CHEMISTRY NEWS
A publication of a division of the
Council on Undergraduate Research

Welcome from the Chemistry Division Chair

Kim Frederick (Skidmore College)

Another school year is upon us and CUR Chem has spent the summer thinking about how to support you and your undergraduates. In addition to the division's ongoing programs, we are embarking on several new initiatives.

Electronic Writing Group: Are you having a hard time making time for your research? Would you like to have a group of like-minded individuals who can help with questions and provide suggestions? If so, please consider joining our electronic writing groups. Research on participation in academic writing groups has shown dramatic improvements in productivity. If you are interested, please contact Joe Baker (bakerj@tcnj.edu).

Community College Group: Are you doing research at a community college or do you want to be? We are working to establish a network for chemists teaching at community colleges to understand the unique rewards and challenges of research in this context. If you are interested, please contact Kim Frederick (kfreder1@skidmore.edu)

Accepting Nominations for CUR Chem Councilors: Would you like to be more involved in CUR? Please consider nominating

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About CUR's Chemistry Division

The Chemistry Division of the Council on Undergraduate Research—the oldest and largest division of CUR—provides networking opportunities, activities, and resources to assist chemistry administrators, faculty members, students, practitioners, and others in advancing undergraduate research.

• **Newsletter Editor and Secretary**
Patricia Ann (Pam) Mabrouk,
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- Upcoming Funding Opportunities
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yourself or a colleague to be elected as a CUR councilor. Councilors provide leadership and energy for CUR's activities and advocacy aimed at strengthening the undergraduate research enterprise. Serving as a councilor is a great professional development and networking opportunity. We are particularly interested in broadening the diversity of councilors in all aspects, so please consider submitting your name. All nominations should be sent to Kraig Wheeler by October 1 (kraigwheeler@whitworth.edu).

In the newsletter, other ongoing work is highlighted, including the division's mentor network, CUR institutes, and publications resulting from undergraduate research experiences. More information about CUR's activities and services can be found on the CUR website (www.cur,org). Questions or feedback? Please contact me any time!

Now let's get back in the lab!•

CUR Posters on the Hill Applications Opening Soon

Do you know a talented undergraduate researcher who would be an effective communicator about his/her research and would benefit from the opportunity to present research to members of Congress and their staff? Consider working with the student to assemble an application for this year's Posters on the Hill event (expected to open October 1). Visit the CUR website for tips on the application process.•

Publication: *Best Practices for Chemistry REU Programs*

Are you currently running an REU or are you thinking about starting one on your campus? Two CUR Chemistry members with long histories of working with Chemistry REU programs—Mark Griep (University of Nebraska–Lincoln) and Linette Watkins (James Madison University)—coedited the ACS Symposium Series volume *Best Practices for Chemistry REU Programs*. The book provides information about successful NSF-sponsored Chemistry Research Experience for Undergraduates (REU) sites based on presentations from the 2013, 2016, and 2017 ACS spring national meetings in the Divisions of Chemical Education and Professional Relations. The book is now available online and will be available in print in December 2018.

Eleven chapters describe REU programs at a diverse array of institutions, and one chapter describes the Chemistry REU Leadership Group. The authors have shared the expertise they acquired using a broad range of approaches, multidisciplinary collaborations, and multi-institutional collaborations. Each author contributes distinctive and partially overlapping perspectives into the complex factors that produce successful summer research programs. These authors describe excellent models for professional development and mentor training workshops. This book provides undergraduate research faculty advisers at universities across the nation the information needed to design thoughtful and efficacious undergraduate research programs. Aspiring principal investigators should find a wealth of useful information that should enable them to write competitive proposals to fund their own summer research programs.•

Have You Checked Out CURCHEM, the Division's Blog, Recently?

- Breaking Professional Isolation at PUIs by Building Your Own Research Network (July 23)

- Prepare the Sled in Summer So Your Research with Undergrads Can Thrive (July 16)

The CUR Chem Mentoring Task Force Wants YOU!

