SEAN MACBRIDE

Email ◇ GitHub ◇ LinkedIn ◇ Personal website ◇ +1 (802) 922 4673

EDUCATION

University of Zürich, Zürich, Switzerland May 2024 - Present
Ph.D. in Physics

University of Michigan, Ann Arbor Michigan Aug 2022 - May 2024
M.Sc. in Physics

Wheaton College, Norton Massachusetts Aug 2016 - May 2020
B.A. in Physics, Honors. Minor in Astronomy

RESEARCH

University of Zürich/University of Michigan Apr 2023 - Present
Graduate Student Research Assistant Prof. Marcelle Soares-Santos

- **Rubin Observatory**: Led re-verification of LSST Camera (LSSTCam) on Cerro-Pachón for the Rubin Observatory. Characterized defects in LSSTCam, including the picture-frame response in different detector types and vampire pixels. Contributed to commissioning telescope mount assembly. Contributed to Target-of-Opportunity strategy development for GW, neutrino, and solar system object events.
- **Dark Energy Science Collaboration**: Started the standard sirens topical team in the modeling and combined probes group, focused on combining gravitational wave data and galaxy catalogs to constrain cosmology. Leading a project focusing on the impacts of galaxy catalog completeness on cosomological parameter estimation.
- **Dark Energy Survey**: Implemented improvements to Dark Energy Survey gravitational wave (DESGW) pipeline, including improvements to the telescope strategy and real-time monitoring code. Performed remote observing using the Dark Energy Camera (DECAM) in response to gravitational wave (GW) triggers S240413p and S240915b. Performed analysis of DECAM observations of GW events S240413p, S240422ed, S240511i, and S240915b.
- **Image Sensors**: Designed a new testing apparatus for detectors in astronomical applications using vacuum, thermal, and optical subsystems. Coordinate collaboration between Fermilab National Accelerator Laboratory and University of Zürich to exchange specialized sensors from DECam and Oscura experiments for testing and verification at the University of Zürich.
- **Robotic positioners**: Tested Dark Energy Spectroscopic instrument (DESI) robotic positioners to increase precision and improve testing capabilities for DESI focal plane. Characterized failure mode of DESI positioners and resolved failure with a reproducible solution. Authored and submitted an internal report and presented the results of this study to the DESI focal plane working group. Dynamic testing of prototype robotic positioner performance through lifetime, focal-ratio degradation, and fiber angle tests using different telescope configurations.

University of Michigan & Southwest Research Institute Feb 2023
Graduate Observer - NASA LUCY Prof. David Gerdes (UM) & Marc Buie (SwRI)

- Participated in a ground-based observation campaign to study the occultation of the Jupiter trojan asteroid 15094 Polymele. Authored procedure used by 50+ team members, detailing process to configure Celestron telescope mount, optics, and software in efficient manner.
- Coordinated 1,100+ miles of travel to observation site location. Trained other team members in telescope setup and resolved issues with hardware and software in preparation for occultation event.
- Successfully captured field of observation during occultation event. Contributed data to NASA-LUCY ground based occultation team, which confirmed 15094 Polymele's surface features and prescence of smaller orbiting satellite.

Massachusetts Institute of Technology Nov 2020 - Jul 2022
Technician - LLAMAS Gábor Fûrész (PI) & Mark Egan (Engineering supervisor)

- Assembled and modified opto-mechanical mounts and ground support equipment for *Large Lenslet Array Magellan Spectrograph* (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.
- 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.
- Loaded and unloaded optical fibers into anti-reflective coating fixtures. Integrated the AR-coated fibers to the spectrograph by bonding with optical adhesive, with 100% accuracy. Authored and modified the fiber bonding and protective tube-pulling procedure to meet evolving science and safety needs.

Massachusetts Institute of Technology May 2021 - Nov 2021
Research Assistant - STARSPOT Gábor Fûrész (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 - Jul 2020
Honors Thesis Student Prof. Amélie Saintonge (UCL) & Prof. 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 sampler to higher dimensions to include the inclination-dependent reddening in the calibration.

