

# SEAN MACBRIDE

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## EDUCATION

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**University of Michigan, Ann Arbor Michigan**

Aug 2022 - Present

Ph.D in Physics

- ★ Member of physics DEI committee
- ★ Member of physics graduate council
- ★ Member of APS chapter at UM

**Wheaton College, Norton Massachusetts**

Aug 2016 - May 2020

B.A. in Physics, Honors. Minor in Astronomy

- ★ Member and peer advisor of the Wheaton College physics club from 2016-present
- ★ Studied spring 2019 at University College London
- ★ Elected captain of the Wheaton College men's rugby team during 2019-2020 season. Elected match secretary from 2017-2019. Elected club safety officer from 2017-2019.

**Awards** Wheaton Centennial Grant for tremendous academic promise  
Boggess Family Foundation scholarship for achievements in physics

## RESEARCH

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**Massachusetts Institute of Technology**

November 2020 - July 2022

*Technician - LLAMAS*

*Gábor Fûrés (PI) & Mark Egan (Engineering supervisor)*

- Assembled and modified opto-mechanical mounts and ground support equipment for LLAMAS instrument according to assembly drawings. Inspected custom-fabricated parts using a coordinate measurement machine and prepared reports detailing measurements.
- Tested the efficiency of diffraction gratings at nominal orientation. Modified existing test equipment to measure blaze-angle transmission. Authored report detailing procedure, methods, results, and analysis.
- Prepared adhesives for bonding handling tabs to optical components. Bonded camera lenses into bezels. Developed and modified bonding procedure to best accommodate changing circumstances. Successfully handled high pressure environments, resolving problems and eliminating risk of potential damage to optical components.
- Designed protective covers, fixtures, and tools using SolidWorks. Collaborated using different version control software - Git and SolidWorks PDM. Wrote software for precise control of DC servo motors, used to ensure highest standards of spectrograph fiber bonding and integration.

**Massachusetts Institute of Technology**

May 2021 - November 2021

*Research Assistant - STARSPOOT*

*Gábor Fûrés (MIT) & Jennifer Burt (NASA-JPL)*

- Developed a data pipeline for concatenating single-day observations from a multi-channel optical solar spectrometer. Modified pipeline routine to maintain compatibility with different data structures. Utilized data pipeline to collect spectrophotometry from different solar events.
- Created data analysis tools and objects for studying solar events obtained by spectrometer. Compared ground-based data to International Space Station observations from same epochs. Studied correlations between historical S-index, magnetic activity, total solar irradiance, and spectral solar irradiance.
- Determined limit of detection of solar events for the ground-based optical spectrometer. Pipeline and data tools served as supporting evidence in several forthcoming publications that describe the proposed space-based project scope.

**University College London & Wheaton College**

May 2019 - July 2020

*Honors Thesis Student**Professor Amélie Saintonge (UCL) & Professor Dipankar Maitra (WC)*

- Coordinated joint thesis project between UCL and Wheaton College. Authored honors thesis detailing scientific rationale, results, and central conclusions of study. Presented to Wheaton and UCL faculty and students for critique and discussion. Received highest marks from faculty of both schools.
- Designed and implemented python data pipeline for use with derived data from xCOLD GASS, JINGLE, and SDSS galaxy surveys. Developed a linear Markov-chain Monte Carlo sampler to constrain relationship of cold-gas and dust components of star-forming galaxies from Balmer emission.
- Generalized the MCMC sampler to higher dimensions to include the effects of inclination-dependent reddening in the calibration.

**University College London**

Jan 2019 - Mar 2019

*Group Lead**Professor Thanh Nguyen*

- Led research group of 8 UCL students to determine the detection limits of lateral flow assays using photo-thermal heating of magnetic nanoparticles.
- Resolved conflicts between group members and determined group structure. Coordinated laboratory logistics and safety measures between student group and the Royal Institute of London.
- Prepared ferromagnetic nanoparticle solution and samples for observation. Designed setup of infrared laser and sample apparatus. Obtained and analyzed temperature data from a thermal camera for determination of optimal membrane type and solution concentration.
- Collaborated and authored report detailing group processes, results, & analysis. Received highest marks from UCL faculty and Royal Institute staff.

**Rutgers University New Brunswick**

May 2018 - Aug 2018

*REU Research Assistant**Professor Carlton Pryor*

- Improved proficiencies in Pandas, NumPy, SciPy, and other data analysis tools to support investigations of dwarf satellite galaxy orbits.
- Designed, implemented, and modified data pipeline for use with Gaia DR-2 data selections of dwarf satellite galaxies. Discovered small scale tidal tail around central core of dwarf satellite galaxy Carina using radial density measurements.
- Prepared and presented progress reports to Prof. Pryor on a weekly basis. Prepared and delivered final presentation at summer research symposium and to professors and graduate students of the physics and astronomy department.