Did you know that CUR's history is rooted in faculty development and mentoring? Stay tuned this fall for some exciting new opportunities for personal growth and/or service from the CUR Chemistry Mentoring Task Force that will provide a platform for growth and development of faculty at all stages of their careers, including those who have just earned their PhD and postdoctoral scholars transitioning to faculty roles, faculty advancing through the tenure and promotion process, and faculty seeking to transition to or from administrative posts. Additionally, a virtual writing support group will be rolled out for those who really want to write their grants and papers but are busy and would benefit from some accountability to advance their writing efforts.

If you have any questions or are interested in being either a mentor or mentee, please contact Mentoring Task Force Chair Amy Deveau (adeveau@une.edu)•

Meet Two 2018 ACS Fellows

Editor's Note: Two of the newest ACS Fellows—Kerry K. Karukstis and Paris Svoronos, who share a passion for undergraduate research—offer some reflections below on their careers and work with undergraduates.

Pivotal Moments That Shaped My Career

Kerry K. Karukstis

My students today spend a great deal of time exploring a multitude of potential future careers. Through the decision-making process, they deliberate over their choice of major; discuss the opportunities with faculty; and opt for a variety of course electives, extracurricular activities, and summer experiences that will help to shape their career path. Their options seem endless and, frankly, very exciting. I simply don't remember expending the same degree of effort in choosing a major or deciding on my postgraduation plans. Did my campus even have a career resource center? Yet somehow decisions were made, next steps were taken, and eventually my career was launched. Nevertheless, there have been several junctures during my time as a faculty member when I've reflected on my path. Early on, I focused on the typical goals for an assistant professor of preparing my courses and establishing my research laboratory. I recall being stunned when one national STEM leader visited our campus and asked me to describe my "five-year plan." I was simply struggling to be prepared for the next day! Perhaps I didn't craft a formal action plan to guide my growth as a faculty member, but I have realized that there were certain pivotal moments that shaped my career.

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Pivotal Moments

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Each situation required me to make an important decision that would set me on a particular course that, in retrospect, had a powerful impact on my academic career. I share these personal discoveries now, as I'm hopeful some of these insights might be useful on your academic journey.

Pivotal moment #1: Arriving at Harvey Mudd College and facing an empty laboratory with no start-up funds. Today's junior faculty often have the luxury of a start-up package that includes an account that the faculty member can draw on to establish a research laboratory. That wasn't the case for me, and I feel very fortunate that I needed to raise the funds to support my research program. I wrote many proposals over the years—some successful, some not. I didn't rely on a single funding agency nor did I submit just one proposal at a time. In the end, I garnered research funds far in excess of any start-up package and continued to sustain my program over the years. Independent research funding enabled me to support numerous students, acquire my own instrumentation, and travel to both national and international conferences. Never despair at the lack of generous research support—it's an opportunity to experience tremendous pride when you succeed on your own. *Lesson learned:* Although institutional support for research is always welcome, successful undergraduate programs are possible without such support.

Pivotal moment #2: Beginning my service as a CUR Chemistry councilor. My department has had a long history with CUR, but I didn't know much about the organization when I accepted an opportunity to be a councilor. I didn't know it at the time, but this would be by far the most significant career-impacting decision that I would ever make. I had no expectations on what the position would entail. I wasn't looking for professional development or leadership opportunities and I certainly wasn't sure what I could contribute to this national organization. However, as CUR is a volunteer organization, there were endless ways to get involved. I never anticipated the professional opportunities that I would have through CUR, and it's the reason why I encourage faculty to look beyond their own campus for leadership prospects. But the benefits of CUR involvement that I didn't expect and treasure the most are the incredible friendships that I have made throughout the organization. They are the reason why I continue to seek ways to be involved. *Lesson learned:* Look beyond your campus for professional involvement. The investment in time can lead to some lasting friendships and unique growth opportunities.

