In one or two sentences, describe your career goals and professional aspirations. (200 characters)

I will pursue a PhD in theoretical astrophysics, followed by postdoctoral fellowships until I obtain a research and teaching position at a university.

What are your career goals and professional aspirations? Indicate which area(s) of mathematics, science or engineering you are considering pursuing in your research career and specify how your current academic program and your overall educational plans will assist you in achieving your career goals and profession aspirations (3000 characters)

In May 2019, I will graduate with a double-major in physics and mathematics and a minor in astronomy. This, coupled with my research experience, has allowed me to customize an academic program necessary to properly prepare me for a research career in astrophysics.

My physics major includes a concentration in honors academic physics, which contains additional coursework covering advanced topics in classical mechanics, relativistic electrodynamics, and quantum mechanics. Completing the mathematics major supplies me with a proficient mathematical foundation for graduate studies in theoretical astrophysics. In particular, this foundation provides both practical and abstract mathematical tools such as numerical analysis, partial differential equations, and differential geometry. These tools aid in studying complex problems in modern astrophysics and are malleable enough to apply to other areas of research. Theoretical astrophysics is where my career interests lie; therefore, the astronomy minor has proven especially beneficial by providing me pertinent coursework such as stellar structure and general relativity. I have intentionally combined specific mathematics and physics courses to maximize my academic skillset. For example, by combining general relativity with the more intensive mathematical backgrounds provided in differential geometry and topology, I have given myself a much stronger conceptual framework than is provided by the standard curriculum. Similarly, I have coupled stellar structure and evolution with classes in numerical methods. Taken as a whole, my university course of study leads back to solidifying a well-rounded background to take with me into any theoretical astrophysics program.

In order to extend and enrich my studies, I have worked with a theoretical stellar astrophysics research group since my freshman year at university. This has given me access to long-term personalized training by leaders in the field. For my current project with UT-ORNL astrophysics group, I am working on developing new stellar hydrodynamics algorithms, which will lead to a

submission in the Astrophysical Journal before my graduation. This research experience has afforded me insights into the day-to-day activities of a researcher—from weekly meetings to conference presentations—and has also provided me with crucial computational and theoretical knowledge that I will use in my professional career. Working with this research group has given me experience working with large, parallelized simulation codes—a skill that is becoming increasingly necessary. I also have been given substantial exposure to version control software, a utility common in most research groups that use simulations in their research. My current project has introduced me to advanced numerical methods not covered in the undergraduate curriculum.

Describe an activity or experience that has been important in helping shape or reinforce your desire to pursue a research career in science, mathematics or engineering.

During my first research experience in the summer after my freshman year at UTK, my PI tasked me with creating a new analysis software for studying the turbulent flows that occur in core collapse supernovae. I was nearly finished with the initial version of the code, but it would not produce results. For about two weeks I struggled with errors and null results. Finally, late one night, I had a small, yet life-changing, breakthrough. The euphoria that followed after I visualized the results of the analysis was a feeling that I will not forget. This victory, however small, had a profound effect on me: I had created a tool that would be used by myself and other scientists to analyze simulation data. Moments like these have continually inspired me to pursue research as a career path.

Unfortunately, it came to be that this research project did not produce the results originally planned. After a considerable amount of time, several conferences, and numerous presentations, we were left with few meaningful results. While this certainly was disheartening, I did not let it deter me from my goals. My first research experience had provided me with countless insights and research skills and had introduced me to the joy of discovery—and, yes, it had also showed me the less glamorous side of research. As a result, I have come to appreciate the excitement of discovery, but also the failures that will inevitably accompany a career in research. This strikes me as a more than fair trade-off.

(Optional. Answering this question will depend on your personal experience.) Goldwater Scholars will be representative of the diverse economic, ethnic, racial and occupational backgrounds of families in the U.S. Describe any socioeconomic impacts you have personally experienced that influenced your education – either positively or negatively – and how you dealt with them.

I grew up in a very rural part of west Tennessee, raised by a single mother working a low-income job. My high school was small and, unfortunately, lacked any advanced science and mathematics courses—the sorts of courses that prepare students for college-level work in STEM fields. Along with being the first person in my family to pursue post-secondary education, this lack of a strong STEM background made my adjustment to university honors classes quite difficult. The coursework at my high school was, candidly, not challenging, and I had a difficult time learning proper study strategies to cope with the higher demands of university physics and mathematics. In other words, I had the motivation, if not the skills and background, to hit the ground running as an honors student. I recall the first day of classes my freshman year when my honors introductory physics professor told me I probably should not be in the class given my background—my honors peers had, he explained, attended rigorous high schools. To adapt to this environment, I was forced to quickly learn effective study methods and time-management skills. My GPA has been on a clear upward trend and, since working to create more productive study habits, I have caught up to and now surpassed my peers to become one of the top students in my department, both in terms of coursework and research endeavors.