Tell us about your current and near-term career-related activities and goals, as well as why you decided to pursue the specific graduate program(s) and school(s) that you have.

My career goal is to become an expert in quantum chemistry and use this, along with my disabled identity, to make an impact in sustainability.

I plan to make this happen through my passion for scientific communication, enabling me to succeed in both technical academia and non-technical public policy.

Last year, I embarked on a senior thesis project, which involved working on a theoretical method in quantum chemistry known as the GW approximation. Nowadays, wet lab chemists use computation in conjunction with their experiments to answer pressing research questions, but conventional computational techniques are not sufficient. For example, GW allows one to efficiently probe a candidate material for more efficient solar panels computationally. Experimentalists might be asking what kind of modification could be made to the material that composes current solar cells (silicon) for larger absorption of sunlight, and computation helps them answer that.

The motor impairments caused by my stroke present unique challenges to scientific communication required by this project, but with the help of AI tools, I was able to overcome them. As the final product of my GW project, I dictated a ~40-page final report and gave a 15-minute oral presentation. Throughout the year, I became an active member of the Talon Slack, which is where the community for my free dictation software meets. Improving the software is a continuous project with everybody contributing. In particular, there are meetups three times a week over Discord, where users can ask questions to the Talon developers while doing a screen share of their personal dictation setup. Often, people stay around afterward to chat about how to improve the hands-free coding experience. Here, I am reminded of the proverbial saying that iron sharpens iron. When ChatGPT went viral, I had the idea of interfacing with it to correct my dictated text. This led other people to think about how to use large language models, like ChatGPT, to improve the dictation experience. For example, one user thought of translating a piece of English text into Japanese. Instead of going to Google Translate and pasting the text in to get a mediocre translation, you can select the piece of English text and say, “Model, please translate this to Japanese,” and get back a state-of-the-art translation immediately in your text editor, courtesy of ChatGPT, which has ingested the Tower of Babel. For most people this means a few seconds savings, but for the disabled with difficulty using the mouse, it is priceless.

In order to give back to the Caltech Undergraduate Research Journal (CURJ), for which I had formerly written a publication, I took on an editorial position at the journal. Throughout the year, I made multiple revisions for a submission in the adjacent field of nonlinear spectroscopy, both asynchronously and over a Zoom meeting with the author and my college writing center. Having my scientific writing edited by senior figures countless times in the past, I was finally able to relay what I learned, but with my own distinct flavor, to somebody else! Having developed an interest in the subject matter during the editing process, I took a nonlinear spectroscopy class during the spring. One of my classmates was an underclassman who had similar interests; he had TAed for the same quantum chemistry class as I had and was doing inorganic physical chemistry as I originally had. We would walk back after class together, before parting ways to our separate dorms. He would tell me about the difficult physics classes he was taking out of intellectual interest, wondering out loud if he was doing the right thing; after all, his peers were taking easier classes for a good GPA, thus increasing their chances on paper of getting into top graduate schools. I told him to not stop being himself; this was a simple thing to say, but it took on weight due to what I said next as a likeminded upperclassman. I explained that my academic success had not been due to many high-impact research publications at the early stage of my career, but by getting recommendations from professors who were willing to vouch for my passion for the subject. We gave a final presentation to the class, which consisted of 3 graduate students, me, him, and two professors. In a valiant effort, he chose to present a difficult topic that even the professors did not have mastered. Afterwards, everyone praised him. Walking back afterward, he asked me what I thought of his presentation. I gave him the truth. He had reduced the font size to pack a lot of information on each slide; it made the presentation hard to follow. He chose to walk back with me to my dorm because he wanted to pick my brain, enthralled by the sober advice I had given him.

During the summer, I gave a talk on my senior thesis work at the 4th annual Goldwater Symposium to further hone my presentation skills. My love for scientific communication has only grown—through countless experiences, I have learned that there are wrong ways to explain a concept, but there is never one right way. It takes creativity to craft an explanation for your specific audience, ranging from technically minded scientific researchers to unfamiliar government policy officials.

This summer, I began my PhD studies at Harvard in the Division of Chemistry and Chemical Biology, with a rotation in Professor Joonho Lee’s group. He is a leading expert on developing quantum chemistry simulations for materials like solar panels. Together with him, I will be able to use my background in GW to improve simulations of photovoltaics. I also chose Harvard because it has the top school in public policy, the Kennedy School, where influential people from Washington come regularly to give talks. I will be doing research that makes solar panels, a technology that will drive the green energy transition, more efficient. I want to held figure out how to bring solar energy to the consumer, using my expertise on the science of solar cells. With the busy early years of my PhD program, I will attend these policy talks as my schedule permits.

My background in rehabilitation prepares me to be part of the sustainability movement. Climate change is going to get a whole lot worse before it gets better; there is continued resistance to climate solutions even as disasters become more common. Not long ago, I was unable to go to the toilet by myself, but now I am living across the country from home in Southern California independently. You learn that persistence in the darkest moments pays off in the long run.

I am inspired by the story of Caltech Professor Frances Arnold, who suffered both the suicide of her husband and death of her son in an accident. She was recently awarded the Nobel Prize for her work on protein evolution, but also oversees many corporate sustainability ventures and is the president of the Biden Sustainability Council. One day, I too hope to make lemonade out of lemons.