

River Gazette

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Photo by Barbara Woodel

For Andy Koch, teaching is a way of giving thanks for all the mentoring he received as a young man. In his teaching, Koch encourages students to see that they can tackle big problems.

Teaching Chemistry: A Different Kind of Formula

by Andrew Koch, Associate Professor of Chemistry

A few years back, I was at a national meeting of the American Chemical Society. It was early in the morning, and some of my old graduate school buddies and I had met at the local café in an attempt to jolt ourselves awake before the first round of talks. The place was crawling with chemists. They were easy to spot—either off in their own little world with a name tag pasted to a bland wrinkled shirt, or huddled in a group over a napkin containing cryptic symbols. One always sounded much more excited than the others.

Our group, too, had been guilty of this just the night before. Over a few beers, we had filled each other in on the latest chem-

istry we were engaged in. It had been a long night, and now we just sat there, quietly laughing at the seemingly dysfunctional social behavior before us. Were we really as bad as all the others?

The silence at our table couldn't last forever, so someone started talking about his job. Soon the subject of salaries came up, which always puts me in an uncomfortable situation. I was the only one at the table who had chosen to go into academics. They were all talking about working normal 9-5 jobs, making over twice what I make and able to leave their work at the office.

Now they looked at me with the dreaded curiosity—what does an academic make? I gave a little chuckle and said I

would be very happy to receive a raise that would bring me up to half of their salary and told them that a light week was 60 hours. I did not mention that I rarely get a "light week" during a semester.

The next question was predictable: "So, why do you do this?" It was a good question. My career choice certainly had not been an easy path, and I had never really had to articulate the reason for my choice. I had come from a family of academics, so I never had the misconception that you get your summers "off"—I knew that summer was the time to roll up your sleeves and get some real research done.

I had followed in my parents' footsteps, but why? Put on the spot like that, the best I could come up with was that I had always been good at explaining things, had a knack for teaching, and liked working with young minds. I pointed out that we were all entering our 40s and were "entirely too old," anyway. That got a round of smiles

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and a chance for the conversation to drift into another direction. But as I sat there, giving about half of my attention to the conversation, I thought about why I had chosen this path.

Maybe I had just been destined for an academic career. Both of my parents taught chemistry in a small liberal arts setting. As a child, I remember my parents entertaining their research students at our house. I saw the students treating my parents with a comfortable respect, as if they were a cross between their own parents and the leading authorities in their field. I had seen them put in countless late nights working on lectures, grading exams, developing research strategies. It was not until I entered college as a student that I fully understood why so much work had been done off-hours. Their workdays were spent interacting with, training, and counseling students who were on their way to becoming professionals.

I started to realize for the first time just how lucky I had been. I had been born into an academic family and was provided with guidance and opportunities from the beginning. Even as a high school student, I was fortunate enough to spend my summers doing product analysis for my father while my friends flipped burgers.

While in graduate school at Cal Berkeley, I met Beth Kuchinsky, now Beth Koch, who was putting herself through college by working as a secretary for a chemist in our department. She juggled work and classes 3,000 miles from home with no assistance. In contrast, my parents had worked at Ithaca College, which had a tuition remission program for all employees. I had only needed to take out a few student loans to pay for housing to get through college and was actually paid as a research and teaching associate to earn my Ph.D.

After that, I had an extremely marketable degree with countless opportunities awaiting me. I don't think I was entirely aware of why I was choosing my academic career path at that point, but now, 15 years later, it seems so obvious.

Acquiring all the experience I would need for my academic career was a fascinating time, but this research-intensive path was designed for one who wanted to direct a large group of graduate students, and inside, I knew that I could make a bigger difference working with undergraduates.

