

## Mc-Griff-Bruton Math & Computer Science Research Internship

The opportunity to partake in undergraduate research at Sewanee for the summer has been both challenging and rewarding. Unsure of what to expect, the beginning of the summer comprised mainly of becoming familiar with relevant topics and reviewing the findings of Mary Michael Forrester, a Sewanee math student who worked with Dr. Rudd two summers ago. A large component of our research involved working with R, a computer programming language vital to producing our results. It took me the first few weeks of our internship to become comfortable with the code already available and the concepts related to our research. We had an unstructured work schedule, allowing us to make progress on our own time, and then met with Dr. Rudd about three times a week to discuss our findings and seek further guidance. As the project initially required copious amounts of trial and error, the structure was helpful in encouraging us to manage our time well, problem solve on our own, and maintain the self-responsibility required to get the work done.

Despite several challenges we faced during the summer, by the end of our internship, we were pleased to complete our goals set initially. A general synopsis of our research includes the use of an averaging algorithm together with a code that generates a mesh over a certain domain to carry out a sort of statistical game. At first, this topic may seem limited, but the iteration of the averaging algorithm over various domains is very useful in the modeling of certain distributions, such as heat flow over time. Therefore, the code we have can be helpful in visualizing scientific mechanisms that would otherwise be described by complicated equations. For me, the process of reading about the topic, looking over related codes, and writing some of our own code to produce a visual model that illustrates the math contained in the algorithm was such an enlightening

process. Having the entire summer to dedicate to math research both renewed my appreciation for the subject as well as provided me with a comprehensive understanding of a topic that is both relevant, significant, and applicable to many mathematical scenarios.

While the progress we made in our research certainly exposed me to topics and skills in mathematics that otherwise would not be covered in regular coursework, the most beneficial aspects of the experience were the reiteration of the importance of collaboration as well as the necessity of independent thinking. The work we did involved multiple elements, which made the collaboration among my peers and with Dr. Rudd especially beneficial. Additionally, a large part of researching new mathematical topics requires creative problem solving and the input of multiple individuals significantly better our chances of coming up with a solution. After working with my three peers and Dr. Rudd this summer, I have come to appreciate the importance of considering several perspectives, as people often comprehend issues differently, warranting various approaches to the same problem. I know that this realization will serve me well in the future, as the ability to work well in a group is invaluable in the professional world.

The most challenging part of the research was the computer science aspect. I have not had much previous exposure to computer coding, so a large majority of what I learned was the result of trial and error. I think taking an introductory computer science class before the summer would have been very beneficial, but I became much more comfortable with R as the summer continued. Additionally, a major component of our goal was to have visuals that accompanied the results. While Dr. Rudd was extremely helpful in finding ways to produce such results, I felt that this was an area that I could have had better input with more computer science experience. Luckily, we can continue to work and improve our results over the next year.

Even more importantly, this research internship gave me the opportunity to enjoy Sewanee in the summer. As a student, I had already come to love and appreciate the beautiful surroundings, even without experiencing the summer season. The warm weather, green foliage, sense of community, and afternoons at the lake were just a few of the reasons that summer has become my most cherished Sewanee season. With the long days and enthusiastic summer crowd, I was able to explore parts of the Domain and meet people that I otherwise would not. The chance to explore a unique mathematical avenue while also spending an unforgettable summer has been incredibly rewarding in many ways. I know I have formed that connection with Sewanee and the Domain that will be there forever.

Finally, this research internship provided significant insight regarding my future career goals. While the actual research made me appreciate the curiosity and passion required to pursue such topics, I still would like to go into a career more related to my business classes that still maintains an aspect of mathematics, particularly actuarial studies. Although the theoretical components of math are appealing, I find myself more drawn to statistical and financial math. However, one beneficial aspect of the internship that will prove invaluable in the future was my renewed appreciation for the numerous applications of technology, problem solving, and the benefit of a visual and graphical display of a concept. Without the incorporation of computer coding, our work would have been exceedingly tedious, if not impossible. Overall, the process of researching a topic in mathematics with the help of computer science honed my analytical skills, encouraged creative thinking, and provided me with invaluable insight into possible future academic and career pursuits. I am truly grateful to have had the opportunity to work with math in such an incredible environment and firmly believe that this experience is applicable over a lifetime.