Pivotal moment #3: Having the courage to make a major shift in research direction. This change might not seem out of the ordinary, but switching from explorations of the light reactions of photosynthesis to spectroscopic characterizations of binary phase diagrams of aqueous-based surfactants was a radical change in my mind. I had years of successful research productivity, external funding, and collaborations that had enabled me to attain full-professor rank while working in the area of photosynthesis. Nevertheless, I left that all behind to carve out an area of exploration with a narrow and unique scope that reinspired me, capitalized on my

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students' skills, and allowed my research group to make important scientific contributions at a pace commensurate with an undergraduate setting. *Lesson learned:* It's OK (maybe even essential) to reinvent yourself to maintain your passion.

Pivotal moment #4: Serving on a Mellon Faculty Career Enhancement Committee. A committee assignment might not seem like a momentous occasion. But this committee assignment gave me an opportunity to explore how faculty at all career stages could benefit from various forms of professional development. Funding from the Mellon Foundation was awarded to pairs of primarily undergraduate institutions (known as "dyads") that were part of a larger network of eight institutions (known as the "cluster"). In reviewing professional development proposals from faculty within the dyad, I remember being disappointed that the only type of faculty development request was for research funds. So when the call came for proposals involving faculty within the "cluster," I vowed to propose a project that would benefit faculty (including myself) in a completely different way. As the first and most senior woman in my department (and the first tenured woman in any technical department at the college), I envisioned using a "horizontal mentoring strategy" to create a support network of women in similar situations throughout the cluster. The initiative was funded and led to an NSF-ADVANCE grant to establish a horizontal peer network of five-member "alliances" for senior women chemists and physicists at primarily undergraduate institutions. The project contributed immensely to the knowledge base of practices that can enhance the academic career enhancement of women faculty. Even more gratifying are the friendships that I continue to enjoy from the women in my alliance—these mentors have had a lasting influence on my life. ***Lessons learned:*** Faculty professional development and renewal is essential at all career stages. And committee assignments can have a powerful impact on your life!

Kerry K. Karukstis is Ray and Mary Ingwersen Professor of Chemistry at Harvey Mudd College. Throughout her career, Karukstis has been a strong proponent of the teacher-scholar model for faculty and the practice of student-faculty collaborative research. Mentoring more than 100 undergraduates, she has conducted externally funded research totaling more than $2 million and has coauthored more than 100 publications in scientific journals and two books. She has coedited four volumes on issues related to undergraduate research and the advancement of women faculty. Karukstis has served CUR in many capacities, including as a councilor for and chair of the Chemistry Division, as president, and as co–principal investigator on three National Science Foundation awards focused on institutionalizing undergraduate research. She received the 2003 Henry T. Mudd Prize for outstanding service to Harvey Mudd College and was named the CUR Volunteer of the Year in 2004 and 2010, a 2012 CUR Fellow, and a 2018 American Chemical Society Fellow.•

How Are We Doing? CUR *Chemistry News* Wants to Hear from YOU!

It's been one year since we started producing the CUR Chemistry Division newsletter. Do you read *CUR Chemistry News*? Is the content relevant and useful to you? Do you share the newsletter with your colleagues? Do you have an idea for an article? Please send your thoughts and ideas to p.mabrouk@neu.edu.

Starting an Undergraduate Research Program at a Community College

Paris Svoronos

Beginning as a tenure-track, organic assistant professor at a community college after earning a doctorate (and often completing a postdoctoral fellowship) from a respectable institution can be puzzling for a young scientist. That transition may be even traumatic. This young, enthusiastic chemist had been surrounded for years by professors, postdoctoral fellows, and graduate students all aiming at establishing a synthetic pathway or justifying the mechanism that leads to the formation of an unexpected reaction product. This environment changed overnight to dealing with nontraditional college students whose reason for taking organic chemistry was to graduate or to enter a health sciences program. The same situation can apply to any other faculty member with chemistry, biochemistry, or physics credentials.

