OPTICS111

Education

Bachelor of Arts - Luther College (May 2017)
    Major: Physics
    Minors: Math and Computer Science
    Focus: Astrophysics

Master of Science – University of Oregon (Expected December 2018)
    Major: Applied Physics
    Focus: Optical Devices

Research

Research Assistant- Luther College Department of Physics, supervised by Dr. Jeffrey Wilkerson
(Summer 2015- Spring 2017)

- Worked with Dr. Jeffrey Wilkerson studying the properties of eclipsing binary star systems in star cluster Messier 23 (M23), funded by a grant from the Howard Hughes Medical Institute.
- Developed telescope calibrations and implemented photometry methods to accurately measure star luminosity and improve normalization methods to correct an inconsistency in long-term data caused by a change of telescope in 2007.
- Reduced statistical uncertainty in the period of a binary star system by creating and interpreting hundreds of light curves to increase data population size.
- Refined and developed period analysis techniques through observed - calculated standard deviation period analysis from within 15 seconds to within 0.2 seconds.
- Presented in the Luther College planetarium to audiences of 10 to 40 people on the solar system and M23, and taught prospective students about light curve analysis using curve fitting techniques.

Senior Thesis – Luther College Department of Physics, Supervised by Dr. Jeffrey Wilkerson   (Fall 2016-Spring 2017)

- Extended research from work with Dr. Jeffrey Wilkerson to study in detail how the period of a binary star is measured and physical explanations for how it can change with time.
- Modeled the probability of observing an eclipse in an arbitrary binary star system using Kepler's third law and Fortran 77.
- Presented concise, yet detailed summary of paper to an audience of 20 consisting of physics students and faculty.

Work Experience

Physics and Astronomy Tutor – Luther College, supervised by Ms. Jenna Eichberger   (Fall 2016 - Spring 2017)

- Tutored eight students in E&M and Astronomy while serving as a teaching supplement to courses taught by Dr. Todd Pedlar and Dr. Jeffrey Wilkerson respectively by improving homework comprehension and study practices of students.
- Communicated effectively with students by scheduling weekly appointments and determining in advance what topics they wished to study to avoid conflicting meetings and spend meeting time efficiently.
- Reviewed E&M and Astronomy concepts in advance to accurately and effectively convey key physical concepts, connect mathematical models to physical scenarios, and explain the essential details in solving problems.

Physics Teacher's Assistant- Luther College Department of Physics, supervised by Dr. Erin Flater   (Spring 2017)

- Corrected homework assignments for a statics course by carefully adhering to a rigorously structured grading scale as instructed by Dr. Flater and returning graded assignments to students in a timely manner.
- Advised students through constructive feedback on problems they solved incorrectly by drawing attention to errors and explaining how to fix them leading to students successfully avoiding similar mistakes on future assignments.
- Improved quality of grading by conducting weekly meetings with Dr. Flater in person to discuss nuances of each assignment and receive advice on how to improve my grading a feedback.

Student Intern- Maritime Applied Physics Corporation, Mr. Richard Frost, New Brunswick, ME (January 2017)
- Worked 40 hours a week for four weeks as an intern in a professional work environment with limited supervision and learned the importance of communication within a company by attending telephone conferences between New Brunswick and Baltimore offices discussing projects and internal affairs.
- Collaborated with a team of employees to develop aircraft-pods to harbor fragile surveillance equipment while meeting specifications such as cost, cooling systems, and electrical connections demanded by the client.
- Researched which species of kelp and combustion methods were best to optimize the energy output from the farm, then quickly learned and utilized SolidWorks engineering software to computer generate a model for an off-shore kelp biofuel farm to be used as a bid for a government contract.
- Cleaned and disassembled broken actuators returned by client using hand tools, then diagnosed their cause of failure and determined the cause of failure to be a poorly designed bolt that caused a leak in their casing leading to water damage.
- Coordinated with another employee to determine the viability and cost of working on a new munition technology and concluded that the cost of the new munition was too great to continue pursing, but avoided unnecessary costs.

Lab Assistant – Luther College Department of Physics, supervised by Dr. Erin Flater (Fall 2016)
- Helped locate, build and test the functionality of experimental apparatus before students arrived in class which led to increased efficiency during their work time.
- Answered student's questions about procedure, physical concepts, error analysis, and proper lab techniques.
- Met weekly to lab details with Dr. Flater and one other student to preemptively diagnose potential problems and sources of confusion the students would likely experience.

Math Tutor- Self Employed, Edina MN (Summer 2015)
- Aided students taking summer courses in statistics and algebra by meeting them once a week for one hour to review material with them. Increased one student's grade from an 'F' to a 'C+' to help him pass his statistics course.
- Contacted potential clients through mutual connections to find business, then cooperated with them to establish meeting times, tutoring material, and compensation before beginning tutoring sessions.

Lab Techniques

Advanced Lab – Luther College Taught by Dr. Erin Flater, Cavendish Experiment, (Spring 2017)
- Wrote a formal research proposal detailing the specific equipment, procedures, costs, and concepts behind why we thought our experiment would be worthwhile.
- Constructed a Cavendish torsional pendulum and support frame from raw materials by precisely cutting, measuring, and building custom parts in a shop using heavy machinery such as a band saw, handsaw, and electric sander.
- Presented monthly updates of progress in the form of PowerPoint presentations to the rest of the class

Science Communication Seminar, Luther College, Dr. Eric Baack and Dr. Jodi Enos-Berlage (Fall 2015)
- Developed the ability to communicate scientific ideas to both scientists and non-scientist audiences using a wide variety of communication methods such as posters, short speeches, and power point presentations.
- Presented a poster at the Fall 201 Luther College Research Symposium on eclipsing binary star system research from working with Dr. Wilkerson.

Skills

Computational:
- Programming Languages
  - Advanced: Python, Javascript, SQL, HTML
  - Proficient: FORTRAN, relational algebra, CSS
  - Intermediate: C++ relational algebra, general internet programming techniques.
  - Proficient with common operating systems (Windows, Mac OS, Linux).

- Capable with the following software: Kaleidagraph, Spartan Chemistry Software, Zemax OpticStudio, Mathematica, SolidWorks, ImageJ, LabVIEW.

Other related Science Courses: Quantum Chemistry and Spectroscopy.

Fluency in French: Extended French Immersion program K-12 at Normandale French Immersion School.