The Early Years: a Scientist and a Leader

During middle school (East Greenbush, NY) I became an active member of Science Olympiad, a national competition aimed at challenging young scientists. When I was a sophomore in high school I was voted co-captain of the team despite being one of its youngest members. I led the team until I graduated from high school and for two years took our team to the finals in the New York State competition. I recall this as the time when I first discovered faith in myself, not only in my academic ability, but also as a leader. I had a similar experience in Authentic Scientific Research (ASR), a pilot program at my high school designed to expose students to laboratory research. I was the only girl in a group of 8 sophomores. The class required early morning meetings before classes, summers spent in the lab, and weekends at out of town symposia. In addition to the satisfaction I eventually found in my research, conducted at the Marine Biological Laboratory (Woods Hole, MA), I felt a duty to persevere and recruit more women. By the time I graduated as salutatorian of my high school class the ASR program was almost half female.

College: Discovering Molecular Biology

Although I began college with the assumption that I would major in Biology, I took on a diverse course load, both within and outside the sciences. I knew I loved science, but that was as narrow as I could get at the time. My junior year at Reed College (Portland, OR) I took a class titled "Vascular Plant Diversity." I became fascinated that molecular techniques could illuminate such a complicated and beautiful process as plant evolution. Although I had studied molecular biology before, it was not until that class that I found myself so excited about a specific discipline, and I realized *why* I wanted to pursue graduate research. After a year of independent research, I completed my senior thesis project, spoke about my work in an oral defense, and graduated from Reed with the goal of eventually pursing a PhD in molecular biology.

A Foundation for Broader Impacts: Undergraduate Teaching Experience

While at Reed I also took class notes for challenged students, captained the biology softball team, taught myself to play the viola, and coordinated the student art for the annual Reed Arts Week. In addition, I greatly enjoyed chemistry, and in my senior year I was the only non-chemistry major in upper level chemistry elective classes. For three years the chemistry department invited me to TA labs in introductory and organic chemistry and to work as a group and individual tutor, positions normally held only by those pursuing chemistry or biochemistry degrees. All Reed students, regardless of major, are required to pass a science class. I watched French students struggle with the foreign language of the elements and witnessed artists wrestle with their beautifully rendered hybrid orbitals without understanding the science behind the shapes. It was a challenge for me, too, as I strove to explain something that made natural sense to me to people to whom the periodic table looked like Greek. It was worth the challenge to watch them finally comprehend even the most difficult concepts, and many of my students would proudly bring me their graded homework or aced tests. After several years of truly enjoying tutoring and looking forward to the time I spent with students, I knew I wanted to teach.

Time in Industry: Learning Effective Communication

Before I pursued graduate study I worked in industry for two years. In June 2006 I was hired by the molecular profiling department at Biogen Idec (Cambridge, MA). In this core lab I learned the software and hardware for robotic liquid handlers, interacted daily with vendors and companies, and grew adept at processing RNA samples on a large scale. One of my greatest accomplishments while in industry was teaming up with a programmer to reverse engineer the coding language used by Tecan in their Genesis software. Together we wanted to create a program that, when given a set of parameters, would write a file that could then be uploaded to

the Genesis software. The file would command the robot to rearray and normalize samples from many plates onto one, a very laborious and error-prone process when done by hand. My task was to teach the programmer, who had no laboratory experience, what the commands meant, for what they were useful, and when it was appropriate to use them. Within very little time we had the program up and running and integrated into the laboratory workflow. After this success I was asked to participate in a collaboration to create a new laboratory interface management system ("LIMS," the database that keeps track of samples and experiments for the lab). When I left the company the new LIMS was ready to be deployed. My time in industry was invaluable in teaching me how to communicate and collaborate with scientists, engineers, programmers, and even my own replacement. However, I longed for the stimulation of academia and after two years I was ready to return.

Continued Passion for Teaching and Learning

While at Biogen Idec I also volunteered in the company community lab, which is designed to expose local middle and high school students to science and technology. While this involved little more than teaching students to pipette and helping with worksheets, I found fulfillment in showing the students that young people not much older than they can have successful jobs in biotechnology. In addition to the community lab, I volunteered as a general tutor at a local middle school and took night classes in biotechnology and physics at Harvard University Extension. The Extension school was a novel experience for me: here were students of all ages and backgrounds who had a passion to learn about science, not necessarily for a degree or a grade. I met many people for whom science was a new fascination, but I found they lacked the basic (albeit foreign) vocabulary and the understanding of general principles to adequately analyze the topics under debate.

Broader Impacts: Teaching Aspirations

The public as a whole is daily asked to make decisions regarding biotechnology; advances in GMOs, prenatal genetic screens, gene therapy, and the never ending stem cell debate are all constantly reported by the media and are subjects about which many Americans feel very strongly. In order for the most beneficial and rational decisions to be made regarding these topics, the public, especially the youngest people, must feel that science is accessible. As stated above, I have known since college that I want to teach. As a first year graduate student at the University of Wisconsin-Madison, I am surrounded by opportunities to become a more effective teacher. I will take several classes from the Delta Program, a division of the NSF-funded Center of the Integration of Research, Teaching and Learning program. Through these classes I hope to learn how to more effectively teach and communicate, as well as how to evaluate my impact on students. Once I am prepared, I hope to partner with local middle and high schools to present hands-on laboratory experiments to the students. In this way, I hope to contribute to the public understanding of science and allow more young students to feel that science is intelligible.

Conclusion

My intellectual merit is clearly demonstrated by my success across the country, in academia and industry, as a student and a teacher. The NSF Graduate Research Fellowship would allow me to pursue my own education at the University of Wisconsin-Madison, reach out to other aspiring young scientists, and give back to science and non-science communities through teaching, tutoring, and public education. Also, I believe it is important that young people see women in science as a norm—not an anomaly. Through my public outreach efforts I hope to achieve this while also contributing to the knowledge of this significant field of research.