Brandon Radzom

PhD Candidate · Astronomy

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Education

Indiana University (IU) - Bloomington *Bloomington, IN 47405-7000*

PhD Astronomy *Aug. 2020 - May 2025 (anticipated)*

- Minor: Scientific Computing
- Distinctions: Goethe Link Prize for Outreach in Astronomy, Frank & Margaret Edmondson Prize for Teaching
- Advisor: Prof. Songhu Wang
- Course highlights: Orbital Dynamics & Exoplanets, Numerical Analysis, Computational Physics

University of Wisconsin (UW) - Madison *Madison, WI 53706-1507*

B.S. Astronomy-Physics, B.S. Physics *Sept. 2016 - May 2020*

- Minor: Computer Science
- Distinctions: Thesis of Distinction Award, Lowell Doherty Award for Excellence in Astronomy
- Thesis title: *Characterizing AGN Activity in the SSA22 Field*
- Advisor: Prof. Amy Barger

Research Experience

Planetary Science Summer School Student, NASA Jet Propulsion Laboratory *Pasadena, CA*

THUNDER: A New Frontiers-class Titan Orbiter *2023*

- Work with program cohort to develop THUNDER (Titan's Hydrocarbons: Uncovering New Dimensions of Evolutionary pRocesses), a novel mission concept for an orbiting satellite at Titan in response to the New Frontiers 5 Announcement of Opportunity (AO). Act as Deputy PI, Science Chair, and Science Objective Lead. Develop the science case and requirements related to liquid hydrocarbon transport and evolution, surface processes, and cratering.
- Mentors: Dr. Alfred Nash, Dr. James Keane Tuttle
- Manuscripts: Seltzer, Lien, & Radzom et al. submitted to PSJ.

Graduate Research Assistant, IU-Bloomington, Dept. of Astronomy *Bloomington, IN*

Stellar Obliquities of Giants in Compact Multi-Planet Systems *2021-Present*

- Measure the stellar obliquities of sub-Saturns and hot Jupiters in compact multi-planet systems via the Rossiter-McLaughlin effect. Test primordial alignment and provide constraints on misalignment and giant formation mechanisms.
- Data: WIYN/NEID spectroscopy, archival spectroscopy from HARPS-N and photometry from CHEOPS & LCOGT 1-m
- Manuscripts: Radzom et al. 2024 *AJ* 168 116, Radzom et al. in prep.

The Nearby Companion Rate of Hot Saturns

- Utilize advanced signal searching and vetting algorithms to identify significant transit timing variations for known hot Saturns caused by nearby companions. Provide the first constraints on the nearby companion rate for close-in sub-Saturns. Manuscript in prep.
- Data: *Kepler* photometry
- Manuscripts: Radzom et al. in prep.

Post-disk Dynamical Evolution of Short-period Gas Giants in Multi-planet Systems

- Run N-body simulation suite containing hot and warm Jupiters embedded in compact multi-planet systems. Test the viability of quiescent, compact origins by analyzing resultant architectures and companion properties.
- Data: REBOUND (N-body)
- Manuscripts: Radzom et al. submitted to ApJ.

Undergraduate Research Assistant, UW-Madison, Dept. of Astronomy *Madison, WI*

X-ray Sources in the SSA22 Field *2019-2022*

- Combine photometric and spectroscopic data to construct 2-8 keV X-ray luminosity functions (LFs) over the redshift range $z = 0.25 - 4$ for Active Galactic Nuclei (AGN) and other extragalactic objects in the Hawaii Deep Survey Field SSA22. Used these data to constrain AGN activity across cosmic time and publish an updated source catalog for the field.
- Data: Keck/DEIMOS spectroscopy, archival *Chandra*/ACIS X-ray, Subaru $BVRiz$, Subaru/HSC $Ugrizy$, UKIRT J & K NIR, *Spitzer* IRAC IR
- Manuscripts: Radzom et al. 2022 ApJ 940 114

Undergraduate Research Assistant, UW-Madison, Dept. of Physics *Madison, WI*

Developing a Temperature Regulation System for an Atomic Trap *2017-2020*

- Design, build, test, and implement a temperature regulation system for an atomic trapping chamber.

Minimizing Polarization Drift in a Polarization Maintaining Optical Fiber With a Dispersive Measurement

- Design, construct, and document a novel device and associated methodology for polarization alignment in birefringent optical fibers. Write-up documentation is internal to Dr. Mark Saffman's laboratory group.

