Benjamin V. Rackham

51 Pegasi b Postdoctoral Fellow
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EDUCATION

2012–2018 *University of Arizona, Tucson, AZ*
Ph.D. in Astronomy & Astrophysics
Astrobiology Minor
Magna Cum Laude
Advisor: Dr. Dániel Apai

2005–2009 *Westminster College, Salt Lake City, UT*
B.S. in Neuroscience, Honors Degree
Social Science Minor
Magna Cum Laude

EMPLOYMENT

2019–present **51 Pegasi b Fellow**, *Massachusetts Institute of Technology*, Cambridge, MA

2018–2019 **Postdoctoral Research Associate**, *University of Arizona*, Tucson, AZ

2017–2018 **Graduate Research Assistant**, *University of Arizona*, Tucson, AZ

2014–2017 **NSF Graduate Research Fellow**, *University of Arizona*, Tucson, AZ

2014–2014 **Graduate Teaching Assistant**, *University of Arizona*, Tucson, AZ

2012–2013 **Graduate Research Assistant**, *University of Arizona*, Tucson, AZ

2010–2012 **Biological Technician**, *WestLand Resources, Inc.*, Tucson, AZ

2009–2010 **Wildlife Technician**, *Utah Division of Wildlife Resources*, Salt Lake City, UT

HONORS AND AWARDS

2019 **51 Pegasi b Fellowship in Planetary Astronomy**, *Heising-Simons Foundation*
(Three-year, $375,000 grant)

2019 **CSH Fellowship** (declined), *Center for Space and Habitability, University of Bern*

2014 **Graduate Research Fellowship**, *National Science Foundation*
(Three-year, $138,000 grant)

2009 **Trustees' Character Award**, *Westminster College Board of Trustees*
(One of only three student awards given at graduation)

2008 **Dr. Barry Quinn and Dr. Bob Warnock Endowed Science Scholarship**, *Westminster College*

2007 **Barnett Honors Scholarship**, *Westminster College*

REFEREED PUBLICATIONS

15 total (284 citations) | 3 first-author (136 citations) | ADS: https://goo.gl/T1Dzwf

First-author publications:

1. **Rackham, B. V.**, Apai, D., & Giampapa, M. S. 2019. *The Transit Light Source Effect II: The Impact of Stellar Heterogeneity on Transmission Spectra of Planets Orbiting Broadly Sun-like Stars.* AJ 157, 96.
2. **Rackham, B. V.**, Apai, D., & Giampapa, M. S. 2018. *The Transit Light Source Effect: False Spectral Features and Incorrect Densities for M-dwarf Transiting Planets.* ApJ 853, 122.
3. **Rackham, B. V.**, Espinoza, N., Apai, D., et al. 2017. *ACCESS I: An Optical Transmission Spectrum of GJ 1214b Reveals a Heterogeneous Stellar Photosphere.* ApJ 834, 151.

Second-author publications:

4. Bixel, A., **Rackham, B. V.**, Apai, D., et al. 2019. *ACCESS: Ground-based Optical Transmission Spectroscopy of the Hot Jupiter WASP-4b.* AJ 157, 68.
5. Espinoza, N., **Rackham, B. V.**, Jordán, A. et al. 2019. *ACCESS: A Featureless Optical Transmission Spectrum for WASP-19b from Magellan/IMACS.* MNRAS 482, 2065.
6. Pinhas, A., **Rackham, B. V**, Madhusudhan, N., & Apai, D. 2018. *Retrieval of planetary and stellar properties in transmission spectroscopy with AURA.* MNRAS 480, 5314.

Third-author publications:

7. Gibbs, A., Bixel, A., **Rackham, B. V.**, et al. *EDEN: Sensitivity Analysis and Transiting Planet Detection Limits for Nearby Late Red Dwarfs*. AJ, in press. https://arxiv.org/abs/2002.10017
8. Zhang, Z., Zhou, Y., **Rackham, B. V.**, & Apai, D. *The Near-Infrared Transmission Spectra of the TRAPPIST-1 Planets b, c, d, e, f, and g and Stellar Contamination in Multi-Epoch Transit Spectra*. AJ 156, 178.

