addition, every chemist needs to understand basic safety concepts such as the recognition, assessment, and management of hazards, as well as fundamental toxicology principles. Safety education should occur throughout the undergraduate curriculum, so that students receive continual reinforcement of the importance of safety. The goal is to produce chemists who have positive attitudes toward safety; adequate safety skills to recognize, assess, and manage hazards; and enough concern for safety to promote the safety ethic to others.

There are many ways to incorporate safety into the chemistry curriculum, and no single approach will be right for all. CHAS offers "Teaching Safety" symposia at ACS national meetings and invites your participation. Suggestions for strengthening the safety education of our chemists are welcome and can be submitted to the authors at hillr@batelle.org and george_wahl @ncsu.edu, or by interacting on the CHAS list server at DCHAS-L@LIST.UVM.EDU. ■

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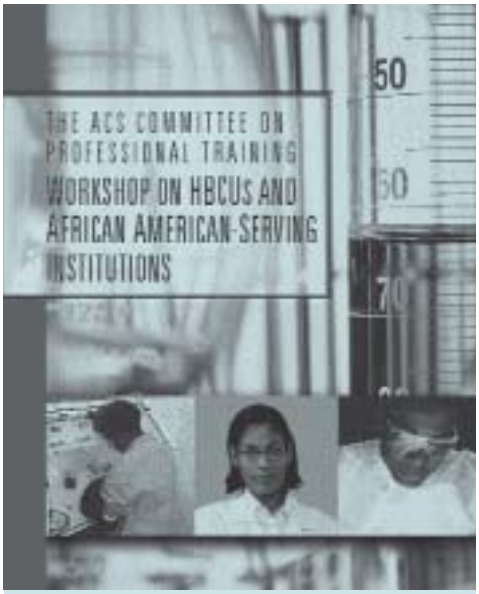
# Workshop on HBCUs and African American-Serving Institutions

The Committee on Professional Training (CPT) conducted a workshop which focused on increasing participation of African American undergraduates in chemistry and understanding the barriers to obtaining ACS approval of chemistry programs at historically black colleges and universities (HBCUs) and African American-serving institutions. The primary focus of this workshop was how to better utilize the ACS approval process for undergraduate chemistry programs to both increase the number of HBCUs and other African American-serving institutions holding ACS approval and to aid in the recruitment and retention of African American undergraduate students in chemistry. The workshop generated many insightful recommendations for specific actions that could be taken either by CPT or by other governance groups within ACS to advance undergraduate education of African Americans in chemistry. A brief summary of the report and the key recommendations to CPT that arose from the workshop follow.

The lack of diversity of our nation's science, technology, engineering, and mathematics (STEM) workforce has been the focus of considerable attention in recent years.[1–5] Such attention stems from the realization that the scientific and technical problems facing this nation require diverse solutions that can only come from an equally diverse scientific and technical workforce. The nation's population demographics are becoming less and less a white Caucasian majority, with persons of African American, Hispanic, Asian American, and Native American descent increasing substantially in number.[6] Despite these changes, individuals of African American, Hispanic, and Native American descent remain significantly underrepresented in the nation's STEM workforce with potentially devastating long-term consequences for the country's economic health, standard of living, homeland security, and national defense.

One pressure point in the "pipeline" of potential participants from these underrepresented groups in the STEM workforce occurs at the undergraduate level. Despite their presence in the year 2000 general U.S. population at the rate of 12.9%, 12.5%, and 0.9%, African Americans, Hispanics, and Native Americans received only 8.1%, 7.0, and 0.7%, respectively, of the baccalaureate degrees in STEM disciplines in 2001.[6-7]

In the discipline of chemistry, these groups are underrepresented to an extent comparable with other STEM disciplines. According to the National Science Foundation's *Characteristics of Recent Science*




*and Engineering Graduates: 2001*, of the 17,800 chemistry baccalaureate degree recipients in the years 1999 and 2000 (excluding biochemistry), 9.0% were African American, 6.2% were Hispanic, and <1% were Native American.[8] These statistics are consistent with those CPT has recently begun to collect in the annual reporting of approved undergraduate chemistry programs. Of the 10,145 baccalaureate degree recipients in chemistry reported from approved programs for the 2003–2004 academic year, 6.5% were African American, 5.3% were Hispanic, and <1% were Native American.

CPT statistics for African American chemistry degree recipients can be disaggregated further by institution type. Of the 653 African American degree recipients, 34% came from bachelor's institutions, 23% came from master's institutions, and 43% came from doctoral institutions.[9] Comparing these values to the percentage of total baccalaureate degrees in chemistry produced by these institutions of 32%, 17%, and 51% for bachelor's, master's, and doctoral institutions, respectively, indicates that master's institutions overproduced—and doctoral institutions underproduced—African American degree recipients relative to their contributions of total degree recipients.

