**Part C. Responsibilities of the Student**

Chris’ proposal builds upon work that he started last year. During that time, Chris has attended research group meetings to learn the basics of the astrophysical code known as Cloudy, which is addressed in the research proposal of this document. Next semester, he will continue to build a solid foundation of the theoretical concepts in nebular astrophysics and test these concepts by performing plasma simulations. Chris already possesses many skills, such as navigating the command line of Unix systems and developing scripts, which are necessary to succeed in a field with an ever-growing dependence on numerical work.

Armed with the background knowledge necessary to conduct astronomy research, this grant would allow Chris to complete the logical next step by undertaking a high quality research project. His responsibilities reflect the proposed plan presented in the research proposal and fit into three broad categories:

1. **Develop working knowledge of running simulations on high performance clusters.** Cloudy has the ability to make use of multi-core processors, which drastically decreases the time required to complete a series of simulations. The research group already has access to a high throughput computing cluster located off campus. Chris will need to learn how to access this cluster, install Cloudy on his own workspace, and configure Cloudy so that it can run on the system. This will also require Chris to develop a basic understanding Bash scripting, which allows each user of the computing cluster to submit simulations to the queue.

2. **Maintain an online code repository.** Chris’s project will require him to write code in the programming language Python. He will need to learn how to use the version control system known as Git, and create an online repository on Github, to manage all of the scripts he will write. This will allow others in the research group to make use of his scripts, allow his mentor to easily validate his work, and promote strong programming practices.

3. **Further investigation of Cloudy’s capabilities.** While Chris will have a firm understanding of the theoretical underpinnings of Cloudy, the documentation of its capabilities is vast (~600 pages). Chris will need to develop the ability to quickly assess the problem at hand and then determine the appropriate tool in Cloudy best suited to solve it. Additionally, an online message board solely dedicated to Cloudy will assist Chris in investigating questions that other users have encountered and the path they took to solve them.

After successfully completing this work, Chris will formally document the results of the project and present them at the American Astronomy Society Meeting in Jan. 2017.