**Julian Yocum  
Lindley Winslow: Spring 2020  
February 12, 2020**

**Searching for Magnetic Monopoles with CUORE**

**Project Overview**

I will be conducting research in Professor Winslow’s group involving the use of data from the Cryogenic Underground Observatory for Rare Events (CUORE). Although Professor Winslow’s research involving CUORE is particularly interested in the search for Neutrinoless Double Beta Decay (CUOREs primary purpose) as well as dark matter candidates, I will be tasked with utilizing the experiments data in the search for magnetic monopoles. Much of the work will be done in 26-567 with the oversight of graduate student Daniel Meyer.

**Personal Role & Responsibilities**

I will have several responsibilities during my search for magnetic monopoles. First, I must learn the relevant physics through textbooks and papers that outline the information about how CUORE works, and as well as the physics of muons and magnetic monopoles. Second, I must learn the basics of data analysis on CUORE. Next, it will be necessary for me to develop a way to characterize the presence of muons in the detector. If this is not done, the background interference of Muons, if not properly accounted for, will effectively mask any potential evidence for monopoles. This will also be helpful for the future upgrade of CUORE. Lastly, I must develop a way to characterize the presence of magnetic monopoles. In order to search for monopoles we must first determine what evidence for them would look like.

**Goals**

My personal goals for the UROP are to gain experience with statistics and data analysis in physics. Even if what I am doing in this project will not be what I ultimately focus on in my career, data science will surely be a part of my journey. Moreover, the actual content of the physics that I learn will no doubt be beneficial as I continue my study of advanced physics. As far as the overall aim of the project, the search for magnetic monopoles has not been done so far at CUORE. This means that the research I do could potentially be groundwork for future research in this search.

**Personal Statement**

As a first-year physics major, I am excited to enter the world of physics research. Thus far in my experience, physics has been something that you do in a classroom. Bridging the worlds of theory and experiment will be incredibly beneficial for me, as I will gain first-hand experience in the application of concepts I have studied (and many I have yet to learn). Additionally, this research will give me the opportunity to apply some of my knowledge of computer science to physics.