Co-authored publications:

9. Cloutier, R., Eastman, J. D., Rodriguez, J. E., …, **Rackham, B. V.**, et al. A Pair of TESS Planets Spanning the Radius Valley Around the Nearby Mid-M Dwarf LTT 3780. Submitted to AAS Journals. https://arxiv.org/abs/2003.01136
10. Badenas-Agusti, M., Günther, M. N., Daylan, T., …, **Rackham, B. V.**, et al. HD 191939: Three Sub-Neptunes Transiting a Sun-like Star Only 54 pc Away. Submitted to AAS Journals.
11. Guerrero, N. M., Seager, S., Huang, C. X., …, **Rackham, B. V.**, et al. *The TESS Objects of Interest Catalog from Year 1 of the TESS Mission.* Submitted to ApJS.
12. Yan, F., Espinoza, N., Molaverdikhani, K., …, **Rackham, B. V.**, et al. *LBT Transmission Spectroscopy of HAT-P-12b: Confirmation of a Cloudy Atmosphere with no Significant Alkali Features.* Submitted to A&A.
13. Weaver, I., López-Morales, M., Espinoza, N., **Rackham, B. V.**, et al. 2020. *ACCESS: A Visual to Near-infrared Spectrum of the Hot Jupiter WASP-43b with Evidence of H_2O, but No Evidence of Na or K.* AJ 159, 13.
14. Schlawin, E., Hirano, T., Kawahara, H., …, **Rackham, B. V.**, et al. 2018. *Back to "Normal" for the Disintegrating Planet Candidate KIC 12557548 b.* AJ 152, 281.
15. Spake, J. J., Sing, D. K., Evans, T. M., …, **Rackham, B. V.**, et al. 2018. *Helium in the eroding atmosphere of an exoplanet.* Nature 557, 68.

SELECTED NON-REFEREED PUBLICATIONS

1. Gillon, M., Meadows, V., Agol, E., …, & **Rackham, B. V.** 2020. The TRAPPIST-1 JWST Community Initiative. Community White Paper. https://arxiv.org/abs/2002.04798
2. Apai, D., Milster, T., Kim, D. W., …, **Rackham, B. V.**, et al. 2019. Nautilus Observatory: A Space Telescope Array Based on Very Large Aperture Ultralight Diffractive Optical Elements. Proceedings of the SPIE 11116, 08.
3. Apai, D., Bixel, A., **Rackham, B. V.** et al. 2019. Nautilus: A Very Large-Aperture, Ultralight Space Telescope for Exoplanet Exploration, Time-domain Astrophysics, and Faint Objects. Astro2020 APC White Paper. BAAS 51, 7, 141. https://baas.aas.org/wp-content/uploads/2019/09/141_apai.pdf
4. **Rackham, B. V.**, Pinhas, A., Apai, D., et al. 2019. Constraining Stellar Photospheres as an Essential Step for Transmission Spectroscopy of Small Exoplanets. Astro2020 Science White Paper. BAAS 51, 3, 328. https://baas.aas.org/wp-content/uploads/2019/05/328_rackham.pdf
5. Apai, D., **Rackham, B. V.**, Giampapa, M. S., et al. 2018. Understanding Stellar Contamination in Exoplanet Transmission Spectra as an Essential Step in Small Planet Characterization. White paper submitted to the NAS Committee on Exoplanet Science Strategy. https:/arxiv.org/abs/1803.08708

INVITED TALKS

Dec 2019	Exoplanet Pizza Lunch. Center for Astrophysics | Harvard & Smithsonian. Cambridge, MA.
Nov 2019	Impact of Stellar Variability and Inhomogeneity on Rocky Exoplanet Characterization. SEEC Symposium 2019. NASA Goddard. Greenbelt, MD.
Oct 2019	Planetary Lunch Seminar. Department of Earth, Atmospheric, and Planetary Sciences. Massachusetts Institute of Technology. Cambridge, MA
Jul 2019	Research Talk. 51 Pegasi b Science Summit 2019. Cavallo Point Lodge. Sausalito, CA.
Jan 2019	CSH Symposium. University of Bern Center for Space and Habitability. Bern, Switzerland.
Jan 2019	Exocoffee Seminar. Max Planck Institute for Astronomy. Heidelberg, Germany.
Nov 2018	Stars & Planets Seminar. Harvard-Smithsonian Center for Astrophysics. Cambridge, MA.
Nov 2018	Special Exoplanets Seminar. Massachusetts Institute of Technology. Cambridge, MA.
Nov 2018	Astrophysics Luncheon Talk. Jet Propulsion Laboratory. Pasadena, CA.
Nov 2017	Lunch Talk. European Southern Observatory Vitacura Office. Santiago, Chile
Jul 2017	Special Exoplanet Seminar. Institute of Astronomy, University of Cambridge. Cambridge, UK.

