

The two passions that singularly drove my life as an undergraduate were research and teaching. In the morning, I was a teaching assistant (TA) in the basement of Cory Hall at U.C. Berkeley, lit by the unbounded enthusiasm of a lab full of CS150¹ students. In the afternoon, I transitioned into research through the Berkeley-Stanford systems biology project (my research experience essay discusses this work in detail), in settings ranging from research symposium presentations to designing the next facet of my group’s Bayesian inference accelerator. My undergraduate experience can be characterized as a continuous jump between these two worlds, and a personal journey to unite them.

My teaching career began before my years as an undergraduate—at an after school enrichment center called “Zeitgeist.” Zeitgeist, based in the Crenshaw District of Los Angeles, introduced at-risk elementary school students to subjects such as math, science, the liberal arts, and yoga (among other subjects). Watching these children grow, while serving as their mentor, had a great impact on me as a teacher and as a person. In order to make the greatest contribution possible, I began teaching a subject that the children had little exposure to otherwise: computer skills. After establishing the Zeitgeist computer literacy program, complete with six modern computers, I helped develop two software learning applications so that the program would better match the students’ needs. Several years later, I returned to the center and was thrilled to see that the same computers were in steady use, and that my once second grade students were using the equipment for fifth grade projects. Through working at Zeitgeist, I discovered a love for teaching and realized how effective presenting novel material was as a way of inspiring students.

Later, as a CS150 TA at Berkeley, my interaction with students was grounded in a recitation called honors discussion. ‘Honors’ was open to the entire class and emphasized material not covered in lecture—which made it a conduit for exposing students to research. In Spring 2010, I introduced synchronous and asynchronous pipelines, which were being covered in a graduate-level research course on hardware design patterns. This was an exciting time for me as a teacher because there was real learning taking place. One morning, a student asked: “What happens when the sink in a synchronous pipeline, without enable or back-pressure, can suddenly no longer receive data?” “You get a train wreck!” I replied. Later, during the unit on asynchronous pipelines, another student made an insightful comment, related to gray code sequences, that later triggered a discussion in the graduate course’s recitation section. I owe these anecdotes of classroom enthusiasm and participation to the research material that was weaved into the course curricula. At a fundamental level, students let go of their inhibitions and spark discussion if they feel that what they are learning is still being ‘learned’ by the research community as well. From facilitating honors discussion, I learned that an effective classroom is a two-way street where the knowledge that you share with your students is reciprocated in their effort and validated through their participation.

Inside the CS150 lab, this two-way learning environment became most animated every Friday during weekly lab lecture. Lab lecture is a class-wide congregation where a TA gives an oral presentation on the next week’s lab assignment. In TAing CS150 for three semesters, I cannot overstate the importance that this activity had on my presentation skills. During my second semester as a TA, I took the opportunity to rewrite three of the five lab exercises to get the class ready for a new hardware platform and curriculum.

¹CS150 is U.C. Berkeley’s lab-based “Components and Design Techniques for Digital Systems” class.

This not only gave me a greater appreciation for the lab lecture material, but also made delivering lab lectures very similar to presenting research. The element that set the two types of presentations apart was that students would be reproducing my lab lecture ‘results’ in the next week’s lab! Between lab lectures and what would eventually be my first conference talk, CS150 students were the more skeptical crowd. In many ways, designing labs and delivering lab lectures was my first training to be a researcher.

The seminal moment that ignited my love for research came when I gave a series of talks on my work to the scientific community. I began working, under U.C. Berkeley Professor John Wawrzynek, on the systems biology project in Spring, 2009. In the Fall of that year, Professor Wawrzynek asked me to represent the group and present our *Bayesian inference accelerator* to representatives across multiple universities at the GigaScale Systems Research Symposium (GSRC) in San Jose, California. Giving the talk, and seeing how the audience responded to it, inspired me. In the semester following GSRC, I presented the talk during CS150 honors discussion. Too often my students told me that research was intimidating because you first had to “crack the shell” of reading and understanding hundreds of papers before you could get involved. My hope, in giving the talk, was to show students that research is done by real people (their peers, in fact!) and that getting involved was a matter of meeting and talking to the researchers who were working all around them. In the summer after the CS150 presentation, the whole experience reached a high point as I gave a more mature version of the original talk at a technical session at the International Conference on Supercomputing in Tsukuba, Japan. Starting with GSRC, giving talks showed me that research is not only about synthesizing knowledge and insight but also about sharing that knowledge and insight with the community.

I am fortunate to have been able to take part in an interdisciplinary research project where my work was concurrently being used in cancer and disease studies. In the end, the system that I designed and built was connected to a Stanford web interface that researchers, and the public domain, could submit cell cultures to and collect cell signaling network models from. In pursuing future projects, I will work to integrate some component of user feedback into the research product. Experience has taught me that feedback not only helps put research into context but also impacts how well the end result is adopted by the community. The systems biology project—spanning biology, statistics and computer science across both U.C. Berkeley and Stanford—was a rare collaborative opportunity. Regardless, I will strive for my future endeavors to be in similar interdisciplinary environments to help drive innovation.

My passion is to synthesize and share knowledge, and to that end, I want to pursue a career in academia. An invaluable asset while teaching and conducting research has been to have a certain degree of freedom. From the children at Zeitgeist to U.C. Berkeley CS150 undergraduates, my strategy to fully engage students has been to integrate novel material into the teaching curriculum. From giving talks to designing the Bayesian inference accelerator, being able to take ownership over an important part in a larger research project has been extremely motivating and makes the work more personally fulfilling. Moving forward as a graduate student, obtaining the NSF fellowship is an important step in keeping this freedom, and will best allow me to follow my proposed academic path.