Overview - What is an REU

REU’s (Research Experience for Undergraduates) are NSF (National Science Foundation) funded research opportunities for undergraduate students. Groups of about 10 students are typically invited to a hosting institution where they are given individual research topics over the summer. However, the applications and the program specifics are determined by the individual program, so REU’s may significantly differ in requirements, application procedures, and programming.

Through the NSF website, students can look for hosting institutions by research topic (https://www.nsf.gov/crssprgm/reu/reu_search.jsp) or by state. For example, I searched for materials research programs and there are 80 institutions from Alabama A&M to Yale, all with unique and interesting focuses. In fact, there are even a few international locations.

There are five REU’s listed on the NSF website for ASU, with more located elsewhere in Arizona. The ASU REU’s include solar energy research, sensor and signal information processing, computer simulation and mathematical biology.

My REU - Nanotechnology Collaborative Infrastructure Southwest (NCI-SW) 2017

The REU I participated in was the Nanotechnology Collaborative Infrastructure Southwest. The NCI-SW program is focused on nanotechnology and nanoscience. The prefix “nano” in these two terms refers to nanometers, which are only a billionth of a meter. For scale, a human hair is approximately 100 micrometers, more than 10,000 times larger than a single nanometer. Examples of nanoscience include molecular science, computer chips and thin films. To learn more about nanoscience, please visit https://www.nsf.gov/news/overviews/nano/index.jsp.

In this particular year of the program, my REU program was folded into the QESST (Quantum Energy and Sustainable Solar Technologies) REU program. We were effectively in the same program with only slight differences in logistics. However, this changes from year to year as the 2018 REU program was much more self contained. A complete summary of topics can be found on http://ncisouthwest.org/index.php/education/research-experiences/.

The QESST program focuses on photovoltaic solar cells. In addition, this program differs in that recruits students from across the country and even a few international students.

My Experience

During my final semester as a community college student, I applied and was accepted in the NCI-SW REU program for the summer of 2017. It was a relatively short application and there was no interview process. The application required my unofficial transcript, a letter of recommendation, an application form with three short answer questions. These questions were “Why are you interested in engineering, physical sciences or biological sciences?”, “What is your experience with nanotechnology?”, and “What are your goals for participating in NCI-SW’s Research Experiences for Undergraduates?”. I had no previous experience in nanotechnology but I made sure to do my research to find some interesting topics and background.

Before arriving at the Solar Power Lab, it was first necessary to undertake the required reading on PV Education (https://pveducation.org/). It was not expected that you would understand all the aspects of
solar cell manufacturing or operation but being introduced to these principles early certainly assisted in hitting the ground running. After the first couple of days of safety training and introductions, we began the first phase of the program called Solar Cell 101. During this time we were shown the entire student-lead pilot line from bare silicon wafer to a complete, laminated solar cell. On the second run through the process, we were expected to take the lead but we still had constant supervision just in case.

The remaining phase of the program revolved around conducting a research project under the mentorship of a PhD student or researcher. I was put in a group with one other student. Our project involved the surface pyramids created during the texturing process of the bare silicon wafer. These nanoscale pyramids assist in light absorption and we determined the optimal size of these pyramids to achieve the highest efficiency solar cells. A powerpoint that was presented at a national conference can be found here: https://www.nnci.net/sites/default/files/inline-files/E-02-Atkins.pdf

Throughout this phase of the program, most of our time was spent in the lab conducting research, in the lunchroom reviewing data or creating presentations. Every friday all the REU’s would get together for a group meeting where we would present our progress and exchange advice. We also participated in a number of education activities including a tour of FristSolar, some of the facilities at U of A and educational outreach.

To conclude the summer program, we had a local poster session that included the NCI REU, the ASU QESST REU and a few QESST REU’s from other QESST facilities. In addition to the poster session, I also attended AzSEC (Arizona Student Energy Conference) hosted by ASU and NNCI (National Nanotechnology Collaborative Institute) REU Convocation in Atlanta, Georgia. NNCI abstracts and itenary can be found here: https://www.nnci.net/sites/default/files/inline-files/REU%20Convo%20programedit.pdf

In the summer of 2018, I rejoined QESST to conduct another project for ASU’s FURI Program. I volunteered as a mentor in the Solar Cell 101 portion of the 2018 REU program. In addition, since one group of REU’s was assigned a very complimentary project to mine, I became an unofficial mentor for them. I primarily taught them about the shared processes between our projects and provided assistance when they got stuck.

I presented my summer semester work at the Duramat Workshop hosted by Slac National Accelerator Laboratory, just outside of Stanford. I was also able to tour the accelerator facility. I plan to continue this project at least into the spring of 2019.

**Takeaways**

This program more than anything stoked my interest in research and more specifically, solar. I was fortunate enough that I was already planning on transferring to ASU which allowed me to continue research through the FURI program and later becoming a student worker. I not only appreciated the ability to conduct research but I was able to interact with fellow students from around the world, learn about the world of academia and become a more effective presenter. Seeing the research I would be able to conduct convinced me that I should pursue a PhD.
Program Specifics/Logistics

Pay: NCI-SW interns were paid $5,000 in three installments over the course of the summer. QESST REU's were paid a $500 per week stipend and had both housing and travel covered. This difference is due to the fact that QESST REU's typically would not be local where NCI-SW usually were.

Length of program: 9 weeks from end of May to end of July. However, required reading to prepare you took an additional week.

More details: See website.