CONFERENCE TALKS

Sep 2019	Rackham, B. V. et al. Towards Mitigating the Impact of Stellar Photospheric Heterogeneity on Precise Exoplanet Transmission Spectra. EPSC-DPS Joint Meeting 2019. Abstract #971. Geneva, Switzerland.

Jun 2019 Rackham, B. V. et al. Opportunities to Characterize Stellar Photospheres and Enable Exoplanet Biosignature Observations in the 2020s. AbSciCon 2019. Abstract #202-12. Bellevue, WA.

Jun 2019 Rackham, B. V. et al. Promising Approaches for Constraining the Photospheres of Ultracool Hosts. TRAPPIST-1 Conference. Liége, Belgium.

May 2019 Rackham, B. V. et al. Probing Exoplanet Atmospheres with Magellan and MMT. MMT 40th Anniversary Symposium. Tucson, AZ.

Jan 2019 Rackham, B. V. et al. The Transit Light Source Effect in F to M Dwarf Systems. Dissertation Talk. 233rd Meeting of the AAS. Seattle, WA.

Aug 2018 Rackham, B. V. et al. Constraining M-dwarf Photospheres through the Transit Light Source Effect. Cool Stars 20, Boston, MA.

Jul 2018 Rackham, B. V. et al. The Transit Light Source Effect. ExoPAG 18, Cambridge, MA.

Jul 2018 Rackham, B. V. et al. The Fault in Our Stars: Towards Constraining Stellar Contamination in Exoplanet Transmission Spectra. Exoplanets II, Cambridge, UK.

Nov 2017 Rackham, B. V. et al. The Light Source Problem: The Effect of Heterogeneous Stellar Photospheres on Searches for Transiting Exoplanet Biosignatures. Habitable Worlds 2017, Abstract #4032. Laramie, WY.

Apr 2017 Rackham, B. V. et al. The Effect of Heterogeneous Stellar Photospheres on Searches for Transiting Exoplanet Biosignatures. Astrobiology Science Conference 2017, Abstract #3610. Mesa, AZ.

Dec 2016 Rackham, B. V. et al. An Optical Transmission Spectrum of GJ 1214b Suggesting a Heterogeneous Stellar Photosphere. Magellan Science Symposium 2016. Washington, DC.

Oct 2016 Rackham, B. V. et al. An Optical Transmission Spectrum of GJ 1214b Suggesting a Heterogeneous Stellar Photosphere. 48th Annual DPS Meeting, Abstract #302.03. Pasadena, CA.

Jun 2015 Rackham, B. V. et al. How Can Ground-based Efforts Complement JWST Follow-up of Exciting TESS Planets? Astrobiology Science Conference 2015, Abstract #7491. Chicago, IL.

Oct 2014 Rackham, B. V. et al. An Optical Transmission Spectrum (4000–10000 Å) of the Super-Earth GJ 1214b. 46th Annual DPS Meeting, Abstract #104.07. Tucson, AZ.

OTHER SEMINARS AND LECTURES

Oct 2019 Opportunities to disentangle stellar and planetary signals in transits. Stellar Activity and Exoplanet Transmission Spectroscopy Workshop. National Solar Observatory. Boulder, CO.

Apr 2019 Characterizing Exoplanet Host Stars: An Astro2020 Perspective. Steward Observatory Journal Club, University of Arizona. Tucson, AZ.

Nov 2018 Disentangling stellar and planetary signals in exoplanet transmission spectra. Origins Lecture. Lunar and Planetary Laboratory, University of Arizona. Tucson, AZ.

Oct 2018 Disentangling stellar and planetary signals in transmission spectra. Special Talk. Center for Space and Habitability, University of Bern. Bern, Switzerland.

Aug 2018 Exoplanet transmission spectroscopy and the transit light source effect. Earth in Other Solar Systems All-Hands Meeting. Tucson, AZ.

