

Personal Statement

My research began in an underground copper-lined bunker in the Appalachian Mountains of West Virginia. The bunker shielded the radio telescope from interference while I collected data, manually cranking knobs to direct the massive dish. While attending the West Virginia Governor's School for Math and Science at the National Radio Astronomy Observatory, I devised a research plan, was awarded time on the Green Bank Telescope, collected data, and presented my results. I learned that working with data is messy and fun and that the final stage of science is explaining what you have done and why it is important. What I learned at Green Bank ten years ago drives my commitment to research excellence and science communication as a graduate student now.

At Williams College, I studied astrophysics and worked with Dr. Karen Kwitter to research planetary nebulae, the final life stage for approximately solar-mass stars. After graduation, I transitioned to planetary science by pursuing a two-month planetary science internship at JPL, where I worked with Dr. Bonnie Buratti to study Titan's hydrocarbon seas. Using data from Cassini's Visual and Infrared Mapping Spectrometer, I developed a preliminary spectral mapping technique to ascertain the relative abundances of methane and ethane in and around the polar lakes of Titan. While I applied my knowledge of chemistry and spectroscopy to my work at both JPL and Williams, the more tangible nature of spacecraft data appealed to me in the same way that manually maneuvering the radio telescope had in my first research project at Green Bank.

At Boston University (BU), I work with Dr. Paul Withers to study the ionosphere of Venus. I performed a critical analysis of the seminal empirical Venus ionosphere model from 1984 which is widely used, but the accuracy of which hasn't been sufficiently evaluated. The model was developed from electron density data from the Orbiter Electron Temperature Probe (OETP) aboard Pioneer Venus Orbiter (PVO). I used IDL to analyze OETP data and PVO and Venera radio occultations to assess the successes and shortcomings of the model. I showed that the departures from the mean ionospheric density model are due to increased scatter in the data caused by solar cycle variations. This work, in preparation for publication, is the basis for the proposed research project. I presented the framework for this research at the Mars Express and Venus Express Radio Science Team Meeting in October 2017. In addition, I attended the International Mars Aeronomy Conference in May 2017 to familiarize myself with the current open questions in Mars aeronomy.

As a graduate student at BU, I have shown that I am capable of succeeding in a rigorous academic environment by passing the written PhD qualifying exam after only one year, a feat that only the top 20% of BU PhD students accomplish. I have also excelled in my advanced coursework in planetary ionospheres and magnetospheres, which will directly benefit my investigation of the ionospheres of Venus and Mars. In recognition of my academic achievements, I was awarded the Clare Boothe Luce Graduate Fellowship, the selection criteria for which are "academic excellence and professional potential." In July 2017, I was selected to present my research at the Ewha-Luce International Seminar in South Korea. Additionally, in January 2018 I was competitively selected to be the first ever American Astronomical Society Media Fellow, which I have used to better my science communication skills.

In short, my background prepares me to undertake and successfully complete the proposed research and quickly and clearly disseminate the results in the form of scientific papers. As a graduate student, I have mastered advanced coursework, demonstrated my ability to synthesize complex concepts, and quickly adapted to a new research field. I am poised to succeed in the proposed research plan under the guidance of Dr. Paul Withers, an expert in the field of planetary ionospheres. The research described in this application will not only contribute to NASA's science goals, but also propel me toward my goal of becoming a leader in the field of planetary science.