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

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|---|---|
| **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** | UW Astronomy Excellence in Teaching Award |
| **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., Amaral L., **Birky J.**, et al. 2023, *History and Habitability of the LP 890-9 Planetary System* (Accepted PSJ)

*[Last updated: December 2, 2024]*

- Gialluca, M. T., Barnes, R. K., et. al (incl. **Birky, J.**) 2024, *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.**) 2024, *The Brown Dwarf Kinematics Project (BDKP). VI: Ultracool Dwarf Radial and Rotational Velocity Survey with SDSS/APOGEE High-Resolution Spectrometer*, Accepted ApJS (arXiv:2403.13760) [paper ↗]

- 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

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|---|---|
| *Prospects of Constraining Tidal Dissipation of Low-mass Stars*<br>Poster presentation at Cool Stars 22, UC San Diego | 2024 |
| *The Formation of Short-period Binaries in Hierarchical Triples*<br>General Exam, University of Washington | 2024 |
| *Prospects of Constraining Tidal Dissipation of Low-mass Stars*<br>Qualifying Exam, University of Washington | 2023 |
| *Prospects of Constraining Tidal Dissipation of Low-mass Stars*<br>Talk at DDA Meeting 54, Lansing, Michigan | 2023 |
| *Challenges in Establishing an Accurate Model of Tidal Dissipation for Low-mass Binary Stars.*<br>Poster presentation at AAS 241, Seattle WA | 2023 |
| **(Invited)** *Precise abundances of M dwarfs: data driven models applied to large scale surveys*<br>Talk at Cool Stars 21, Toulouse, France | 2022 |
| *Constraining the XUV Luminosity Evolution of Low Mass Stars.*<br>Poster presentation at Cool Stars 21, Toulouse France | 2022 |
| *ALABI: Active Learning for Accelerated Bayesian Inference*<br>IAU Symposium 362 – Predictive Power of Computational Astrophysics, Virtual Conference | 2021 |
| *Systematic Classification of TESS Eclipsing Binaries.*<br>Poster presentation at AAS Meeting 235, Honolulu HI [poster ↗] | 2020 |
| *Physical Parameters for 10,000+ M dwarfs in the APOGEE Survey*<br>Talk at Sloan Digital Sky Survey Collaboration Meeting, Ensenada, Mexico | 2019 |
| *Precise Stellar Parameters for 10,000+ APOGEE M dwarfs.*<br>Poster presentation at AAS Meeting 233, Seattle WA [poster ↗] | 2019 |
| *Data-Driven Spectral Models for APOGEE M Dwarfs.*<br>Poster presentation at AAS Meeting 231, Washington DC [poster ↗] | 2018 |
| *Modeling Stellar Parameters for High Resolution Late-M and Early-L Dwarf SDSS/APOGEE Spectra*<br>Poster presentation at AAS Meeting 229, Grapevine TX [poster ↗] | 2017 |
| *Data Driven Models for APOGEE M dwarfs*<br>Talk at Stars Meeting & Milky Way Meeting, MPIA, Heidelberg, Germany | 2017 |
| *Identification of H-band Absorption Lines in High Resolution APOGEE Spectra of the Lowest Mass Stars.*<br>Poster presentation at the national SACNAS Conference, Long Beach CA | 2016 |

## 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. Designed student research projects and served as primary research mentor for six YVC undergraduates in summer 2024. Project webpage: https://jessicabirky.com/yupra/ ⧉

**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
**Marshall Hobson-Ritz** (UW post-bac; now PhD student at University of Maryland)           Jan 2023 – Present
**John Delker** (UW undergrad, PreMAP program; now PhD student at Michigan State)           Nov 2022 – Dec 2022
**Leah Peterson** (UW undergrad, PreMAP program)                                            Nov 2022 – Sept 2023
**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)                   Jun 2021 – Sept 2022

## Leadership

**Department Grad Student Representative**                                                  Summer 2024 –
Represent and advocate for graduate student interests at department faculty meetings, manage the assignment of grad jobs, and plan graduate student orientation and community events. Also initiated the development of a grad wiki website for documenting resources.

**Lead Teaching Assistant** Fall 2024 –
Developed a new training program for all new TAs in the department. This includes writing a TA handbook, helping TAs develop discussion materials, providing teaching feedback, as well as assisting in solving any class issues.

## Teaching Experience

**Teaching Assistant:** Lead weekly lab or discussion sections, held office hours, and graded assignments/exams for both intro and advanced astronomy courses:

**ASTR 421: Stellar Theory and Observations** (Instructor: Emily Levesque) Winter 2025
*Upper-division major course. Observations and theory of the atmospheres, chemical composition, internal structure, energy sources, and evolutionary history of stars.*

**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

**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

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| Astronomy Grad Congress Representative | Fall 2024 – Present |
| 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

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| NBIA Summer School on Astrophysical Dynamics of Gravitating Systems – *Copenhagen, Denmark* | Aug 2024 |
| 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, Data Visualization

## 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