May 2018 Disentangling stellar and planetary signals in transmission spectra. Origins Lecture. Department of Astronomy, University of Arizona. Tucson, AZ.

Sep 2017 The transit light source problem: the effect of stellar contamination on transmission spectra of low-mass exoplanets. Earths in Other Solar Systems All-Hands Meeting. Tucson, AZ.

May 2017 ACCESSing exoplanet atmospheres & constraining stellar photospheres. Origins Lecture. Department of Astronomy, University of Arizona. Tucson, AZ.

Mar 2017 An optical transmission spectrum of GJ 1214b reveals a heterogeneous stellar photosphere. Steward Internal Symposium. Department of Astronomy, University of Arizona. Tucson, AZ.

Sep 2016 Arizona-CfA-Católica Exoplanet Spectroscopy Survey update. Earths in Other Solar Systems All-Hands Meeting. Tucson, AZ.

Sep 2015 Transmission spectroscopy of transiting exoplanets. Earths in Other Solar Systems All-Hands Meeting. Tucson, AZ.

Oct 2014 Exoplanet atmospheres. Steward Internal Symposium. Department of Astronomy, University of Arizona. Tucson, AZ.

Jan 2014 How will we characterize habitable exoplanets? Origins Debate. Department of Astronomy, University of Arizona. Tucson, AZ.

SELECTED POSTER PRESENTATIONS

Sep 2018 **Rackham, B. V.**, Apai, D., Giampapa, M., Espinoza, N., Pinhas, A., Madhusudhan, N., Zhang, Z., Zhou, Y., and the ACCESS Team. Disentangling Stellar and Planetary Features in Transmission Spectra. Cloud Academy, Les Houches, France.

May 2016 **Rackham, B. V.**, Apai, D., López-Morales, M., et al. ACCESS: Exploring exoplanet atmospheres through ground-based transmission spectroscopy. NExSS Face-to-Face Meeting. Washington, DC.

Mar 2014 **Rackham, B. V.**, Espinoza, N., Apai, D., et al. Exploring the hot Neptune / super-Earth transition via ground-based transmission spectroscopy. Search for Life Beyond the Solar System: Exoplanets, Biosignatures, & Instruments, Abstract #P3.55. Tucson, AZ.

Mar 2014 Espinoza, N., Jordán, A., **Rackham, B. V.**, et al. A ground-based optical transmission spectrum of WASP-31b. Search for Life Beyond the Solar System: Exoplanets, Biosignatures, & Instruments, Abstract #P3.53. Tucson, AZ.

ACCEPTED PI TELESCOPE PROPOSALS

2019 "The Fault in Our Stars: Constraining Spot Properties of Low-mass Exoplanet Host Stars." Magellan 6.5 m, 3 nights.

2014–2018 "ACCESS: Probing exoplanet atmospheres from the ground and enabling TESS follow-up." Magellan 6.5 m, 5 nights; MMT 6.5 m, 2 nights

2013A "Exploring the haze in the nearby super-Earth GJ 1214b." VATT 1.8 m, 6 nights

SELECTED CO-I TELESCOPE PROPOSALS

2019 "How hot is the inside of a young planet?" HST Cycle 27, 16 orbits. Program No. 15838, PI: J. Spake.

2018–2019 "Project EDEN: The Search for Nearby Transiting Earths." (10+ programs, PIs: D. Apai, P. Gabor, Th. Henning, L. Mancini, W.-P. Chen). Eight 0.6–2.3 m telescopes, ~500 nights.

2013–2019 "ACCESS: The Arizona-CfA-Católica Exoplanet Spectroscopy Survey." (10+ programs, PIs: M. López-Morales, D. Apai, A. Jordán, D. Osip, N. Espinoza, N. Lewis). Magellan 6.5 m, 61 nights; MMT 6.5 m, 3 nights

2015B "Inspecting the atmosphere of a transiting hot Jupiter." (PI: F. Rodler). LBT 2 × 8.4 m, 2 nights

2015B "Variability monitoring of ACCESS targets: towards a precise and accurate view of exoplanetary atmospheres." (PI: N. Espinoza). LCOGT 1 m, 50 hours