**Wheaton College**

Aug 2017-Dec 2018

*Student astronomy projects**Professor Dipankar Maitra*

- 3D printed a mount for projection of sunlight on a 4.5" reflector telescope. Obtained and analyzed solar spectrum using a spectroscope. Observed spectral limb-reddening resulting from gas densities similar to the chromosphere. Authored report detailing methods, results, and analysis.
- Retrieved archived photometry from V404 Cygni outburst event obtained at Wheaton College in June 2015. Analyzed data using Aperture Photometry Tool. Identified two outburst events on the night of June 27, separated by roughly one hour. Authored report detailing methods, results, and analysis.
- Determined specifications of diffraction grating for use with DSLR camera. Obtained spectrum of Vega and Capella using grating and 30s exposure. Identified iron absorption features in both stars. Authored report detailing methods, results, and analysis.
- Retrieved x-ray binary data taken by MAXI instrument. Implemented Lomb-Scargle periodogram techniques to derive orbital periods of four different x-ray binary systems. Derived slight differences in period of binary 2S 1417-624. Authored report detailing methods, results, and analysis.

**Project P.A.N.O.P.T.E.S.***Student Collaborator*

Sep 2017 - Dec 2018

*James Synge (Google Cambridge)*

- Communicated between professors at Wheaton and outside collaborators to install, operate, and maintain autonomous exoplanet telescope inside Wheaton College observatory dome.
- Aligned P.A.N.O.P.T.E.S. unit for observation according to polar-alignment procedure using hand tools.
- Performed maintenance on the astronomy dome to ensure continuous observation of P.A.N.O.P.T.E.S.
- Modified existing dome control code for weather-automated and manual remote operation of telescope.

**NASA Langley Research Center***Summer Intern*

May 2017 - Aug 2017

*Dr. Brian Walsh*

- Designed, built, and operated a 2.1 & 1.06  $\mu\text{m}$  pump source for proof of concept atmospheric-monitoring mid-infrared Lanthanide-LuAG laser.
- Programmed a model to determine resonator stability based on resonator dimensions and elements. Determined resonator quality through spectroscopic tests.
- Performed spectroscopy on resonator components using mid-infrared and optical spectrometers. Optimized resonator setup from outcomes of spectroscopic tests and model predictions.

**Wheaton College***Undergraduate Assistant*

Dec 2016 - May 2017

*Professor John Collins*

- Built Nd:YAG laser resonators from individual components. Modified existing laser configurations as necessary, including soldering new trigger circuits for a q-switch.
- Determined threshold energies for spontaneous emission using different resonator specifications.
- Exercised safe and appropriate use of voltmeters, oscilloscopes, and other electric and optical equipment.

**TEACHING****University of Michigan Physics Department***Graduate Student Instructor*

August 2022 - December 2022

*Ann Arbor, MI*

- Led laboratory sections of undergraduate students in life sciences disciplines through weekly labs focused on introductory physics concepts.
- Answered questions pertaining to lab content, fundamental concepts, and course policies throughout lab session. Student feedback average of 4.72/5 in teacher evaluations related to instruction.
- Held office hours once a week to assist students in all introductory physics classes with homework problems, exam preparation, and comprehension of fundamental concepts of physics. Organized one-on-one meetings with students outside of regular office hours for similar discussions.

**Wheaton College Physics Department***Teaching Assistant*

August 2018 - December 2019

*Norton, MA, USA*

- Increased engagement of Introductory Physics I & II students with in-class problems & labs through effective communication and classroom instruction.
- Performed laboratory setup and breakdown for class of 40+ students in accordance with schedule.
- Communicated student comprehension of specific topics to professors to increase participation.

**Wheaton College Physics Department***Physics Tutor*

August 2018 - December 2018

*Norton, MA, USA*

- Assisted students with understanding concepts of physics to support problem sets and exam preparation.
- Increased engagement with struggling students by meeting outside of regular tutoring hours, communicated deficiencies to professors to optimize the classwork plan.
- Participated in tutor development meetings to enhance instruction and communication skills.

## OUTREACH

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**Wheaton College Astronomy Department**  
*Observatory Guide*

August 2016 - May 2020  
*Norton, MA, USA*

- Showcased features of different telescopes to local tour groups at Wheaton College Observatory.
- Operate and adjust telescopes to show appropriate stars, objects, and events based on sky conditions.
- Educated children and adults in how to locate objects and explained features about the objects on sky.

## PRESENTATIONS

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### **Oral Presentations**

**Nov 2021** Wheaton College

**May 2020** Wheaton College and University College London

**Sep 2018** Wheaton College

**Aug 2018** Rutgers University

### **Poster Presentations**

**Jun 2019** 234th meeting of the American Astronomical Society

**Aug 2018** Rutgers University

**Apr 2018** Northeast Astronomy Forum