TEACHING

University of Michigan Physics Department May 2023 - Jun 2024
Lead Graduate Student Instructor Ann Arbor, MI

- Organized course administration, including worksheet development, lab procedures, and grading practices, for introductory physics lab that serves 1000+ students and managed ∼15 graduate instructors each term.
- Communicated to all parties by acting as a liason between undergraduate students, graduate instructors, introductory lab support staff, and faculty. Resolved grading disputes through collecting all pertinent information, meeting with undergraduate students, and meeting with department chairs and parents of students, on occasion.
- Led three teaching workshops for first-year students over four days throughout the academic year. Reformed training workshops for new graduate student instructors to better prepare them for teaching. Created additional workshops with other lead instructors and new graduate instructors to familiarize new instructors with how to manage classroom social dynamics.

University of Michigan Physics Department Aug 2022 - Dec 2022
Graduate Student Instructor Ann Arbor, MI

- Led laboratory sections of undergraduate students in life sciences disciplines through weekly labs focused on introductory physics concepts.
- Student feedback average of 4.72/5 in teacher evaluations related to instruction. Answered questions pertaining to lab content, fundamental concepts, and course policies throughout lab session.
- 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 meetings with struggling students outside of usual hours and tailored class sessions to better meet students needs

Wheaton College Physics Department Aug 2018 - Dec 2019
Teaching Assistant Norton, MA

- 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 Aug 2018 - Dec 2018
Physics Tutor Norton, MA

- 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

University of Michigan-Southern Illinois University Aug 2023 - May 2024
Eclipse Group Leader Albuquerque NM, Burlington VT

- Led high school group of students to operate a solar telescope and take images of the sun during the 2023 annular eclipse and 2024 total eclipse.
- Teach high students from about physics of the sun, solar observations, and eclipses through virtual and in person presentations.
- Successfully operated and captured images of the 2023 annular eclipse on site in Albuquerque NM, and 2024 total eclipse on site in Burlington VT.
- Encouraged safe and responsible observations and discussed the science of eclipses with the public through several local news outlets, including NBC-5, Vermont Public Radio, and the Essex Reporter

Wheaton College Astronomy Department Aug 2016 - May 2020
Observatory Guide Norton, MA

- 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.

DEPARTMENT SERVICE

- Designed art installation in University of Michigan Physics help room showcasing previous experiences by graduates of the undergraduate program, highlighting struggles overcame and success in their later lives.
- Lead organizer and host of physics graduate student symposium in 2023, a weekly speaker series highlighting research projects from several departments in the University of Michigan.
- Member of UM physics Diversity, Equity, and Inclusion committee from 2022 - 2024.

PRESENTATIONS

Invited talks

11/2021 LLAMAS Assembly Integration and Testing, Wheaton College, Norton MA

Public talks

05/2020 Undergraduate honors thesis research, Wheaton College, Virtual
05/2020 Undergraduate honors thesis research, University College London, Virtual
09/2018 REU research on dwarf satellite galaxies, Wheaton College, Norton MA
08/2018 REU research on dwarf satellite galaxies, Rutgers University, New Brunswick NJ

Poster Presentations

03/2024 LSSTCam Defects, Image Sensors for Precision Astronomy 2024 at SLAC, Menlo Park CA
06/2019 REU research on dwarf satellite galaxies, 234th AAS Meeting, St. Louis MO
03/2019 Magnetic nanoparticle research, UCL Physics department poster symposium, London UK
08/2018 REU research on dwarf satellite galaxies, Rutgers University, New Brunswick NJ
04/2018 Project P.A.N.O.P.T.E.S., Northeast Astronomy Forum, Suffern NY

PUBLICATIONS

Papers

1. Rubin ToO 2024: Envisioning the Vera C. Rubin Observatory LSST Target of Opportunity program. Andreoni, Margutti, ... **MacBride** ... 7 Nov 2024.
2. Characterizing the Dust and Cold-Gas Content of Nearby Star-Forming Galaxies. MacBride, Sean Patrick. 2020, May 10. Wheaton College Digital Repository, 2020.