I have been fortunate enough to explore many branches of the Electrical Engineering tree throughout my undergraduate career. Although my research and industry experience may initially appear to be an eclectic mix of unrelated topics, each project has had a key role in pointing me towards my next goal and task, ultimately shaping my long-term plans.

My first research experience was at Pennsylvania State University through an NSF-sponsored REU, designing and building MRI microcoils for imaging individual cells. Here I learned about circuit resonance and design, as well as basic laboratory procedures and research methods. I had the chance to use 7T and 14T MRI coils and design my now Helmholtz resonators with remotely tuneable resonant frequencies via varactor diodes. Although I found this project academically interesting, it often left me wondering about research at the more basic and materials level. For this reason, I scoped out nanomaterials work that would give me relevant skills.

The next summer, I was accepted into the NanoJapan program through Rice University, another NSF-sponsored REU. Not only did this program give me the chance to pursue work in materials science, but it also let practice my Japanese skills that I had been developing for years inside and outside of the classroom at the University of Florida. However, due of the Fukushima incident, I conducted my research in the Ajayan Lab at Rice University later that year. Although I did not get a chance to immerse myself for as long as I had hoped in, I gained a lot of experience working with graphene and nanomaterials for energy storage applications. Furthermore, being at Rice University gave me the time and resources I needed to train for and set my a world record in the sport of joggling.

Shortly after I learned of my acceptance into the NanoJapan program that year, I also learned that I was accepted as an intern at SpaceX, my dream company at the time. I was unable to do both programs during summer, so I decided to take time off of school to follow my seize this opportunity to work on the next generation of reusable rockets. This juxtaposition of fundamental scientific research and product-oriented industry work within the same year had a profound affect on my academic trajectory. While research at Rice was exciting and cutting-edge, seeing my work launch to space at SpaceX was enthralling. However, in antithesis to the way that research at Rice was occasionally frustrating and slow, work at SpaceX moved at such a dizzying rate that the biggest challenge became managing the stress. That year, I decided that nanomaterials, though fascinating and full of potential, was not a field that I would enjoy spending the rest of my life in. Similarly, Avionics Integration did not involve enough electronic design and creativity to satisfy me.

One of my SpaceX projects, however, was instrumental in shaping my interests. I worked on the thermal imaging systems that monitor temperatures of the engine nozzle on the second stage of the rocket. This sparked a heavy interest in photonics and led me to take a specialized Photonics class at my university and join another NSF-sponsored summer program, the Optics in the City of Light REU through University of Michigan. My project was designing and characterizing a full-field optical coherence tomography setup that could be coupled with optical tweezers for cell-level biological studies. Although I found this to be the most interesting and exciting work up to that point and thoroughly enjoyed the international atmosphere, I was still not satisfied settling on photonics as a career. Some of the side tasks that this project called for initiated my developing interest in computer science and information technology at the time.

I returned to SpaceX the next summer in the Hardware Development and Test Software group to gain more industry experience working on the hardware-software interface. Although by the end of this internship, I had decided that SpaceX is not where I want to establish my career, one of the projects I worked on employed machine learning algorithms in order to automate certain parts of the rocket design process. I thoroughly enjoyed developing these software tools and continued to learn more about the subject. This led me to join the Machine Intelligence Laboratory at the University of Florida for the end of my undergraduate career to gain more experience with unsupervised learning and computer vision. I am currently developing SLAM algorithms for the university’s robot in the IEEE autonomous robot competition. I find this work intellectually stimulating and a great introduction and source of inspiration for the potential of neuromorphic engineering.

Building a map of the course while simultaneously keeping track of the robot’s position in this map is a computationally intensive problem, at least when compared to the effort required for a human to do the same task. Neuromorphic engineering would take advantage of the work that evolution has done for eons, shaping the animal brain into a powerful tool for sensory processing. However, neuromorphic engineering is not limited to assisting piles of metal and silicon navigate autonomously. I envision that it will greatly expand the capabilities of humans to explore space. A massively parallel architecture would render an electronic system far more resistant to radiation and corrupted data, which is one of the problems with modern computers.

If not for the long series of intellectually stimulating projects over the past few years, I would not have been able to discover these passions. I hope that my participation in the Marshall program will be a continuation of this academic journey that will instill me with the knowledge and experience to build the future I dream of.