I earned a doctorate in organic chemistry from Georgetown University and continued my association with my alma mater by teaching the premed organic chemistry course there for 27 summers while serving as a tenure-track faculty member at CUNY's Queensborough Community College (QCC). The annual teaching load at a junior college is at least twice that of a primarily undergraduate institution (PUI), which makes conducting research during the academic year difficult. Moreover, advanced instrumentation is unavailable, and the students are unlikely to stay past the second year of their chemistry classes, unlike four-year institutions where undergraduate research is usually conducted in the third and fourth years. Collaborating with a PUI and sharing its instrumentation may sometimes work, although the community college crew will always be seen as guests. The QCC administration would always frown upon this idea, as the enrollment in science classes has always been significantly lower than those of common core or general education ones. After all, chemicals are expensive, and disposal of chemical waste can be significant for a college with a small budget.

For these reasons, starting a research program at QCC was inconceivable for 19 years until a new college president arrived who held a doctorate in biochemistry. The first research student—a Pakistani GED student—and I needed nothing more than a 60 MHz NMR to determine the relative concentrations of butadiene versus pinacolone in the traditional pinacolone rearrangement procedure using different acid catalysts. She presented her findings in an oral presentation at the 2000 ACS-NY section of the Undergraduate Research Symposium at Fordham University and was the first community college student in 48 years to have this experience. She subsequently presented her findings in poster form at the National ACS Meeting in Washington, DC, in August of that year. The student later coauthored an article based on this work that was published in *Tetrahedron Letters* (edited by a Yale professor; see De Lezaeta et al. 2002). This experience proved that a faculty member needs to downgrade the sophistication of his or her research plans when the degree of instrumentation is not as sophisticated as the one used during his or her graduate studies.

Taking advantage of the diversity of the QCC campus, I chose four students of different backgrounds (Chinese, Haitian, Hispanic, and Korean students) for various projects; their findings also were presented

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at several ACS conferences. More important was the fact that each student introduced me to two friends of her cultural background. The registration in departmental courses expanded quickly, and young faculty members were hired who shared the same vision and enthusiasm about research at the community college level. Since 2003, QCC's students have outnumbered every New York section institution at the annual ACS-NY section URS. Also, QCC hosted the event in 2004, 2008, and 2015, as well as the MARM 2008 conference (the first time the event was held in New York City and the first time that it was hosted by a community college). After this development and effort, the Carnegie Foundation for the Advancement of Teaching and the Council for Advancement and Support of Education selected me as Outstanding Community College Professor of the Year in 2003 with the celebration hosted at the National Press Club and a visit made to Congress. It was the first time (and one of only two in history) that this award was made to a chemistry faculty member—a recognition of the effort to establish undergraduate research at the community college level.

The positive effects of undergraduate research at community colleges are multifaceted, both for students and faculty members (see Gaglione 2005). Students learn firsthand that optimum undergraduate research results are obtained after a multitude of repeated experiments, many of which are often failures. This is in contrast to what is often taught in class, where statements and concepts are often brought about as "a matter of fact" by the instructor. As a result, this experience builds critical thinking by identifying the sources of error that may be responsible for the occasional non-reproducibility of the experimental results. In addition, securing the funds for student presentations at conferences improves their self-confidence and ability to present their findings and conclusions to other scientists. Finally, such accomplishments add to the students' resumes, leading in many cases to subsequent admission to prestigious programs and scholarship opportunities upon transfer to colleges and universities.

Faculty members also benefit from this experience, since their enthusiasm when first joining a community college as tenure-track faculty is sustained and further developed. "En masse" participation at conferences improves both departmental homogeneity and collegiality of both students and faculty. Because faculty request that research students participate in the research group for a minimum of three semesters, second-year students serve as "postdocs" to the incoming ones. The success and exposure of students to undergraduate research has allowed QCC to apply and receive competitive research grants, including NSF instrumentation, Department of Education, NSF/ATE and NSF/STEP sponsored ones. The crucial term of "sustainability" was partially overcome by requiring the students to register for an Honors-labeled class for every semester associated with research, which demands that the student commit a minimum of 45 hours of bench time per credit per semester while providing partial release time to the mentor. The same terms apply to students who would complete internships at the Food or Drug Administration in Jamaica, NY, or the New York City-Division of Environmental Protection in Brooklyn.

