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Barry Martin Trost: Educator

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Barry M. Trost (left) and Brian P. Coppola (right), from 1979.

Dr Brian P. Coppola is Arthur F. Thurnau *Professor of Chemistry at the University of Michigan. He is currently the department's Associate Chair for Educational Development and Practice, and directs CSIE/UM, a program in which faculty-led projects are the foundation for educating future faculty, and CALC/UM, the companion program for students pursuing non-academic careers. He received his B.S. in 1978 (University of New Hampshire) and his Ph.D. in 1984 (University of Wisconsin-Madison). Moving to Ann Arbor in 1986, he joined an active group of faculty in the design and implementation of a revised undergraduate chemistry curriculum. His publications range from mechanistic organic chemistry research in 1,3-dipolar cycloaddition reactions to educational philosophy, practice and assessment.*

In a world where some chemistry professors have a peculiar relationship with education, in that they trivialize, dismiss and sometimes even denigrate teaching, Barry M. Trost epitomizes the best kind of chemistry professor – one who takes seriously the most critical responsibility of an academic's career: to educate.

Barry was also my dissertation advisor. We did not always see eye to eye; so right up front, I want to acknowledge that he gets all the credit for not terminating my career when I gave him more than enough reasons (plural) to do so. And that is all I have to say about that.

I have built my own career on one basic lesson I learned during graduate school, and it is one I have repeated frequently: *In service to one's education, you ought to identify a difficult and challenging problem to pursue, and then take your creativity and imagination and work hard to solve it.*[1]

Sometime in the early 1980s, I decided to focus my career on developing the area of discipline-centered teaching and learning, rather than on making new carbon–carbon bonds with atom economy and high enantioselectivity. This choice has sometimes been challenging for people to understand, particularly in how it might draw from my graduate training. Even on the day of my PhD defense, my own dissertation advisor explicitly questioned my choices when we sat together after that momentous event. As I said, we did not always agree.

Whether building a 10-year case for a tenured position as an education specialist in the chemistry department at the University of Michigan[2] or demonstrating a case of significant cultural change within that department around education,[3] the echoes can be found of Barry's approach to analyzing problems and building pathways to efficient solutions.

Working on problems in education has not only been a good match for my creative skills (yet another lesson), but also, frankly speaking, these can be significantly more challenging problems than anything physical science has to offer. Despite the recent rhetoric around so-called scientific teaching, and the rise of data analytics, education is a social science and defies understanding through methods that work well on, say, 10^{23} interchangeable and non-cognating particles that re-equilibrate nearly instantaneously when you swipe away a block of them.

But, I digress.

I want to make the simple point that Barry Trost is a consummate educator. In didactic settings (seminars, classrooms) he commands with organization, strong arguments, and a mastery of his craft. As a research advisor, his former students (me included) will acknowledge, to a person, their regard for the strong, transparent, and consistent premium he put on education and human resource development.

In an era where nearly every graduate student I encounter, everywhere in the world, talks about "working for the boss" rather than "working with an

advisor",[4] we in the Trost group benefited daily from working with an advisor. The work we did was our work; the time we spent was in service to our degrees. I am convinced that this difference in language is not trivial. Language speaks to underlying meaning, attitudes and intent. Language shapes the mental images and roles we assume, which affects our actions, beliefs, and behaviors.

In 2001, at the closing of his 60th birthday celebration, where hundreds of former group members had assembled, Barry reflected masterfully on the (annoying) habit of faculty colleagues who saw research output, rather than human resource development, as the primary goal of academic science: "...after all", Barry said that day, "if research productivity was the sole outcome, why would we then choose to do it with untrained scientists?"[5] I have repeated that story more times that I can count. Along those lines, Trost has also been outspoken on the intrinsic conflict faced by professors when the demands of their business ventures clash with their academic responsibility to their students.[6,7]

I have had many fortunate opportunities, including those above, to reflect and write on lessons from my days in the Trost group. And I am not alone. Will Pearson and I wrote a piece about Barry's influence on the way we taught organic chemistry when we were teaching together at the University of Michigan.[8] Barry's signature pedagogy, and one that simply infects his students, is an exceptional ability to think analogically and see the connections between things that might seem disparate on the surface.

Will also documented his own ideas about Barry while introducing me at the 1994 University of Michigan Golden Apple Award presentation.[9] He noted "we both underwent a transformation [in graduate school] because of the man we worked with, Barry Trost... and whether he knows it or not, he is one the best teachers I have ever been around". Will makes the key point: "[Trost] taught us how to analyze problems; how to think about chemistry as well as about other subjects".

