EMIKO C. GARDINER

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EDUCATION

PhD Student in Astrophysics, University of California at Berkeley, Berkeley, CA (expected) May 2028

B.S. in Physics and Engineering Science, University of Virginia, Charlottesville, VA May 2022
Rodman Scholar, Dean's List, Highest Distinction

RESEARCH

University of California, Berkeley / NANOGrav Jan 2023 – present
Graduate Student Researcher, NANOGrav Associate Member, Advisor: Luke Z. Kelley *Berkeley, CA*
- Predicting GW anisotropy and continuous waves (CWs) from supermassive black hole binaries by developing and optimizing semi-analytic simulations of massive black hole binary populations.
- Placing constraints on astrophysical models for galaxy populations and binary evolution based on current nondetection of CWs and upper limits on anisotropy.

Virginia/Chalmers Initiative on Cosmic Origins May 2021 – Aug 2022
Undergraduate Research Fellow, Advisors: Jonathan Tan, Jan Staff, Jon Ramsey *Gothenburg, Sweden*
- Modeled shocks, photoionization, and free-free emission in a 3D magnetohydrodynamic simulation of massive protostellar disk-wind driven outflow.
- Predicted observables including ionization fraction, emissions intensity, spectra, and flux variability using Python. Compared these predicted observables to both observations and theory.

National Radio Astronomy Observatory May 2020 – May 2021
Summer Student Researcher (NSF REU), Advisors: Ilsang Yoon, Bjorn Emonts *Charlottesville, VA*
- Created radio images of 39 strong X-shaped Radio Galaxy (XRG) candidates
- Identified 63 strong candidates for [OIII] emission line analysis from a pool of all 236 known XRGs and classified them as single or doubled-peaked Gaussians by comparing their reduced χ^2 values, BIC, and AIC
- Correlated spectral classifications to physical scenarios, finding support for the relic emissions model in which relic jets are left after a change in spin due to coalescing binary SMBHs

Duke Free Electron Laser Lab: High Intensity Gamma-ray Source Feb 2019 – May 2020
Student Research Assistant, JLB Physics Lab, Blaine Norum *Charlottesville, VA*
- Conducted a research project on minimizing the error in polarization observables for low-energy deuteron photodisintegration scattering experiments
- Developed procedures for building and testing liquid scintillator detectors

Fermilab: Mu2e Cosmic Ray Veto Detector Jan 2019 – Aug 2019
Student Lab Technician, High Energy Physics Lab, Craig Group *Charlottesville, VA*
- Worked on all aspects of assembly and quality testing of the Cosmic Ray Veto for Fermilab's Mu2e experiment
- Developed and wrote the procedure for silicon photomultiplier (SiPM) manifold assembly

PUBLICATIONS

Gardiner, E. C., Kelley, L. Z., Lemke, A., Mitridate, A. "Beyond the Background: Gravitational Wave Anisotropy and Continuous Waves from Supermassive Black Hole Binaries", arXiv:2309.07227, (*Expected Submission: September 2023*)

Gardiner, E. C., Tan, J. C., Staff, J. E., Ramsey, J. P., Zhang, Y., Tanaka, K. E. "Shock-Ionized Jets from Massive Protostars", arXiv:2309.03887, (*Submitted to ApJ: August 2023*)

Agazie et al., "The NANOGrav 15-year Data Set: Constraints on Supermassive Black Hole Binaries from the Gravitational Wave Background", ApJL, 951 (*June 2023*)

Agazie et al., "The NANOGrav 15-year Data Set: The NANOGrav 15-year Data Set: Search for Anisotropy in the Gravitational-Wave Background", arXiv:2306.16221, (*Accepted to ApJL: August 2023*)

PRESENTATIONS, CONFERENCES, & WORKSHOPS

Establishing Multimessenger astronomy Inclusive Training Summer School, Nashville, TN, (Jul 2023).

Code/Astro Software Engineering Workshop, Evanston, IL, (Jul 2023), [Developed and Presented `LTEpy`].

NANOGrav Spring 2023 Collaboration Meeting and Student Workshop, Corvallis, OR (Mar 2023).

Lunch Talks, Berkeley Astronomy Department, Berkeley, CA, (Jan 2023), Gardiner, E. Tan, J., Staff, J., Ramsey, J. *Shock and Photo Ionization from Massive Protostars* [Oral Presentation].

The 241st Meeting of the American Astronomical Society, Seattle, WA, (Jan 2023). Gardiner, E. Tan, J., Staff, J., Ramsey, J. *Ionization from Massive Protostars* [Oral Presentation].

CASSUM-VICO 2022 Summer Student Symposium, Gothenburg, Sweden, (Jul 2022). Gardiner, E., Advised by Staff, J., Tan, J. *Ionization from Massive Protostars* [Oral Presentation].

From Stars to Galaxies II, Chalmers University of Technology, Gothenburg, Sweden (Jun 2022). Gardiner, E., Tan, J., Staff, J., Ramsey, J. *Shock-Ionized Jets from Massive Protostars* [Poster and Prize Talk].