Software Skills

- Programming languages: Python, MATLAB, C++, Java, LabView
- Operating systems: Windows, Linux
- Python packages: `jupyterlab, spyder, allesfitter, exoplanet, pymc, rebound, lightkurve`
- Other: git & GitHub, Linux shell, VS Code, HTML, LaTeX, Maple, Mathematica, Windows Office Suite

Awards, Fellowships, & Grants

2024	**Frank and Margaret Edmondson Prize for Teaching**, IU-Bloomington	*$500*
2023	**Goethe Link Prize for Outreach and Public Education in Astronomy**, IU-Bloomington	*$500*
2022	**College of Arts and Sciences Travel Award**, IU-Bloomington	*$200*
2020	**Thesis of Distinction**, UW-Madison College of Letters & Science	
	Lowell Doherty Award for Excellence in Astronomy, Dept. of Astronomy, UW-Madison	*$500*
	Member of the Dean's List, College of Letters & Science, UW-Madison	
2019	**Member of the Dean's List**, College of Letters & Science, UW-Madison	
	Liebenberg Family Undergraduate Research Scholarship, UW-Madison	*$ 2,000*
	David H. Durra Scholarship, UW-Madison	*$ 3,000*
2018	**John Karl Scholz Sophomore General Scholarship**, UW-Madison	*$ 500*
2017	**Member of the Dean's List**, College of Letters & Science, UW-Madison	
2016	**Memorial Scholarship**, Anoka High School	*$ 500*

Publications

Refereed

Cassandra Seltzer, Rudi Lien, **Brandon T. Radzom**, et al. 2024. *THUNDER: A Titan orbiter mission concept for the New Frontiers program*, submitted to PSJ

Brandon T. Radzom, Jiayin Dong, Malena Rice, Xian-Yu Wang, Samuel W. Yee, Tyler R. Fairnington, Cristobal Petrovich, Songhu Wang 2024. *Evidence for Primordial Alignment: Insights from Stellar Obliquity Measurements for Compact Sub-Saturn Systems*, 2024 AJ 168 116

Brandon T. Radzom, Songhu Wang, Bonan Pu, Malena Rice, Dong-Hong Wu 2023. *Post-disk Evolution of Short-Period Gas Giants in Compact Multi-planet Systems: A Mechanism to Produce the Observed Companionship Dichotomy*, submitted to ApJ

Jack Lubin, Xian-Yu Wang, Malena Rice, Jiayin Dong, Songhu Wang, **Brandon T. Radzom**, et al. 2023. *TOI-1670 c, a 40 day Orbital Period Warm Jupiter in a Compact System, Is Well Aligned*, ApJL, 959 L5

Brandon T. Radzom, Anthony J. Taylor, Amy J. Barger, Lennox L. Cowie 2022. *X-ray Sources in the Chandra Field SSA22*, ApJ, 940 114

Xian-Yu Wang, Malena Rice, Songhu Wang, Bonan Pu, Gudmundur Stefánsson, Suvrath Mahadevan, **Brandon T. Radzom**, et al. 2022. *The Aligned Orbit of WASP-148 b, the Only Known Hot Jupiter with a Nearby Warm Jupiter Companion, from NEID and HIRES*, ApJL, 926 L8

Non-Refereed

Brandon T. Radzom 2020. *Characterizing AGN Activity in the SSA22 Field*, Senior thesis submitted to the UW-Madison Dept. of Astronomy

Conference Posters

Brandon T. Radzom, et al. "Evidence for Primordial Alignment: Insights from Stellar Obliquity Measurements for Compact TESS Systems", 2024, TESS Science Conference 3, 10.5281/zenodo.13117605

Cassandra Seltzer, Rudi Lein, **Brandon T. Radzom**, et al. "THUNDER: A New Frontiers-class Titan orbiter mission concept from the NASA JPL Planetary Science Summer School", 2024, Lunar and Planetary Science Conference 2024

Brandon T. Radzom, Songhu Wang, and Bonan Pu. "In Situ Origins of Hot Jupiters", 2022, Emerging Researchers in Exoplanet Science VII, 10.5281/zenodo.6944743

Brandon T. Radzom, Amy J. Barger, and Anthony J. Taylor. "Characterizing AGN Activity in the SSA22 Field", 2020, American Astronomical Society Meeting #236, id.137.03

Minho Kwon, Christopher Young, Matthew Ebert, Sebastian Malewicz, **Brandon Radzom**, Thad Walker, and Mark Saffman. "Progress toward entanglement of atomic ensemble qubits via Rydberg blockade", 2018, International Conference on Atomic Physics

Presentations

Invited Talks

Measuring Stellar Obliquities To Constrain the Origins of Exoplanets. Fall 2023 WIYN Board Meeting, Virtual Event.

The X-ray Luminosity Function of Optically Narrow and Broad-line AGNs Out To $z \sim 4$. Fall 2020 Astronomy Lunch Talk, IU.

Contributed Talks

Evidence for Primordial Alignment: Insights from Stellar Obliquity Measurements for Compact Giant Systems. Emerging Researchers in Exoplanets IX, Cornell University.

Post-disk Dynamical Evolution: A Mechanism to Explain the Companionship Dichotomy Between Hot Jupiters and Warm Jupiters. Division on Dynamical Astronomy Meeting #54, Michigan State University.

In Situ Origins of Hot Jupiter Isolation. Great Lakes Exoplanet Area Meeting 2022, The Ohio State University.

Teaching Experience

Instructor of Record, IU-Bloomington, Dept. of Astronomy

Astronomy 100: The Solar System (Summer 2023 & 2024)

- Designed and instructed an online 30-student course for non-majors that covers the solar system and exoplanets.
- Duties: Prepared, graded, and managed all course content, held office hours.

