Shane O'Brien

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Education

University of California, Irvine (Sep. 2020 – June 2024)
Bachelor of Science (B.S.) in Physics, with Honors
- Specialization in Astrophysics
- Honors Senior Thesis: *A Characterization of TOI-5916b for the Greater GEMS Survey*

Research Experience

Undergraduate Researcher, Astrophysics (Robertson Group) - UC Irvine (Sep. 2023 – Present)
- Working to better understand the nature of exoplanet candidate systems TOI-5916 and TOI-6158 through joint modeling of transit photometry and radial velocity data from TESS, HPF, and ground-based observations
- Our goal is to use the *exoplanet* and *PyMC3* frameworks to build Bayesian models and perform Markov-Chain Monte Carlo sampling for determining system parameters in hopes of better understanding how such giant exoplanets form around M-dwarf stars
- Co-authoring a manuscript in preparation for submission to *The Astrophysical Journal (ApJ)*, presenting derived orbital and physical properties and their implications for giant planet formation around M-dwarf stars

Undergraduate Researcher, Particle Physics (Whiteson Group) - UC Irvine/CERN (May 2023 – Aug. 2024)
Undergraduate Researcher in Particle Physics
- Lived in Geneva, Switzerland for a month working with the UCI ATLAS collaboration at CERN
- Studied the decay modes of the theoretical heavy top quark partner particle T, in hopes of better understanding more about top quarks themselves
- Utilized Python programming, the ROOT framework, and the particle collision simulation program MadGraph to analyze simulated collider data to help improve theoretical understanding of processes

Undergraduate Researcher, Astrophysics (Murgia Group) - UC Irvine (Sep. 2021 – Sep. 2023)
- Investigated the unresolved gamma ray emission excess at the galactic center of the Milky Way by utilizing machine learning to help generate gamma ray maps from gaseous intra-galactic regions for which good data does not exist
- Created Python scripts to take data from simulations and make plots, utilizing the Matplotlib Python library, to determine if the simulated data was statistically consistent with the observed data in training regions where good data exists

Honors & Awards

- **Outstanding Graduating Senior Research Award ($500)** - UC Irvine, 2024
  - For leading a paper with the GEMS Collaboration, to be submitted to the Astrophysical Journal
  - Awarded to only one or two graduating seniors
- **Resonance Fellow** - UC Irvine, 2024
  - Recognition for serving as an undergraduate peer mentor
- **Resonance Fellow** - UC Irvine, 2023
  - Recognition for serving as an undergraduate peer mentor
- **Dean's Honor List** (5 Quarters) - UC Irvine, 2022, 2023, 2024
  - For outstanding academic achievement in the given quarter: finishing the quarter with a 3.5 GPA or above
- **Rank of Eagle Scout** - Boy Scouts of America, 2020
  - The highest rank possible in the Boy Scouts, only awarded to about 4% of scouts

Publications

- **O'Brien, S.***, Wong, A.*, Robertson, P., et al. 2025. *TOI-5916 b & TOI-6158 b: A Couple of Saturn-like Planets Orbiting M Dwarfs*. Manuscript in preparation for submission to *The Astrophysical Journal* (*ApJ*). (*Co-first authors)

Teaching

AP Physics C Instructor, Mechanics & E&M - SCY High School (Part-Time) (Sep. 2024 – Present)

- Instruct AP Physics C, a calculus-based, college-level physics course, at a small private high school part-time
- Plan and deliver three lectures weekly on key physics topics, incorporating problem-solving techniques and real-world applications
- Assign and grade homework and quizzes to assess students' understanding of class material

Freelance Tutor - San Diego, CA (Part-Time) (Sep. 2024 – Present)

- Working closely with students on a weekly basis in order to guide students on applying problem-solving techniques in AP and introductory college level calculus and Physics
- Review homework and practice problems with students to reinforce concepts and ensure comprehension

Physics Learning Assistant - UC Irvine (Sep. 2022 – June 2024)

- Aided professors and TAs for Physics 2 (Intro to Physics), Physics 7C (Intro to Classical Mechanics), Physics 7D (Intro E&M), and Physics 7E (Intro to Waves)
- Collaborated with TAs to guide students through problem-solving and key concepts
- Participated in weekly meetings with professors and TAs to review and improve instructional strategies
- Worked to effectively help students understand the concepts if they encounter any difficulty

Mentoring & Outreach

Physics Dept. Undergraduate Peer Mentor - UC Irvine (Sep. 2022 – June 2024)

- Mentoring a "Resonance Group" of new students from the Physics 99 seminar class, acting as a form of peer support to new physics majors
- Answering student questions about physics courses at UCI, seeking to relieve some of the anxiety that comes with course planning
- Helping new physics students develop good study habits
- Presented my own research to the class of new physics students in order to show them what undergrad research is like and to answer questions about how to get involved in research projects

English Conversation Program (ECP) Facilitator - UC Irvine (Sep. 2021 – Dec. 2021)

- Worked with the UCI International Center to help provide a place where international students could come to practice their conversational English, helping to build their confidence in the language
- Helped provide a judgment free and inclusive environment to international students who may be struggling to meet new people

Software & Programming Languages

- **Proficient:** Python, LaTeX, HTML/CSS, Git/Github, Unix/Linux, SLURM/HPC, Windows, MacOS, MS Office, Google Suite
- **Novice:** C/C++, SQL
- **Other Scientific Libraries & Tools:** NumPy, pandas, SciPy, Matplotlib, Astropy, PyMC3, ROOT, MadGraph

References

- Prof. Paul Robertson, paul.robertson@uci.edu - Dept. of Physics & Astronomy, UC Irvine
- Prof. Daniel Whiteson, daniel@uci.edu - Dept. of Physics & Astronomy, UC Irvine
- Prof. Simona Murgia, smurgia@uci.edu - Dept. of Physics & Astronomy, UC Irvine