

## The Transnational Practice of Chemistry: Key Competencies and Effects on Career and Scientific Productivity

Over the last fifty years, the profession of chemistry has borne witness to rapid change in the form and content of its practice. With growth in global political, economic and technological interdependency, transfer of academic and industrial chemical knowledge and professionals across borders accelerates and becomes more prevalent.

This is particularly apparent in the many years of scientific cooperation between Brazil and the U.S., and most notably through American Chemical Society and Brazilian Chemical Society member, division, and leadership interactions, exchange activities, and network development. Among our joint endeavors, SBQ and ACS cooperated in a biofuels chemistry program that continues to resonate today.<sup>1</sup>

As ACS and SBQ move forward in science-based bilateral and multilateral cooperation efforts – many of which are positioned to favorably impact economic growth, quality of life, and the health and security of the Earth – there is a growing need to better understand how chemists working transnationally experience and use their expertise and know how. It is also important to understand in each country what constitutes success and the extent to which a chemist's career and scientific productivity are impacted for having engaged transnationally.

In my 12 years in ACS international activities, and in that time, having the privilege and honor to collaborate (or enable collaboration) with SBQ colleagues, I have observed that chemists in transnational practice have notable capacities to build and sustain relationships and communicate their science and the passion they hold for it. They are adept at finding creative and efficient mechanisms to work through sometimes unfamiliar language and cultural settings and systems to solve problems and get the job at hand done. That said, I have also noted that transnational chemists quickly learn that their

training and experience may not be fully suited to flourishing in 'overseas' professional settings - be they place-based or virtual. Participating in and measuring the value and impact of the transnational practice of chemistry invites complexity and carries uncertainty.

Personal observation is a start, but we need greater precision in our understanding to have a valid framework to think about the value and impact of globalization on the practice of chemistry and the careers of chemists. There's a concomitant opportunity to use of the fruits of these inquiries to inform innovations in teaching and learning in chemistry in our countries by showing its global reach and character in our classrooms and instructional labs.

There are four questions related to chemists working in transnational contexts that I believe warrant further consideration and inquiry.

- (a) What is the nature of the chemist's experience in a globalized context of practice?
- (b) How do they select and organize their skills and competencies to be successful?
- (c) How do we measure that success in counterpart countries?
- (d) And what impacts on their careers and scientific productivity do these experiences have?

On a mechanical level, measuring the success and impact of transnational chemistry on one's academic career, for example, can be simply inventorying patterns of promotion, invited / accepted presentations, peer-reviewed publications (including citations), grant awards, patents, recognition, etc. in contrast to colleagues with more of a national aspect to their professional lives. There are also creative metrics that could be considered: leadership positions in professional societies and associations, global diversity of lab personnel, and the scientific mobility and productivity of their students.

It is my hope that the content of this editorial might catalyze discussion and further investigation in the U.S., Brazil and worldwide of where and how there is value in the transnational practice of chemistry – to the discipline and the individual – and that it might provide space for thoughtful consideration of the issues and opportunities created when chemistry crosses borders.

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## References

1. Vieira, P. C., Colaboration on Biomass Conversion enhances SBQ and ACS activities, *J. Braz. Chem. Soc.* **2007**, *18*(4) *Editorial*; available at [http://jbcs.sbq.org.br/jbcs/2007/vol18\\_n4/00b-editorial%2018-4.pdf](http://jbcs.sbq.org.br/jbcs/2007/vol18_n4/00b-editorial%2018-4.pdf)
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since 1999 developing programs, products, and services to advance chemical sciences through collaborations in Africa, Asia, Europe, Latin America and the Middle East. At ACS, the world's largest single disciplinary scientific society, he works to create opportunities for chemistry to address global challenges through in-person and web-based scientific network development, research collaborations, and educational exchange. Miller serves on the US National Commission for UNESCO and in 2009 was appointed to co-chair the ACS 2011 International Year of Chemistry Staff Working Group. In 2006 Miller was recipient of an NSF Discovery Corps Fellowship fostering US/Brazil collaboration in chemistry of biomass conversions to biofuels. He has worked for university-based international programs, for a higher education association focused on principles of quality assurance for transnational education, and for a private voluntary organization dedicated to international allied-health sciences. With a PhD from the University of Arizona, a master's degree from the University of Northern Colorado and a baccalaureate degree from University of Virginia - Wise, Brad speaks French, Spanish and Portuguese and has published nine articles and book chapters on topics related to scientific, professional and academic mobility. Brad and his wife, Rebecca, live in Gerrardstown, West Virginia, USA and their son, Quinn, serves in the U.S. Peace Corps in Latin America.