Physics jr.

C. Your Programs and Activities

1. List past and present research activities associated with your interests in mathematics/science/engineering in which you regularly participate. Explain the duration, degree, and significance of your involvement, including what responsibilities you had in the project. In the absence of formal research experience, describe briefly any other skills or accomplishments, i.e. posters, presentations, publications, etc. significant and relevant to this application.

During the summer [redacted] (before my freshman year [redacted]), I worked full-time in the lab of [redacted], a professor of physics [redacted] whose research is in nanotribology, the study of friction at a small scale. While in [redacted]'s lab, I worked independently on two projects. The first was to design and build an electromagnet for an experiment studying the effects of superconductivity on friction. My second project was to write computer programs to perform data plotting in Origin. This work included learning LabTalk, Origin's scripting language, and learning Fortran in order to rewrite programs originally written in Fortran in LabTalk, while also adding new functionalities. During part of the time I worked in [redacted]'s lab, I was selected as a participant in "Reaching Incoming Students Experience." This three week program, RISE, is funded by the Howard Hughes Medical Institute to help incoming freshman [redacted] become involved in research. At the conclusion of RISE, I gave a presentation to the other participants and their mentors about my work during the summer.

Since January [redacted] I have worked in the biophysics lab of [redacted], a professor at [redacted]. During the spring and fall semesters, while in class I have worked part time, and during the summer I worked full time and was supported by an Undergraduate Research Award from the [redacted] Honors Program. I have been working on an experiment to study the infection mechanism of Sindbis virus through the fluorescent labeling of individual viral particles. I have been involved in every step of this process, including building the experiment apparatus, writing data analysis software using MATLAB, collecting and analyzing data, and revising and improving the experimental approach. In addition to working in [redacted]'s lab, I have also been trained in the virology aspects of my research by members of [redacted]'s biochemistry lab. There, I have learned skills such as tissue culture techniques and how to grow and purify virus. I presented a poster at two meetings this fall: the [redacted] Biophysics Symposium and the [redacted] Undergraduate Research Symposium. I will also give a talk at the American Physical Society meeting in Los Angeles, CA in March [redacted]

2. List activities in which you have participated at your school (such as clubs, publications, debating, dramatics, music, art, and student government). Place an "X" in front of those activities you consider most important.

College Activity	Dates participated	Offices held
X [redacted] Undergraduate Research Symposium	November [redacted]	[redacted] student steering committee; participant in poster session
[redacted] Honors Program (includes participation in honors seminar classes, attendance of special events including workshops, guest lectures, and artistic performances)	Fall [redacted] - Present	
X -Peer tutoring of other physics majors	Fall [redacted] - Present	
-Society of Physics Students	Fall [redacted] Present	
-"Learning Laboratory" trip to Washington, DC [redacted]	October [redacted]	
-Private piano lessons, group piano classes, recitals	Fall [redacted] - Present	Member of 5 person planning committee
-Curtain Call – service group that produced and directed a musical at a local middle school	Fall [redacted] Present	Music co-director

D. What are your professional aspirations? Indicate in which area(s) of mathematics, science, or engineering you are considering making your career and specify how your current academic program and your overall educational plans will assist you in achieving this goal.

I plan to become a physics professor because I love the subject and I am passionate about both teaching and learning. I know some professors that are as interested in their students as they are in their research, and I think that their impact is markedly greater because of that interest. Like these professors that I admire, my goal is to be both a teacher and a researcher, and in fact, I find these two vocations to be inextricably linked. In both roles, I hope to spread my enthusiasm for physics to students.

In order to begin to prepare myself to teach, I began last semester to tutor physics majors in freshman and sophomore level classes, and I often assist other friends and acquaintances who want extra help in their physics courses. These activities allow me to think like a teacher, developing skills such as analyzing and explaining problems from various angles in order to answer difficult questions. In addition to helping me learn to teach, these same capabilities will also improve my ability to perform research.

I am fascinated with doing research as a professor because I want to always be a scholar and to work to increase the knowledge of the scientific community. I plan to pursue the subfield of biophysics not only because it is interesting to me, but also because I see in its applications the potential to help others. Through my involvement in research at the undergraduate level, I am developing the skills needed for such an occupation, especially the ability to think like a scientist. Pursuing a graduate degree in physics will allow me to continue to develop these skills and to further specify a research interest.

E. Describe an activity or experience that has been important in clarifying or strengthening your motivation for a career in science, mathematics, or engineering.

I first realized I wanted to be a scientist in the seventh grade when I did a project on Hubble's Constant. As I read about the way astronomers understand that the universe is expanding, I marveled at the knowledge humans are able to gain through research and the pursuit of science. While working on that project, I glimpsed the wonder of discovery I thought a scientist must feel upon realizing that he or she knows something that no one else has ever understood before. I also loved the constant novelty I saw in the pursuit of science—I felt that a career focused on making new discoveries would always be interesting.

As I have begun to be involved in research myself, I now see that the moment of understanding is not always as sudden nor as simple as I imagined it to be in middle school. Instead, scientific discovery often requires long periods of hard work and puzzling results before one finds explanations that come gradually, not at all once. But the realization that science will not be as easy as I once thought has made its opportunities seem all the more rewarding and exciting. Participating in research has only cemented my desire to pursue a career in science. The day-to-day challenges of constructing an experiment, collecting data, and figuring out how to analyze and interpret it continue to be interesting and stimulating to me.

F. Goldwater Scholars will be representative of the diverse economic, ethnic, and occupational backgrounds of families in the United States. Describe any characteristics or other personal information about yourself or your family that you wish to share with the review committee.

I do not find anything particularly unusual in my personal background or that of my parents. Some might argue that I am unusual as a woman in a field that has traditionally been dominated by men. However, I believe that my diversity is more apparent in my accomplishments than in my personal background.