I canvassed a few former group members for their stories.

Mark Lautens (Professor, University of Toronto): "I remember the 'Please see me' notes and also little slips of paper with suggestions and references to ideas. He was fully committed to having our projects go well. It was comforting to know that your advisor was so invested and thinking about your project. Because I felt I 'owned' my project, I appreciated that it was my responsibility to make it go somewhere. I think the key to education is to inspire the learner to feel like they have power over their situation".

Pat McDougal (Professor Emeritus, Reed College): "I was always impressed by his ability to communicate large amounts of information in a form that was connected and digestible. He was able to weave together the vast field of organic chemistry as a connected whole. Equally impressive, given the size of the group and his professional schedule, Barry mentored us as individuals. I always felt that when I was talking with him that I had his undivided attention. While the group jokingly referred to these sessions as confessions, I think that term, at least in my case, misses the salient feature of these meetings: two scientists sitting down to discuss science. I am sure we can all recall coming into lab to find little notes from Barry with suggestions and ideas".

Janine Cossy (Professor, ESPCI, Paris): "Without the Trost group, I would not be in chemistry today. I saw how Barry was managing the group, how he was teaching (he was performing), and his enthusiasm about research. He was a catalyst for me. Upon returning to France, I decided to stay at the University to do research; otherwise, I think I would be making and selling champagne. I remember each time that he was doing confessions at the bench, the first sentence was, 'how's it going?...' although Barry's pronunciation was always 'goink'".

Dennis P. Curran (Professor, University of Pittsburgh): "Barry has high expectations for his students. The effect goes beyond building confidence in students into the realm of inspiration. Likewise, he always treats research interactions as teaching opportunities. For Barry, the research/teaching dichotomy does not exist because research is teaching".

Craig Merlic (Professor, UCLA): "I truly enjoyed the one-on-one sessions when Barry made 'rounds' in the lab. We just focused on chemistry and he was so engaged. Sometimes too much so – I recall one time where we talked for quite a while and then he glanced at his watch. He jumped up and while he was running out the door he said, 'Susie is going to kill me'".

Two of my own former undergraduate students graduated from the Trost group with their PhDs. I wondered if they might remark on similarities?

Dustin Bringley (Scientist, Gilead): "My all-time favorite quote was when we were discussing a paper and he was not happy about the argument being made. Barry's take on that: 'He's trying to be sexy... but it's not sexy to be wrong!' Probably his most common refrain, though: 'Stay in the lab! It's the safest place to be!' Always with a wry smile..."

"One thing that both you and Barry share is an appreciation for the history of chemistry. I've always thought these history lessons/perspectives were important pedagogical tools, at least for me, that both of you used to great effect. The other thing I just saw in your notes (yes, I still have them!) is the idea of precise language, which of course Barry is quite insistent on".

Andrew Weiss (Strategy, Genentech): "For Barry, it's not just making a discovery, it's really about the context, communication, understanding, and bringing along the group. I recall this one clearly: 'In industry, your products will be your drugs. In academics, your products are your students. People might think I'm known for a body of research, but it's all a tool to teach'".

"I definitely saw a lot of his teaching philosophy/style in you. My 'Trost Notes' are 500 pages of reactions that both forced us into the literature and to discuss what we didn't understand. *No answer keys!* And neither of you is going

to shut down a debate or a discussion with 'the answer'. Rather all learning is about the debate, the discussion, and the process of getting to a supported answer. You both clearly value education as its own activity".

Andrew concludes with this terrific anecdote: "one of the times the group was invited to lunch at his house, he had his family serving us catered food. Barry saw the long line waiting for food, and diagnosed a process issue… he believed the food could be delivered more efficiently. So, being Barry, he crossed over from the food line to behind the serving table, walked up to his son, and in the same patient tone that we all know so well, showed his son a better way to serve the food. BMT is legitimately allergic to inefficiency. And for what it's worth… the line did go faster with the now-improved serving methodology".

On behalf of the 700-plus students who passed through the group between 1965–2016, I am pleased and proud to be able to introduce this collection of papers honoring and celebrating the 75th birthday of our mentor and advisor, Barry Martin Trost: Educator.

References

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9 1994 Golden Apple Award – Brian Coppola, https://www.youtube.com/watch?v=ITnOmIrSgcc (accessed July 14, 2016).