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Conference presentations of their internship findings are also expected, which contribute to the increasing number of student participants.

Several QCC participated in the effort that led to this successful program. These include Sasan Karimi (chemistry chair), Nidhi Gadura (biology chair), as well as fellow chemistry faculty members Moni Chauhan, David Sarno, Jun Shin, Sharon Lall-Ramnarine, Tirandai Hemraj-Benny, Sujun Wei, Paul Sideris, and Luis Vargas. The individualized attention to QCC research students has led to their acceptance to more than 45 paid summer NSF-REU internships since 2007. Moreover, several QCC alumni have been awarded PhD fellowships at institutions such as Brown University, University of California, City University of New York, Princeton University, University of Pennsylvania, and State University of New York. In addition, many others have continued their studies in medical, dental, physician assistant, physical therapy, and engineering-related programs (see Gadura et al. 2014; Svoronos 2010, 2017). •

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Paris Svoronos is a professor of chemistry at QCC. Svoronos and his colleagues have obtained more than $3.5 million in external funding to support undergraduate research at QCC. His work inside and outside the classroom has been recognized through his receipt of honors that include the E. Ann Nalley Regional Award for Volunteer Service to the American Chemical Society in 2016, the Stanley C. Israel Regional Award for Advancing Diversity in the Chemical Sciences in 2018, and Fellow of the American Chemical Society in 2018.

Upcoming Chemistry-Related Funding Programs and Deadlines

American Chemical Society (9/24/18–10/19/18)

New Directions (grants for faculty in PhD-granting departments)

Doctoral New Investigator (starter grants for new faculty in PhD-granting departments)

Undergraduate New Investigator (starter grants for new faculty in non-doctoral departments)

Undergraduate Research (grants for faculty in nondoctoral departments)

National Science Foundation

International Research Experiences for Undergraduates Program (IRES; 9/18/18, 9/25/18)

Improving Undergraduate STEM Education (IUSE) Exploration and Design. (no deadline after 10/1/18; applications may be submitted at any time until 5/1/19)

Improving Undergraduate STEM Education (IUSE) Exploration and Design (10/1/18)

Graduate Research Fellowship Program (for doctoral students; 10/23-26—date depends on division)

Louis Stokes Alliances for Minority Participation (LSAMP; 11/2/18 for Bridge to Doctorate and 11/16/18 for New and Renewal Bridge to Baccalaureate)

Division of Molecular and Cellular Biosciences – Investigator-Initiated Research Projects (waiting for new publication)

Historically Black Colleges and Universities – Undergraduate Program Broadening Participation Research Centers (letter of intent 9/4/18 and full proposal 10/2/18 for research initiation and 10/27/18 for others)

Tribal Colleges and Universities Program (Small Grants for Research, 12/10/18)

Alliances for Graduate Education and the Professoriate (AGEP; 12/14/18)

National Institutes of Health

K series (research career development) 11/12/18
R01 10/5/18
R15 (AREA) 10/25/18
R21 7/16/18, 11/16/18

Beginning a Research Program in the Natural Sciences at a PUI Institute
Nov 16–18, 2018 • Skidmore College
App deadline: Oct 30, 2018

This institute gives pretenured faculty members the opportunity to learn from and discuss with experienced faculty how to establish and manage a research program with undergraduates. Learn more.

World CUR Conference
May 23–25, 2019

The Second World Congress on Undergraduate Research will take place at the Carl von Ossietzky University in Oldenburg, Germany, on May 23–25, 2019. Submissions aligned with one or more of six themes (environment, health, economy, communication, politics, and create) are welcome in all academic disciplines. The abstract submission deadline is October 16, 2018.