Earning my Ph.D. at the University of Washington is the next opportunity to contribute to the frontiers of physics while reinforcing my core values to the scientific and broader community. I have experience developing computational models, maintaining observatory infrastructure, developing observational data pipelines and analysis routines, and assembling and integrating astronomical instrumentation. I am eager to extend my expertise from previous research to solve problems in gravitational physics and cosmology.

My most impactful work began when I joined the Astronomical Instrumentation Team (AIT) at the Massachusetts Institute of Technology in November 2020, under principal investigator Gábor Fûresz and faculty lead Prof. Rob Simcoe. AIT is building the LLAMAS spectrograph for the Magellan Telescopes at Las Campanas Observatory in Chile, scheduled to be installed in July 2022. I assembled optical mounts and ground support equipment, designed optical mounting fixtures, and tested diffraction gratings to ensure they met optical-design requirements. My principal responsibility was integrating the fiber run of the spectrograph. I found that my early attempt to bond fibers with the required precision was too slow to meet our project deadlines. To remedy this, I wrote LabView code to allow for simple DC motor control through a computer interface, removing a critical project bottleneck. These adjustments enabled exceptional accuracy in the fiber run when compared to the design requirements (100% fiber yield vs. 99.5% requirement). I presented the science and engineering status of the LLAMAS instrument to an astronomy class at Wheaton College in November 2021.

In parallel to LLAMAS, I am developing software tools to support a research proposal for AIT, concentrating on using solar spectrophotometry to extend photosphere and chromosphere events on the sun to activity on exoplanet host stars. AIT has installed a multi-channel solar spectrometer at Lowell Observatory in Flagstaff Arizona to perform a preliminary ground-based study. I created analysis tools for this spectrometer and organized meetings between AIT members and collaborators at other institutions. Early in the project, I struggled with developing a data pipeline that maintained compatibility with all of the observations, as their file structure was constantly being modified to accommodate the high data volume. In response, I built a robust and flexible data pipeline that accurately represented all solar observations. This pipeline enabled a detailed analysis of several solar events in the second half of 2021 and served as supporting evidence in several forthcoming publications that describe the project scope.

I am very interested in studying the nature of gravity. My previous work with AIT at MIT has given me transferable engineering skills to immediately contribute to current research in the Eöt-Wash group. I am also very interested in experimental and observational cosmology. My experience with AIT at MIT has prepared me to instantly support direct dark matter search projects like ADMX and DAMIC. Furthermore, my previous work with large astrophysical data sets has prepared me to further the current understanding of the nature of dark energy and dark matter through the analysis of cosmological observations. I am broadly interested in gravitational physics and cosmology but am particularly interested in the research of Prof. Gundlach, Prof. Loverde, Prof. Morales, Prof. Rybka, and Prof. Chavarria.

Gaining experience through a doctoral program will prepare me for a postdoctoral position, and ultimately a faculty position at a university. With this opportunity, I will contribute to astrophysics research at the cutting edge and communicate complex topics to the next generation of STEM leaders using teaching methods that reach every student, regardless of their intellectual approach. I will not limit my studies to the cosmos and train undergraduates to solve problems outside of pure research. I will build upon my previous experience in education and public outreach to create a healthy culture that increases participation in STEM by historically under-represented groups. The foundation of my future contributions to science and beyond is earning my Ph.D. at the University of Washington.