Cailin Plunkett

cplunkett23@amherst.edu

Research Interests	Using Bayesian statistics on gravitational-wave data to understand the components and evolution of the high-energy universe.

Education	*Bachelor of Arts in Physics, Mathematics*	*Expected May 2023*
	Amherst College, Amherst, MA	
	GPA: 4.0/4.0	

Awards and Honors	Barry M. Goldwater Scholarship	*2022*
	Amherst College Porter Prize in Astronomy	*2020*
	National Merit Scholarship	*2019*

Publications

Plunkett, C.; Hourihane, S.; Chatziioannou, K. "Concurrent estimation of noise and compact-binary signal parameters in gravitational-wave data." *Physical Review D* 106, 104021, Nov. 2022. `https://journals.aps.org/prd/abstract/10.1103/PhysRevD.106.104021`.

Dacus, B et al., incl. Plunkett, C. "Toward Assembling a Comprehensive Database of Substellar Accretion Rates." *RNAAS*, Vol. 5 (7): id. 174 (2021).

Research Experiences

Michigan Physics REU — *June 2022 - Aug. 2022*
Improving searches for continuous gravitational waves
Mentored by Dr. Keith Riles

- Explored new methods of segmenting data and avoiding phase coherence computations in searches for continuous gravitational waves from Scorpius X-1.
- Developed method to divide data into equal Fourier bin drift segments, which adapts the search to periods of rapid change in the signal. Current results suggest this method improves SNR at minimal computational cost.

Caltech LIGO SURF Program — *June 2021 - Aug. 2021*
Marginalizing over noise uncertainty in gravitational-wave parameter estimation
Mentored by Dr. Katerina Chatziioannou and Sophie Hourihane

- Used `BayesWave` RJMCMC parameter estimation software to compare noise point-estimate and fully marginalized methods for 50 events from GWTC-3.
- Developed mathematical model to explain minimal impact of noise uncertainty with current sensitivities.

Follette Laboratory — *June 2020 - Jan. 2021; Sept. 2022 - Present*
Mentored by Dr. Kate Follette and Dr. Kim Ward-Duong

- *Senior Thesis*: Creating first completeness curves for accreting protoplanets, which will enable analyses of population properties. Will consolidate method into a public Python package.
- *Amherst SURF*: unified parameter estimation techniques in a low-mass accreting object database to identify physical causes of scatter in the mass-mass accretion rate relation.

Presentations	Contributed talk, APS April Meeting, NY, NY.	*Apr. 2022*

"Marginalizing over Noise Uncertainty in Gravitational-Wave Parameter Estimation."

	Poster, AAS 237th, virtual.	*Jan. 2021*

"Toward Assembling a Comprehensive Database of Substellar Accretion Rates."

Relevant Coursework

Physics: General Relativity, Electromagnetic Theory, Quantum Mechanics, Classical Mechanics, Statistical Mechanics and Thermodynamics

Mathematics: Fourier Methods, Lie Theory, Linear Algebra, Abstract Algebra, Real Analysis, Probability

Astronomy: Stellar Astrophysics, Galactic Astrophysics and Cosmology, Data Science in Astronomy

Leadership, Outreach, and Engagement

Co-chair, Climate and Community Committee *Oct. 2020 - Present*
- Student representative, and co-chair since May 2022, on Physics and Astronomy Dept. committee charged with addressing systemic access issues and institutional barriers to success in physics and astronomy, both in and beyond the Department.

Co-president, Spectra Phys. & Astro. Club *Sept. 2021 - Present*
- Run a club designed to support underrepresented physics students. Coordinated mentorship program and research internship symposium for two years. Led research and internship application peer-review workshop in Fall 2022.

Amherst Observatory Manager *Sept. 2022 - Present*
- Student manager of the observatory at Amherst College, which comprises five telescopes used for teaching and recreation. Coordinate and lead telescope training sessions. Program middle- and high-school outreach events with telescopes and mobile planetarium.

Teaching Assistant Positions
- Astrophysics I, Fall 2021 and Fall 2022 (professors: William Loinaz, Kate Follette)
- Signals & Noise Lab, Spring 2022 (professor: Larry Hunter)
- Data Science in Astronomy, Spring 2021 (professor: Kate Follette)
- Intro E&M, Fall 2020 (professors: Kannan Jagannathan, Jonathan Friedman)

Grader Positions
- Mathematical Cryptography, Spring 2022
- Linear Algebra, Spring 2021