Emily Deibert

Personal Statement

As a soon-to-be graduate of the University of Toronto's Physics & Astronomy specialist program, with minors in English and Mathematics, I am excited by the opportunity to apply to U of T's PhD-U program in Astronomy & Astrophysics beginning in the fall of 2017. Based on my previous research and academic experience, as well as my passion for astronomy and astronomy-related outreach, I firmly believe that I am among the top candidates applying to this program and would make a strong addition to the Department of Astronomy & Astrophysics' graduate student population.

Throughout my undergraduate career, I have had the opportunity to be involved in four separate astrophysics research projects, all of which have been invaluable experiences on my path towards a graduate research career. My first experience in research was during the summer of 2015, where I worked with Drs. Marten van Kerkwijk and Ue-Li Pen on a project investigating pulsars as part of the Dunlap Institute's Summer Undergraduate Research Program (SURP). As a part of this research team, I was responsible for writing code used to study "giant pulses" emitted from pulsars, as well as participating in data collection excursions. Several key pieces of code that I wrote for this project—including a program used to study the polarization properties of individual pulses—continue to be used by researchers involved in the collaboration to this day. During the 2015-2016 school year I worked as a research assistant for Dr. John Percy at the Dunlap Institute, where I completed a self-guided research project on the phenomenon of "long secondary periods" in pulsating red giant stars. This project involved a great deal of coding and time series analysis, and led to the publication of a refereed article in an astrophysics journal (Percy & Deibert 2016). Over the summer of 2017 I was once again selected to complete a SURP research project, which involved working with Drs. Chelsea Huang and Cristobal Petrovich on a project investigating the system architectures of *Kepler* super-Earths. I was responsible for writing and running large-scale simulations with which to study systems over time, and also wrote a paper on the project which has been refereed and is awaiting publication (Huang, Petrovich, & Deibert 2016). Finally, I am currently completing a research project with Dr. Chris Matzner on star formation in the Dragonfish nebula. I am responsible for analyzing various infrared datasets in order to identify evidence of star formation, and hope to publish a paper on the results by the end of the semester.

In addition to having a strong research background, I have excelled academically throughout my time at U of T. I have maintained a 3.98 GPA across all courses and a 4.0 GPA across all astrophysics courses, and have been awarded numerous scholarships for my academic achievements. I have also taken a number of advanced astrophysics courses, including Computational Astrophysics (CTA200), Practical Astronomy (AST326), and an independent reading course on the physical origins of the stellar initial mass function (AST430). Furthermore, I have completed minors in English and Mathematics, giving me a unique academic background compared to other applicants. My English minor has allowed me to develop strong written and oral communication skills, and I hope to apply these in future research endeavours at the graduate level.

Over the past several years I have also been involved in a number of astronomy-related outreach initiatives. I have been employed as a teaching assistant for an introductory astronomy course aimed at students without a science background (AST201) over the past two years, and have used this opportunity to share my love of astronomy with interested students from other faculties. In addition to this, I have spent the past several years volunteering for various astronomy outreach initiatives throughout Toronto, including U of T's monthly AstroTours, Astronomy on Tap, and March Break Astronomy Activities at the Royal Ontario Museum. I am also passionate about outreach programs targeted at women in STEM fields, and have helped organize several women in STEM conferences at various universities across Canada.

As a graduate student in the Department of Astronomy & Astrophysics, I hope to pursue research on exoplanets and planetary systems. In particular, I am interested in the importance and utility of programming and large-scale simulations within the field. With the large number of observational results being released from missions such as *Kepler*, *TESS*, and other programs, there are increasingly more questions about the histories and evolutions of observed planetary systems that can be addressed and potentially resolved through computer simulations. For example, can highly eccentric orbits of *Kepler* Super-Earths be explained by gravitational interactions with outer giant planets? What conditions led to the formation of *Kepler* systems made up of ultra-short period planets? I am interested in using N-body simulations to explore chaotic orbital dynamics of planetary systems in order to better understand the processes that led to observed systems to form. Additionally, I am interested in pursuing further research on the processes involved in star formation, and how simulations can be used to answer questions in this field as well.

I have a wide range of research interests and a great deal of previous research experience, and feel that I am well-suited to continue pursuing astrophysics research at the graduate level. Furthermore, I am passionate and curious about the field, and believe that I have a great deal to contribute to the future of astrophysics. I hope to be able to continue my research in astrophysics as a member of U of T's graduate astrophysics program this fall.