The main goal of the McGriff-Bruton fund is to allow a Sewanee undergraduate the opportunity to work in the Computer Science field. This year, I was the recipient of this fund. Professor Carl decided the focus of our work would be parallel computing. I hadn't had any experience in parallel computing or with the operating system we would be working on, so it was important for me to use the first few days to take a Linux online tutorial and study the MPI books and website. A wiki found at http://dokuwiki.sewanee.edu/doku.php?id=pdc:mcgriff2016 contains our day-to-day to progress log and several other pages and links. This page served as the main form of communication between Professor Carl and me, and also allowed us to easily display our findings. We used small computers called Raspberry Pi's to make our cluster. Professor Pond in the art department allowed us to borrow his older Pi's, and we also ordered two new Raspberry Pi 3's. These Pi 3's have quad-core processors compared to the older models single-core, which allows parallel computations to be ran several times on the same unit, making the whole process faster. Professor Pond also asked for our assistance in setting up Pure Data, a sound-editing software, on the different Pi models. We found that using specialized distributions might not work on newer or older models of the Pi, so it is best to install a default Raspbian installation on the Pi's, and then add on whatever programs are necessary. We also used Professor Pond's 3D printer to make a case for our Pi cluster. However, we believe the specifications we
found are for the Pi 2 or Pi 3 model, since the original Pi's didn't have the screw holes that are needed to fit properly in the cases. After we assisted Professor Pond, we began focusing on our parallel computing work. We ran into the same problem we did with the Pure Data distributions on the 3's when we tried to use the master image found in Dr. Matthew's link. As such, we were forced to install MPI from scratch. This also caused difficulties since different forms of MPI are incompatible. However, we were eventually able to get both the 3's working in our parallel cluster. As shown in the results image below, the first group of examples saw a significant speed increase while being ran in parallel. The last few examples didn't see the same trend, but those examples also got more complicated. These are simply examples; however, and our main goal was to build a functional Pi cluster. Now that it has been made, further work using these Pi's could include doing large computations that allow the cluster's parallel nature to actually improve the efficiency of said work.

This project wasn't particularly difficult, but it was a great opportunity for me to receive experience in the field of computer science. I am planning on majoring in computer science, and as such, any internship in this line of study will not only help me find employment later on, but it will also give me an early vision of the type of work that I could possibly be doing in the future. As I'm only a rising sophomore, I had only taken one computer science prior to beginning this internship. I took this class with Professor Carl, who coincidentally happens to be my faculty advisor. All these factors have allowed Professor Carl and I to become good friends. The only other practice I have had with computers is looking at them on my own time, but this mostly included social media
or gaming. This internship provided a very practical sense of basic computing. I learned how to deploy an operating system, use the Linux command line, and got some practice with parallel computing and sound editing. I'm sure I'll see all of these in future classes and possibly in my career, so getting to practice all of these is an incredibly useful and unforgettable experience. Even though I live an hour away from Sewanee, the drive each day was definitely worth the experience I gained.