Origins Workshop - ISM, Star and Cluster Formation, Salt Lake City, UT, (Jan 2022). Gardiner, E., Tan, J., Staff, J., Ramsey, J. *Shock-Ionized Jets from Massive Protostars* [Oral Presentation].

The Sigma Pi Sigma Research Symposium, University of Virginia, Charlottesville, VA, (Nov 2021). Gardiner, E. *Shock-Ionized Jets from Massive Protostars* [Oral Presentation, Coordinator].

FUTURE of Physics 2021, California Institute of Technology, Pasadena, Ca, (Sep 2021).

CASSUM-VICO 2021 Summer Student Symposium, Virtual, (Jul 2021). Gardiner, E., Advised by Staff, J., Ramsey, J., Tan, J. *Shock-Ionized Jets from Massive Protostars* [Virtual Presentation].

Conference for Undergraduate Women in Physics, Virtual, (Jan 2021).

The 237th Meeting of the American Astronomical Society, Virtual, (Jan 2021). Gardiner, E., Yoon, I., Emonts, B. *Searching for X-Shaped Radio Galaxies Hosting Binary Supermassive Blackholes* [iPoster].

Undergraduate Research Network, University of Virginia, Virtual, (Sep 2020). Gardiner, E., Yoon, I., Emonts, B. *Searching for X-Shaped Radio Galaxies Hosting Binary Supermassive Blackholes* [Oral Presentation].

National Radio Astronomy Observatory Summer Student Symposium, Virtual, (Aug 2020). Gardiner, E., Advised by Yoon, I., Emonts, B., *Searching for X-Shaped Radio Galaxies Hosting Binary Supermassive Black Holes* [Virtual Presentation].

AWARDS

1st Place Popular Poster, From Stars to Galaxies II, Chalmers University of Technology June 2022
Outstanding Engineering Science Student, University of Virginia May 2022
Rodman Scholar, University of Virginia Aug 2018 – May 2022

TELESCOPE TIME ALLOCATIONS

VLA/21A-263: "Characterizing Radio Spectral Shape of 'Winged' Radio Galaxies", Approved Nov 9, 2020, Co-I (PI: Ilsang Yoon)

VLBA/21A-104: "Supermassive Black Hole in the Center of X-shape Radio Galaxy", Approved Nov 9, 2020, Co-I (PI: Ilsang Yoon)

VLA/20A-459: "Revealing Spectral Curvature of X-Shaped Radio Galaxies by 10GHz Observation" Approved May 7, 2020, Co-I (PI: Ilsang Yoon)

TEACHING, SERVICE, & OUTREACH

Graduate Student Instructor
Introduction to Astronomy for Non-Science Majors Aug 2022 – Dec 2022
Introduction to Astrophysics (Part 2, galaxies and cosmology) Jan 2023 – May 2023

Graduate Student Representative, Small Council Sep 2023 –
Represent graduate students on the Astronomy Department Small Council, a collection of faculty, staff, and students that meet monthly to discuss department-wide issues, and disseminate updates to graduate students.

SRU/UAW 2865 Representative, Astronomy Organizing Committee Sep 2022 – Sep 2023
Contributed to union organizing and advocacy on the departmental, campus, and university-wide levels.

"Be A Scientist" Mentor, Community Resources for Science Jan 2023 – Mar 2023
Guided 7th grade students as they designed, carried out, and reported independent scientific investigations.

The Compass Project/MPS Mentor Sep 2022 – Dec 2022
Mentored undergraduate astronomy students in areas such as course selection, major/minor selection, research involvement, and post-graduation plans.

Rodman Scholars Council Aug 2018 – May 2022
Research Chair (May 2021 – May 2022): Coordinating the first UVA Undergraduate Engineering Research and Design Symposium, connecting Rodman Scholars with research opportunities, maintaining an ongoing record of research done by the Rodman Scholars.
Co-President (May 2020 – May 2021): Oversaw Rodman Council, which is responsible for running student taught seminars, service projects, social events, and more; appropriated the budget; ran council meetings; and interviewed and evaluated mid-year applicants.
Advising Chair (May 2019 – May 2020): Ran the Rodman mentor-mentee program, course advising, and student panels for prospective students.
Class Representative (Aug 2018 – May 2020): Organized the first-year service project with the Rivanna Trails Foundation, awarded the UVA Public Service Programming Board grant for $1000, planned class events.
Mentor (May 2019 – May 2022) Served as a mentor to first year undergraduates through the Rodman Scholar Mentor-Mentee program.

ΣΠΣ (Physics Honor Society) Jan 2021 – May 2022
President (May 2021 – May 2022): (Co)-coordinated the 2021 ΣΠΣ Research Symposium, the Physics Graduate Applicant Buddies Program, GRE study sessions, and induction ceremonies, helped select new inductees, and participated in general SPS exec meetings and decisions.