

Class name	Textbook	Term of study	Grade (Letter, GPA on 4.0 scale)
Classical Mechanics	Classical Dynamics of Particles and Systems, Thornton & Marion	Spring 2018	A / 4.00
Electric and Magnetic Fields	Introduction to Electrodynamics, Griffiths	Fall 2019	B+ / 3.33
Quantum Mechanics	Introduction to Quantum Mechanics, Griffiths	Spring 2020	A / 4.00
Statistical & Thermal Physics	Thermal Physics, Kittel	Fall 2018	A- / 3.67

**What was your most interesting research experience, either in class, in the lab, or at work?  
What made it interesting?**

The most interesting aspect of research is adding to the knowledge base of analogous scientific fields using a range of tools and techniques. The most interesting research I have ever contributed to spans two different projects in astrophysics, with similar scientific goals but vastly different methods to answer questions about the universe. The intersections of both of these projects reinforced that in order to rapidly advance understanding within a scientific field, a variety of methods are required.

I studied at University College London (UCL) in early 2019 to seek a deeper exposure to astrophysics than was available at my home institution, Wheaton College. I enrolled in challenging graduate courses at UCL in Interstellar Physics and Cosmology. This immersion led to an honors thesis with Prof. Amélie Saintonge of UCL and Prof. Dipankar Maitra at Wheaton. I investigated cold-gas and dust scaling relationships in star-forming galaxies, starting with building a data pipeline to use with galaxy morphology measurements from several different galaxy surveys. I developed a Markov-chain Monte-Carlo (MCMC) sampler to constrain the relationship between interstellar medium composition and the Balmer emission of star-forming galaxies. When the full effects of the COVID-19 pandemic began to impact the world, I adjusted to working from home to complete the project within the modified school year. I applied the smaller survey calibration to a wider set of galaxies to discover a bias due to galactic inclination. I presented these results in a virtual thesis defense to faculty and peers at Wheaton College and UCL and submitted a final report that earned the highest distinction from the faculty of both colleges. After presenting, I generalized the MCMC sampler to include galactic inclination into the scaling calibration, providing a tighter and more accurate calibration of interstellar medium evolution in star-forming galaxies.

After graduating cum laude with departmental honors in physics from Wheaton College in May 2020, 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. While the central goal of the LLAMAS spectrograph is rapid spectroscopic follow-up observation of astrophysical transients, the survey instrument also can collect spatially resolved spectroscopy from star-forming galaxies out to redshift  $z < 0.5$ . 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. After studying reduced observations from several galaxy surveys, the opportunity to build a system that will collect similar observations with higher precision has provided a glimpse at different cycles of scientific development and research. I believe that scientists should be equipped with a diversity of approaches, skills, and abilities to confront and deconstruct a research problem. I am eager to extend my expertise from previous research to solve problems across the subfields of gravitational-wave physics and cosmology. The foundation of my future contributions to science and beyond is earning my Ph.D. at Columbia University.