The contributions of HBCUs to the production of baccalaureate degrees in chemistry from ACS-approved programs are substantial. The Higher Education Act of 1965 defines an HBCU as: "...any historically black college or university that was established prior to 1964, whose principal mission was, and is, the education of black Americans, and that is accredited by a nationally recognized accrediting agency or … [is] making reasonable progress toward

accreditation."[10] The White House Initiative on HBCUs recognizes 105 HBCUs, most of which are located in the Southeastern states and the District of Columbia.[11] They include 40 public four-year, 11 public two-year, 49 private four-year, and 5 private two-year institutions.[11] In 2001, HBCUs enrolled 12.9% of all African American students in higher education, although they constituted only 3% of America's 4,084 institutions of higher education.[12] These institutions awarded 44.8% of degrees in the physical sciences to African American students in 2001.[13]

Of the 89 four-year HBCUs, Peterson's Guide indicates that 70 institutions offer baccalaureate degrees in chemistry.[14] Only 22 of the 70 HBCUs that award chemistry degrees have ACS-approved chemistry programs. This cohort represents only 3% of the 634 ACS-approved institutions, yet in 2003-2004, these institutions graduated 167 African American chemistry degree recipients, or 26% of those from ACS-approved programs. Other institutions also serve a significant population of African American students. These are similarly designated by the Department of Education as accredited postsecondary minority institutions and are referred to in this report as *African American-serving institutions*.[15] Other ACS-approved African American-serving institutions awarded an additional 30 degrees to African Americans.[16] Thus collectively, HBCUs and other African American-serving institutions generated 30% of the African American baccalaureate degrees in chemistry last year. The remaining 50 HBCUs and an unknown number of other African American-serving institutions that award chemistry degrees but do not have ACS-approved programs undoubtedly account for additional African American graduates not represented in this count. These statistics underscore the critical role played by HBCUs and other African American-serving institutions in producing African American baccalaureate degrees in chemistry.

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 community and are outside the control of ACS. Thus, greater mobilization of the HBCU community and greater involvement of the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE) in facilitating development of undergraduate chemistry at these institutions was deemed critical. Nonetheless, representatives from these institutions generally voiced satisfaction with the goals of the ACS approval program and the standards for excellence of undergraduate chemistry programs defined by CPT. Even so, a need was articulated for increased flexibility in the guidelines for approved programs that recognizes and accommodates the different educational environment in this cohort of institutions.

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 ACS, to improve the state of undergraduate education of African Americans in chemistry. These recommendations are described in detail in the text of the report. Although all the recommendations were not unanimously endorsed by workshop participants, or even a majority of workshop participants, all of them have been included in the report for completeness of the record. Some of the key recommendations to the CPT are captured below in an abbreviated form.

1. Recommendations Related to the ACS Guidelines for Approved Programs
   - Develop greater flexibility in the guidelines for approved programs to allow sharing of resources such as major instrumentation and chemical information (e.g., *Chemical Abstracts* and journal subscriptions) between institutions.
   - Focus the guidelines for approved programs on student outcomes.
   - Mediate partnerships and/or consortia for subscriptions to electronic journals and *Chemical Abstracts* and aid in the negotiation of lower subscription rates.
2. Recommendations Related to the Application Process for ACS Approval
   - Develop a web-based, informal, abbreviated application for ACS approval that would receive *formal* CPT feedback as the

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initial stage of the application process.

- Provide more informal guidance/mentoring for the ACS approval process. For example, make available on the web a list of frequently asked questions about the ACS approval process with answers; develop samples of completed applications for ACS approval.

3. Recommendations Related to Better CPT Communication with All Programs at HBCUs and African American-Serving Institutions, Approved and Not Approved
   - Provide the *CPT Newsletter* to *all* faculty at all four-year institutions awarding baccalaureate degrees in chemistry, approved or not.
   - Capture the perspective of those HBCUs and other African American-serving institutions not represented at the workshop on the ACS approval program, possibly by holding a workshop on ACS approval at a NOBCChE meeting.
   - Develop a document specifically targeting HBCUs and other African American-serving institutions describing the advantages of ACS approval.

At the ACS National Meeting held in August 2005, CPT made a formal report on the findings of this workshop to the ACS Board of Directors. In addition, CPT is working to evaluate and implement these, and other, recommendations related to the ACS approval process. Other recommendations in the report have been forwarded to the appropriate governance groups within ACS. A progress report on the implementation of key recommendations will appear in a future issue of the *CPT Newsletter.*

*The Committee on Professional Training wishes to thank Dr. Jeanne Pemberton for her contribution in organizing the workshop and writing the final report.* ■

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## Symposium: "Starting a Successful Research Program at a Predominantly Undergraduate Institution"

Co-chaired by Merle Schuh, Tom Wenzel, and Tom Higgins

Many postdoctoral students and graduate students in chemistry, who plan to teach at a predominantly undergraduate college or university, do not realize the significant expectation for them to establish a successful research program. The unique challenges of doing research with undergraduates will be explored during a **half-day symposium, entitled "Starting a Successful Research Program at a Predominantly Undergraduate Institution", which is being co-sponsored by the Young Chemists Committee of ACS and the Council on Undergraduate Research (CUR), and will be presented at the ACS National Meeting in Atlanta.**

Several experienced faculty speakers (Julio de Paula, Kerry Karukstis, Mel Druelinger, Diane Husic, Tom Huggins, and Tom Wenzel), who have had success in maintaining undergraduate research programs and program officers from the Petroleum Research Fund (Robert Rich) and the Research Corporation (Silvia Ronco), will be the facilitators at the workshop. The informal setting of the event will make it possible for attendees to learn from these experienced facilitators and take part in discussions of the following topics:

1. Why is there an expectation for successful research at predominantly undergraduate institutions?
2. What type of research topics should a new faculty member choose?
3. Selecting and working with undergraduate students.
4. Interacting with the department chair and other administrators and understanding the institution's research expectation.
5. Grantsmanship and seeking external research grants.
6. Writing successful grant proposals
7. Establishing and enhancing a favorable institutional research atmosphere.

*The complete report from this workshop can be downloaded from the CPT website at http://chemistry.org/education/cpt or ordered at no charge from the Office on Professional Training at cpt@acs.org or (202) 872-4589.*