PhD Student
University of Washington
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Jessica Birky

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Research Interests: Stars, binary stars, stellar populations. Stellar and planetary dynamics. Large scale surveys, data analysis and modeling, machine learning and data-driven models.

Education

PhD Astronomy (Data Science Program), University of Washington – Seattle — 2021 — Present
MS Astronomy, University of Washington – Seattle — 2021
BS Physics, University of California – San Diego — 2019

Research Experience

Graduate Student Researcher – University of Washington, Seattle WA — Aug 2020 – Present
VPLanet Group; Advisor: Rory Barnes

Graduate Student Researcher – University of Washington, Seattle WA — Aug 2019 – Present
DIRAC Institute; Advisor: James Davenport

Undergraduate Researcher – University of California San Diego, La Jolla CA — May 2016 – May 2019
Cool Star Lab; Advisor: Adam Burgasser

Research Intern – Max Planck Institute für Astronomie, Heidelberg DE — Summer 2017 & 2018
Stars & Milky Way groups; Advisor: David Hogg

Selected Awards & Honors

2024 Washington Space Grant Fellowship
2019 – 2024 **NSF Graduate Research Fellowship**
2022, 2024 UW Astronomy Jacobsen Award
2018, 2019 UC San Diego Provost Honors
2017, 2018 Max Planck Institute Fellowship
2017 Frances Hellman Research Scholarship
2016 – 2018 Physics Chair Challenge Award

Publications

Lead-author Papers (underlined = undergraduates mentored):

- **Birky, J.**, Barnes, R. K., 2023, *Prospects of Constraining Tidal Dissipation in Binary Stars* (Submitted ApJ)
- **Birky, J.**, Barnes, R. K., Davenport, J. R. A., 2023, *ALABI: Active Learning for Accelerated Bayesian Inference* (In prep)
- Hobson-Ritz, M., **Birky, J.**, Peterson, L., Gwartney, P., Delker, J., Wong, R., Gordon, T., Davenport, J. R. A., Barnes, R. K., 2023, *Tidal Synchronization of TESS Eclipsing Binaries* (In Prep)
- **Birky, J.**, Barnes, R. K., Fleming, D. P., 2021, *Improved Constraints for Trappist-1 XUV Luminosity Evolution*, RNAAS, 5, 122 (arXiv:2105.12562) [paper] [code]
- **Birky, J.**, Hogg, D. W., Mann, A., Burgasser, A. J., 2020, *Temperatures and Metallicities for M dwarfs in the APOGEE Survey*, ApJ, 892, 1 (arXiv:2001.04962) [paper] [code]

Co-author Papers:

- Barnes, R., K., **Birky J.** et. al 2023, *History and Habitability of the LP 791-18 Planetary System* (In prep)
- Barnes, R. K., Amaral L., **Birky J.**, et al. 2023, *History and Habitability of the LP 890-9 Planetary System* (Submitted PSJ)

- Gialluca, M. T., Barnes, R. K., et. al (incl. **Birky, J.**) 2023, *Bayesian Calculations of Water Inventories and Oxygen Accumulation on the TRAPPIST-1 Planets*, PSJ, 5, 137 [paper]
- Hsu, C., Burgasser, A. J., et al. (incl. **Birky, J.**) 2022, *The Brown Dwarf Kinematics Project (BDKP). VI: Ultracool Dwarf Radial and Rotational Velocity Survey with SDSS/APOGEE High-Resolution Spectrometer* (Submitted ApJ)
- Hsu, C., Burgasser, A. J., et al. (incl. **Birky, J.**) 2021, *The Brown Dwarf Kinematics Project (BDKP). V. Radial and Rotational Velocities of T Dwarfs From Keck/NIRSPEC High-Resolution Spectroscopy* (arXiv:2107.01222) [paper] [code]
- Davenport, J. R. A., Windemuth, D., et al. (incl. **Birky, J.**) 2021, *The Rise and Fall of the Eclipsing Binary, HS Hydra*, *ApJL* (arXiv:2107.10954) [paper]
- Martin, D. V., El-Badry, K., et al. (incl. **Birky, J.**) 2021, *TOI-1259Ab–a gas giant with 2.6% deep transits and a bound white dwarf companion*, *MNRAS* (arXiv:2101.02707) [paper]
- Burgasser, A. J., Splat Development Team (incl. **Birky, J.**), *The SpeX Prism Library Analysis Toolkit (SPLAT): A Data Curation Model*, Bull. Astr. Soc. India, 00, 1-6, 2017 (arXiv:1707.00062)

Talks / Posters

Prospects of Constraining Tidal Dissipation of Low-mass Stars 2024
Poster presentation at Cool Stars 22, UC San Diego

