Frontera Personal Statement: Sean Christian Lewis

I am proposing to be a Frontera Computational Science Fellow because I seek critical support for my research studying stellar feedback from embedded O-type stars and its effects on star formation and star cluster evolution. My research uses a novel software environment to design and run cutting-edge simulations in collaboration with the Drexel Department of Physics and researchers at Columbia and McMasters University. Additionally, my experience and proactive work as a student body leader and drive to inspire and collaborate with future colleagues will be greatly developed and enhanced by Frontera’s opportunity to work at TACC and present my work at a community or professional conference.

At California Polytechnic State University: San Luis Obispo, my passionate pursuit of becoming an Astrophysicist was fully realized when I sought the opportunity to join Dr. Vardha Bennert and her research on active galactic nuclei. In what became my senior thesis project, I explored the most accuracy and validity of various fitting techniques for emission spectra of 80 local active galaxies. In the process, I became familiar with statistical methods using Python and personally attended and observing run at the Lick Observatory on Mount Hamilton, California. I presented my research work as a poster at the Cal Poly College of Science and Math Research Faire. My contributions also to a co-authorship my first published paper Bennert et al. (2018). I supplemented my research position as the Treasurer of the physics honors society Sigma Pi Sigma where I coordinated with other undergraduate students and faculty to plan event such as the Department-side Farewell Party. I graduated from Cal Poly in the Summer of 2016 with honors.

I began my PhD program in Physics at Drexel University in September 2017. In the summer quarter of my first year, I began research with Physics Department Head Dr. Stephen McMillan. I utilized my skills in Python to design simulations to explore the survivability of globular cluster close encounters with supermassive binary black holes. I presented my work as a research poster detailing at the 2019 AAS winter meeting. I passed my oral qualification exam in Spring of 2019. Wanting to further test and hone my skills as a computational astrophysicist, I shifted my focus to the topic of star formation. The project, which has now become the basis of my thesis, utilizes a complex software suite that bridges magnetohydrodynamics and n-body physics and has required me to rapidly become familiar with Fortran90, C++ syntax, and HPC environments. The software suite, known as *Torch,* is also being used by several other collaborating graduate students outside of Drexel University. I am also currently the Treasurer and Co-Event Coordinator of the Physics Graduate Student Association (PGSA) where I have allocated funds for, planned, and participated in public outreach programs such as the Drexel Scholar Share event, the annual Philadelphia Science Festival, and student community activities such as the PGSA camping trip and bimonthly PGSA student lectures.

Five years in the future, after receiving my doctorate degree, I see myself participating in a research team focusing on fluid simulations, hydrodynamics. Either in industry or scientific field.

I would make an Outstanding Frontera Fellow for a few reasons, firstly, my current and continuing research is well established, with a concrete end goal facilitating progress on a daily basis. My expertise in using supercomputing clusters at Drexel and my concrete understanding of star formation environments, processes, etc. and my eagerness to communicate, share, and learn from others lends to a cohesive and productive work environment