Associate Instructor, IU-Bloomington, Dept. of Astronomy

Astronomy 451: Stellar Astrophysics (Spring 2024)

- Assist in teaching an in-person 20-student course on stellar structure and evolution for advanced astronomy majors.
- Duties: Develop Python assignments, aid in lectures, grade assignments and exams, hold weekly in-person office hours.

Astronomy 305: Modern Observational Techniques (Fall 2023)

- Assist in teaching an in-person 20-student course for advanced astronomy majors. Course content includes observational methods, photometry, spectroscopy, and associated data reduction & analysis.
- Duties: Attend lecture, grade assignments, hold weekly hybrid office hours.

Astronomy 100: The Solar System (Spring 2023)

- Assist in teaching an in-person 180-student course for non-majors that covers the solar system and exoplanets.
- Duties: Grade assignments, hold weekly virtual office hours, develop course material, prepare and give guest lectures.

Astronomy 107: The Art of Astronomy (Spring 2023, Fall 2020)

- Assist in teaching an online 150-student course for non-majors covering the night sky, telescopes and cameras, light and color, and the science behind astronomical images.
- Duties: Grade assignments, hold weekly virtual office hours, facilitate online discussions.

Astronomy 103: Search For Life In The Universe (Fall 2021)

- Assist in teaching an in-person 178-student course for non-majors that covers the fundamentals of astronomy and explores the prospects for extraterrestrial life.
- Duties: Grade assignments, hold weekly hybrid office hours, attend lectures.

Astronomy 222: General Astronomy II (Spring 2021)

- Assist in teaching an online 25-student course for majors that provides a quantitative introduction to stellar astrophysics, galaxy dynamics, and observational and theoretical cosmology.
- Duties: Grade assignments, hold weekly online office hours, attend lectures, proctor in-person exams.

Guest Lecturer, IU-Bloomington, Dept. of Astronomy

- Astronomy 100: The Solar System (Spring 2024)
- Astronomy 103: Search for Life in the Universe (Spring 2024)
- Astronomy 515: Exoplanets and Orbital Dynamics (Fall 2023)
- Astronomy 100: The Solar System (Spring 2023)

Mentoring

2024 **Alice-Palma Undergraduate Research Program**, Informal Mentor, IU *Bloomington, IN*
2023 **Alice-Palma Undergraduate Research Program**, Formal Mentor, IU *Bloomington, IN*

Professional Development

Service and Outreach

2023-2024 **IU Astronomy Graduate Leadership**, Tea Talk Coordinator
2022-2024 **IU Astronomy Graduate Leadership**, Undergraduate Research Coordinator
2021-2024 **Kirkwood Observatory Open Nights**, Telescope operator & tour guide *Bloomington, IN*
2021-2024 **IU Science Fest**, Astronomy demo leader *Bloomington, IN*
2017-2024 **Miscellaneous Outreach Events**, see my website for more info *Bloomington, IN*
2019-2020 **UW-Madison Astronomy Club**, Vice President
2018-2019 **UW-Madison Astronomy Club**, Volunteer Coordinator

Development

2022-2024: Python for Astronomers Crash Course and Workshop Series, *IU Astronomy Dept.* Creator and lead organizer for two novel event series hosted by graduate students covering various topics related to Python and intended for IU astronomy and physics undergraduates. Topics include `anaconda` installation, logical operators, classes, functions, loops, I/O, plotting, integration, scientific packages (`numpy`, `astropy`, `scipy`), and more.

2023: NASA Planetary Science Summer School, *Jet Propulsion Laboratory (JPL)*. Was selected to join a cohort of 18 grad-

uate students and post-docs across various disciplines to engage in an 11-week planetary mission design program. For the first 10 weeks, I remotely received training on mission formulation from NASA mentors and worked with my cohort as Deputy PI and Science Objective Lead to design a New Frontiers-class orbiter to Titan (in response to the NF5 AO). I assumed the role of Science Subsystem Chair during the culminating week and worked with NASA's Team-X in person at JPL to finalize the mission design before presenting it to a review panel of NASA engineers, scientists, and executives as a mock Portfolio Gate Review. The concept study has been submitted to the Planetary Science Journal.

2023: Code/Astro Software Engineering Workshop, *Northwestern University*. Was selected to participate in the 2023 Code/Astro Workshop which covered best practices for producing and publishing open-source astronomy software. Topics included managing Python environments, git and GitHub, de-bugging tools, releasing code to PyPI and GitHub, documentation of code (using docstrings & `Sphinx`), software testing, and employing anti-discriminatory practices. In parallel, I worked with a small group to develop and publish a pip-installable package for planning observations with IU's Kirkwood Observatory called `kirkwoodnight` (GitHub: github.com/ag161920/kirkwoodnight, PyPI: pypi.org/project/kirkwoodnight). Program link: semaphorep.github.io/codeastro.

2021: Bring an Inclusive Mindset to Your Teaching, *IU Astronomy Dept.* Participant in a 90-minute virtual workshop discussing data-driven techniques to make classrooms more inclusive to all, especially members of minoritized groups.

Professional Memberships

American Astronomical Society (2020-2024)