The Formation of Short-period Binaries in Hierarchical Triples 2024
General Exam, University of Washington

Prospects of Constraining Tidal Dissipation of Low-mass Stars 2023
Qualifying Exam, University of Washington

Prospects of Constraining Tidal Dissipation of Low-mass Stars 2023
Talk at DDA Meeting 54, Lansing, Michigan

Challenges in Establishing an Accurate Model of Tidal Dissipation for Low-mass Binary Stars. 2023
Poster presentation at AAS 241, Seattle WA

(Invited) *Precise abundances of M dwarfs: data driven models applied to large scale surveys* 2022
Talk at Cool Stars 21, Toulouse, France

Constraining the XUV Luminosity Evolution of Low Mass Stars. 2022
Poster presentation at Cool Stars 21, Toulouse France

ALABI: Active Learning for Accelerated Bayesian Inference 2021
IAU Symposium 362 – Predictive Power of Computational Astrophysics, Virtual Conference

Systematic Classification of TESS Eclipsing Binaries. 2020
Poster presentation at AAS Meeting 235, Honolulu HI [poster]

Physical Parameters for 10,000+ M dwarfs in the APOGEE Survey 2019
Talk at Sloan Digital Sky Survey Collaboration Meeting, Ensenada, Mexico

Precise Stellar Parameters for 10,000+ APOGEE M dwarfs. 2019
Poster presentation at AAS Meeting 233, Seattle WA [poster]

Data-Driven Spectral Models for APOGEE M Dwarfs. 2018
Poster presentation at AAS Meeting 231, Washington DC [poster]

Modeling Stellar Parameters for High Resolution Late-M and Early-L Dwarf SDSS/APOGEE Spectra 2017
Poster presentation at AAS Meeting 229, Grapevine TX [poster]

Data Driven Models for APOGEE M dwarfs 2017
Talk at Stars Meeting & Milky Way Meeting, MPIA, Heidelberg, Germany

Identification of H-band Absorption Lines in High Resolution APOGEE Spectra of the Lowest Mass Stars. 2016
Poster presentation at the national SACNAS Conference, Long Beach CA

Telescope Time Awarded

TESS Eclipsing Binaries in Open Clusters Survey 2022 – 2023
PI: **APO 3.5 meter** – 16 total half nights with ARCES/KOSMOS spectrographs

Training the Cannon: Calibrating APOGEE Observations of Ultracool Dwarfs 2018 – 2019
Co-I: **NASA IRTF** – 6 nights with iShell spectrograph (PI: Adam Burgasser)

APOGEE-2 Survey of the Lowest-Mass Stars and Brown Dwarfs: Composition, Chemistry and Companions 2017 – 2018
Co-I: **APOGEE 2.5-meter** – Fibers for ancillary survey (PI: Adam Burgasser)

Observing Experience

Apache Point Observatory (APO) 3.5m

6 half nights (remote), Instruments: ARCES & KOSMOS	Q1 2023
8 half nights (remote), Instruments: ARCES & KOSMOS	Q4 2022
4 half nights (onsite), Instruments: ARCES, KOSMOS, ARCTIC	Q3 2022
2 half nights (remote), Instruments: ARCES & KOSMOS	Q2 2022
2 half nights (remote), Instruments: ARCES, TripleSpec, DIS, NICFPS, ARCTIC	Q4 2020

Manastash Ridge Observatory (MRO) 30in

1 full night (onsite)	Q4 2023

Research Mentorship

Co-founder of YVC-UW Partnership for Research in Astrophysics (YUPRA) Summer 2024

Co-founded a partnership program between Yakima Valley Community College (YVC) and University of Washington (UW) designed to expose underrepresented students from eastern Washington to research. Received $50k grant from Washington Space grant to operate the summer 2024 REU and provide student stipends. Will design student research projects and serve as primary research mentor for six YVC undergraduates in the coming summer.

Mentor for Pre–Major in Astronomy Program (Pre-MAP) Fall 2022

Served as mentor for Pre-MAP: a program designed to expose incoming UW students to programming and/or scientific research who are traditionally underrepresented in astronomy, such as low-income and/or first-generation college students.