In the university setting, I rarely saw professors working or even talking with undergraduates. The professors were clearly brilliant individuals and their students saw this, but the mentoring and coaching aspect was missing—it was reserved for graduate students. But graduate students were *already* motivated to succeed; I wanted to work with students who were still on the edge. I needed to give back something

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by Andrew Koch, Professor of Chemistry
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Photo by Barbara Woodel

Koch's students appreciate his approachability and flourish in the rigorous, yet friendly environment that he creates in class. He emphasizes to students that chemistry is the building block of the sciences and that it can be a tool to create change.

"So, the next time my old graduate buddies ask me why I put so much effort into a job that pays so little, I'll just smile and say, 'I get paid to do my hobby.' Sure, it's a lot of work, but when you enjoy what you are doing, you don't mind the hard work."

for all the help, opportunities, and direction provided to me over the years, and there seemed no better way to do this than to help direct others at critical points in their development.

During the 1980s, many undergraduate institutions were busy building facilities for undergraduate research, and the time was right for me to couple my intense research training with education to help show students that they could do anything if they just worked hard enough. By the fall of 1990, I was applying to teach at strictly undergraduate colleges. As long as the schools had the most basic resources for conducting research, I felt that I could fulfill my mission.

I wanted to use the classroom to show how fundamental knowledge can touch many fields. I wanted to use my research program to provide students the opportunity to work on something exciting and challenging while showing them how it all fits into a bigger picture. Environmental issues provided the perfect focus.

My interest in the environment began when I was an undergraduate. I had no idea, though, how I would work that into chemistry, especially since I was in a field that few considered environmentally friendly. I became a teenager in the '70s, when Rachel Carson's book *Silent Spring* became common reading and the word "chemistry" was synonymous with pollution and environmental havoc.

As was true for so many, I was caught up in this concern over the environment, and there was good reason to be. Lakes in the Adirondacks, not far from where I grew up, were dying. Due to the horrific industrial stench one experienced in cities such as Buffalo, you had to roll up the car windows to keep from being nauseated as you drove through. These problems were the result of a developed country, and I was quick to notice that even the most outspoken activists for the environment were unwilling to give up their climate-controlled living quarters or, heaven forbid, their cars. I personally believe in living simply, but I could-

n't see us going back to a pre-industrial life style. I can still hear the words of my father at the end of our discussions about this: "A good chemist can solve any problem."

Now, years later, with those words still firmly embedded in my mind, I finally realize why I chose this path. I wanted to show others what I had been fortunate to see at such a young age—you can apply knowledge to solve any problem, and the more you know, the bigger the difference you can make. I could raise an awareness of choice and consequence in the classroom through environmental issues, and tie technology to solving social problems. My research program would have to be an example of this, so I exploited my training in advanced materials to focus on solving problems related to solar energy conversion.

I have had the opportunity to show students countless examples of modern convenience and the real price we pay. The chemistry I teach them is great at demonstrating both the benefits and consequences to the choices we make. Many areas are left intentionally grey to allow students to think for themselves about the choices they make. I want them to walk out of my class knowing that every time they take a step it has an environmental impact; we don't stop walking, but once we understand the problems we might walk a little more carefully.

I have found that the real reward for the path I chose does not come on payday. It comes when a non-science major who took my Contemporary Chemistry class comes back a year or two later and tells me that they are exploring environmental opportunities in their own field because of what they learned in my class. It comes when strong science majors see that they can handle anything I throw at them and like it enough to go on to a competitive graduate program to integrate chemistry with other sciences. And it comes when those unfocused undergraduates who seemed to fear what graduation would lead to write back and tell me how they are using the skills I helped to develop in a job they love.

I have not regretted my choice. So, the next time my old graduate buddies ask me why I put so much effort into a job that pays so little, I'll just smile and say, "I get paid to do my hobby." Sure, it's a lot of work, but when you enjoy what you are doing, you don't mind the hard work. You can't put a value on watching your hard work pay off. For me, the value is inherent in watching a student develop from a person who sees subject matter as tight little bundles of facts into a confident graduate who has the ability to *apply* their knowledge and skills independently.