**Essay Two – maximum length 1000 words**

**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. How do you see your current work and study informing your early career goals? If you have not been accepted into a program yet, please tell us about why you selected the programs to which you are applying.**

I want to pursue a graduate program in chemistry and continue in academia as a professor at a research university. Specifically, I am interested in the electronic structure of materials and molecules; working towards a PhD in chemistry would enable me to conduct research and take coursework that would help me learn more about these topics. My generation will be defined by how we adapt to climate change; I hope to make innovations in electronic structure to aid in the development of sustainable technologies.

I came to college intending to major in mechanical engineering, but the freshman chemistry class changed my mind. Learning about how the geometry of electronic orbits affects global chemical properties was fascinating. So, in the summer after my freshman year, I did a research internship in a physical inorganic chemistry laboratory. Having only completed freshman-level studies, I did not know that many details about my research. I was using computational methods to study the dynamics of chemical systems, with applications to molecular qubits that could be used in quantum computers. I found myself interested in what was behind these powerful computational methods that I was using. Whenever my calculations were running, I would pester my graduate student mentor to recommend some reading in this direction. The coursework I took after this experience was geared towards theoretical chemistry, which necessitates an advanced understanding of quantum and statistical physics.

In the summer after my sophomore year, I did a research internship in a quantum chemistry laboratory group. I did not have the quantum mechanics coursework under my belt yet that would enable me to work on real quantum chemistry research, so I used computational methods to study a chemical system. But this time, I was challenged to learn more about the quantum chemistry computational methods that I was using and I spent time reading about them in my own time.

In the fall quarter of my junior year, I was a teaching assistant for an introductory quantum mechanics course for chemists. Being able to navigate complex concepts on one's own is one thing, but being able to communicate these to others who do not have the same knowledge base as you is more difficult. I found that I enjoyed this challenge. However, this was during the COVID-19 pandemic, so I was teaching my recitation sections virtually while writing with an iPad and Apple Pencil amidst a screen share. Due to my motor impairment, to teach at the standard I wish in the future, I have become handy with tools that allow me to communicate science via dictation, like the typesetting software LaTeX, which enables one to code physics and mathematics formulas. I plan to refine the use of these tools as a graduate student TA in chemistry.

My return to my passion, which is doing science, following the stroke that resulted in my fine motor impairment, has been made possible by artificial intelligence. I use it on a daily basis. It powers the dictation software that I use. I use the Co-Pilot product of GitHub, which is an open-source coding platform owned by Microsoft, to make suggestions for me as I write code. And I use ChatGPT for a variety of purposes, ranging from correcting the punctuation, capitalization, and other typos in my raw dictation to helping me understand the code that I am writing better. Artificial intelligence allows me to express my ideas seamlessly.

I find inspiration in the story of Stephen Hawking. At the age of 22, he was diagnosed with ALS, and doctors gave him 2 years to live. He ended up having a fruitful academic career until the age of 76. Early on, he lost the ability to speak. However, a team from Intel figured out a way for him to communicate by converting movements of his cheek muscles into speech. I have had a similar experience with assistive technology, which in my case is speech-to-text powered by artificial intelligence. From his example, it is clear to me that my academic career will in no way be inhibited by my motor impairment.

Although even before my stroke, quantum chemistry had been my intellectual interest, now that artificial intelligence has allowed me to continue on this path, I am even more inclined to pursue this theoretical work. In addition to the programming that I do in the language Python, I do theoretical derivations in my research. Before my stroke, I did them with handwriting. Now, I do them all in LaTeX, and they are even easier to understand by professors and students.

This summer, I finally have the knowledge base in quantum mechanics, which I have been busy obtaining ever since I matriculated at Caltech, to work on a project in quantum chemistry. Furthermore, being able to voice code has enabled me to work on such a project as if nothing ever happened. This project is different from the practical computational chemistry simulations I was running for my research prior. If I was running into a problem before in my research, it would involve persistence to overcome it, but the path forward always seemed straightforward. Now, if I am running into a bug, or error, in my code, constantly thinking of ways to fix it is still necessary, but it is customary to get stuck for days or even weeks over one. It takes a lot of patience to be successful in theoretical work, and it happens to be something I have experience with from the rehabilitation I am undergoing. When I am able to figure out an error that I was stuck on, it brings forth a sense of ecstasy that I was not able to fully experience with my previous research. Now, I am even more certain that I want to continue this kind of work in my graduate studies.