Students mentored:

Karime Estrada (YUPRA REU)	Summer 2024
Josue Cruz (YUPRA REU)	Summer 2024
Alexandra Sanchez (YUPRA REU)	Summer 2024
Michelle Marquez (YUPRA REU)	Summer 2024
Julizza Gomez (YUPRA REU)	Summer 2024
Malachy Caffrey (YUPRA REU)	Summer 2024
Marshall Hobson-Ritz (UW post-bac; PhD student at University of Maryland, Fall 2024)	Jan 2023 – Present
Leah Peterson (UW undergrad, PreMAP program)	Nov 2022 – Sept 2023
John Delker (UW undergrad, PreMAP program)	Nov 2022 – Dec 2022
Peter Gwartney (UW undergrad; now PhD student University of Alabama)	Jun 2021 – Sept 2022
Rachel Wong (UW undergrad, co-mentored with PhD student Tyler Gordon, graduate 2022)	Jun 2021 – Sept 2022

Teaching Experience

Teaching Assistant: Lead weekly lab or discussion sections, held office hours, and graded assignments/exams.

ASTR 101: Introduction to Astronomy (Instructor: Chris Laws) Spring 2024
Introductory course for non-science majors. Introduction to the universe, with emphasis on conceptual, as contrasted with mathematical, comprehension. Modern theories, observations; ideas concerning nature, evolution of galaxies; quasars, stars, black holes, planets, solar system.

ASTR 421: Stellar Theory and Observations (Instructor: Emily Levesque) Winter 2024
Upper-division major course. Observations and theory of the atmospheres, chemical composition, internal structure, energy sources, and evolutionary history of stars.

ASTR 150: The Planets (Instructor: Toby Smith) Fall 2023
Introductory course for non-science majors. Survey of the planets of the solar system, with emphases on recent space exploration of the planets and on the comparative evolution of the Earth and the other planets.

ASTR 101: Introduction to Astronomy (Instructor: Chris Laws) Summer 2023

ASTR 150: The Planets (Instructor: Nicole Kelly) Spring 2021

ASTR 150: The Planets (Instructors: Nicole Kelly, Eric Agol) Winter 2021

ASTR 102: Introduction to Astronomy (Instructor: Scott Anderson) Fall 2020
Emphasis on mathematical and physical comprehension of nature, the sun, stars, galaxies, and cosmology.

Other Service and Outreach

Department Grad Student Representative	Summer 2024 –
Planetarium Volunteer – outreach shows at the UW planetarium	Fall 2023 – Present
Astronomy on Tap Seattle – Organizer & Livestream Manager	Fall 2022 – Present
`VPLanet` Workshop III – SOC and Session Lead	Sept 2023
Yakima Valley CC – organized overnight field trip for students to observe at MRO	Oct 2023
Apache Point Observatory – Telescope Allocation Committee	Fall 2020 – Fall 2022
AAS Foundations of astronomical data science workshop – volunteer helper	Jan 2023
Yakima Valley CC – Outreach talk: Research in modern Astronomy	Nov 2022
UW Pre-Map program – Research Mentor	Fall 2022
`VPLanet` Workshop II – SOC and Session Lead	Sept 2022

Engineering Experience

Design Team – UCSD Human Powered Submarine Club Sept 2015 — May 2017
Prototyped 3D submarine hull profiles to minimize fluid drag, while subject to constraints of internal diving/safety equipment. Designed submarine propulsion fin mechanism, CADed Solidworks models, and prototyped using 3D printing.

Professional Development

AI-driven discovery in physics and astrophysics – *Tokyo, Japan*	Jan 2024
Cool Stars 20.5 – *Virtual Conference*	Mar 2021
NExSS Quantitative Habitability Science Workshop – *Online workshop*	Dec 2020
online.tess.science – *Online workshop*	Sep 2020
TESS Ninja 3: Expanding the Science of TESS – *Sydney, Australia*	Feb 2020
ZTF Collaboration Meeting – *UW Seattle, WA*	Sept 2019
Caltech FUTURE of Physics Workshop – *Pasadena, CA*	Nov 2018
M33 HST Survey Meeting – *Ringberg Castle, Tegernsee, Germany*	Jul 2018
Conference for Undergraduate Women in Physics – *Cal Poly Pomona, CA*	Jan 2018
Gaia Sprint – *Internationales Wissenschaftsforum Heidelberg, Germany*	Jul 2017
Conference for Undergraduate Women in Physics – *UC Los Angeles, CA*	Jan 2017

Graduate Coursework

Radiative Processes, Thermo/hydrodynamics, Stellar Structure and Evolution, Explanets, Interstellar & Intergalactic Medium, Galactic Structure & Dynamics, Astrostatistics, Machine Learning

References

Prof. Rory Barnes (UWL) – PhD advisor rkb9@uw.edu
Prof. James Davenport (UW/DIRAC) – PhD co-advisor jrad@uw.edu
Prof. Adam Burgasser (UCSD) – undergrad research advisor aburgasser@ucsd.edu
Prof. David Hogg (NYU/MPIA/Flatiron) – undergrad research advisor david.hogg@nyu.edu