OBSERVING EXPERIENCE

2019–2020	Magellan/FIRE	3 nights
2014–2019	Kuiper 61"/Mont4k	14 nights
2013–2017	Magellan/IMACS	14 nights
2013–2017	VATT/VATT4K	30 nights
2017B	NTT/SOFI	7 nights
2016A	VATT/VATTSpec	5 nights
2013B	Magellan/MMIRS	4 nights
2013A	Magellan/MIKE	1 night
2012B	MMT/Hectospec	1 night
2012B	KPNO 2.1-m/IR Camera	2 nights

TEACHING EXPERIENCE

Spring 2014 Teaching Assistant for ASTR 170B1, The Physical Universe, University of Arizona. Developed and delivered three lectures and led 100+ students in four lab sessions.

Fall 2013 Teaching Assistant for ASTR 202, Life in the Universe, University of Arizona. Developed and delivered three lectures and an in-class lab for 100+ students.

MENTORING EXPERIENCE

2019–present Advisor of undergraduate student Brianna Ryan

2019	Co-advisor (with Dániel Apai) of undergraduate summer student James Taylor
2018–2019	Postdoc mentor to senior graduate student Nicolas Garavito
2018	Co-advisor (with Dániel Apai) of undergraduate summer student Jose Perez Chavez
2015–2016	Senior graduate student mentor to junior graduate student Peter Senchyna
2014–2015	Senior graduate student mentor to junior graduate student Jianwei Lyu
2015	Co-advisor (with Dániel Apai) of undergraduate summer student Xiao Han
2013	Co-advisor (with Dániel Apai) of undergraduate summer student William Nolan
2013	Alumni mentor of Westminster College Honors Undergraduate Hannah Zweifel

OUTREACH ACTIVITIES

Nov 2019	"NASA's TESS spacecraft is finding hundreds of exoplanets – and is poised to find thousands more." Popular science article at The Conversation. https://theconversation.com/nasas-tess-spacecraft-is-finding-hundreds-of-exoplanets-and-is-poised-to-find-thousands-more-122104
Jun 2019	Developed and led activity for 14 middle and high school students with visual impairments using sonified light curves to explore properties of transiting exoplanets as part of Project POEM. Activity materials available at https://github.com/EDENSurvey/Project-POEM-Activity. Mt. Lemmon, AZ.
Feb 2019	Developed and co-led activity on transiting exoplanets for 24 high school students as part of NOAO's Teen Astronomy Café. Jupyter notebook, designed to introduce students to exoplanet science and coding with Python, available at: https://github.com/EDENSurvey/TeenAstroCafeActivity. Tucson, AZ.
Jun 2018	Developed and led activity for 12 middle and high school students with visual impairments using sonified light curves to explore properties of transiting exoplanets as part of Project POEM. Mt. Lemmon, AZ.
2016–2017	Partnered with teacher Ramon Muñoz at Changemaker High School to develop and lead activities on exoplanets in math classes through the NOAO Project ASTRO Program. Tucson, AZ.
Jan 2015	Lead astronomy activity at Family Science Night at Senita Valley Elementary School. Tucson, AZ.
Nov 2014	Developed and instructed activity on exoplanets with Dániel Apai for the Osher Lifelong Learning Institute. Tucson, AZ.
Sep 2013	Invited public lecture for the Sonora Astronomical Society. Green Valley, AZ.
Jun 2013	Invited public lecture for the Tucson Amateur Astronomy Association. Tucson, AZ.
Mar 2013	Career Day presenter at Southside Community School. Tucson, AZ.

PROFESSIONAL SERVICE

2020	Science Organizing Committee, Exoplanet Atmospheres and Stellar Magnetism Workshop, International Space Science Institute.
2020	Organizing Committee, Boston Area Exoplanet Science Meeting.
2019	Journal Referee, Astronomy & Astrophysics.
2019	Science Organizing Committee, Stellar Activity and Exoplanet Transmission Spectroscopy Workshop, National Solar Observatory.
2019	Observing Proposal Referee, Canadian Time Allocation Committee.
2016	Prospective Student Visit Coordinator, University of Arizona Department of Astronomy.
2015–2016	Graduate Editor, University of Arizona NSF GRFP Application Support Program.
2013–2014	Local Organizing Committee, Search for Life Beyond the Solar System: Exoplanets, Biosignatures, & Instruments.