Brett M. Morris

Curriculum Vitae

Email: bmmorris@uw.edu GitHub: bmorris3
Web: http://staff.washington.edu/bmmorris

Education

University of Washington, Seattle, WA — 2014 – present
Graduate student in Astronomy and Astrobiology (dual-title PhD program)

University of Washington, Seattle, WA — 2013 – 2014
M.S. in Astronomy

University of Maryland, College Park, MD — 2009 – 2012
B.S. with High Honors in Astronomy
B.S. in Physics (double degree)

Selected Graduate Research

Principle Investigator: Two nights at Keck Observatory (MOSFIRE) — 2014
On transit transmission spectroscopy of giant exoplanet atmospheres in the near-infrared

- Developed observing, data reduction, and analysis techniques for transmission spectroscopy of giant exoplanet atmospheres
- Achieved spectrophotometric precision of <2× the photon noise floor (Morris et al. 2016, in prep.)

Principle Investigator: 70+ nights at Apache Point Observatory (Agile, FlareCam) — 2014 – present
Pulsation photometry and transiting planet search targeting metal-polluted white dwarfs ("SPAMS")

- Monitoring newly classified, metal-polluted, ZZ Ceti white dwarfs for pulsations and transiting planets/planetary debris with the ARC 3.5 m and ARCSAT 0.5 m telescopes
- Mentoring undergraduate Pre-MAP students to reduce, analyze the data for credit

Stellar astrophysics via starspot occultations by HAT-P-11 b — 2015–present
Using Kepler observations of richly spotted exoplanet host HAT-P-11 to study stellar astrophysics

- Modeling starspot positions along transit chord in 200 transits using an original photometric inversion model and a forward modelling approach developed by Prof. Leslie Hebb (HWSC)
- Measured distribution of starspot positions, characterized an active stellar latitude

Google Summer of Code: Developer, maintainer of `astroplan`[1] — 2015 – present
Co-wrote and presently maintain an `astropy`-affiliated package for observation planning

- Provides the first observation planning toolkit in Python built on the open source `astropy` ecosystem of Python packages for astronomers
- Funded by the Python Software Foundation, `astroplan` was presented at the .Astronomy conference in Sydney, Australia in November 2015

Employment

NASA Goddard Space Flight Center Research Assistantship — Jan 2013 – Aug 2013
Post-baccalaureate research assistantship with advisor Dr. Avi Mandell at the Goddard Center for Astrobiology.

- Prepared a Python data reduction pipeline for near-infrared differential spectrophotometric observations with Keck/MOSFIRE and Keck/NIRSPEC of transiting exoplanet atmospheres.

Undergraduate Research

NASA Goddard Space Flight Center Research Associateship in Astrobiology — Jun 2012 – Aug 2012
Undergraduate research associateship with mentor Dr. Avi Mandell at the Goddard Center for Astrobiology.

- Wrote original Python algorithms to compute differential photometry of transiting exoplanet HAT-P-7b to detect the secondary eclipse using near-infrared observations from the Hale Telescope at the Palomar Observatory.
- Generated composite light curves with Kepler photometry to measure the orbital parameters and atmospheric properties of HAT-P-7b, with original analysis code in Python and IDL.

[1] https://github.com/astropy/astroplan

– Proposed the first evidence for planet-induced stellar gravity darkening in the HAT-P-7 system.

Undergraduate Research with Professor Drake Deming Aug 2011 – Dec 2012

Independent research for credit (ASTR498), three semesters.

– Traveled to Arizona to act as co-investigator on an observing campaign on the 2.1m telescope at Kitt Peak National Observatory for transiting exoplanet observations in the near-infrared.

– Developed observing techniques and wrote Python algorithms to compute differential photometry of transiting extrasolar planets using observations obtained at the UMD Observatory, Kitt Peak National Observatory and Palomar Observatory.

– Made the first exoplanet transit light curves produced at the UMD Observatory.

– Released and maintain an open source differential photometry code for undergraduate and serious amateur astronomers called "OSCAAR[2]".

– Submitted transit light curves to the Czech Astronomical Society Exoplanet Transit Database recorded at the University of Maryland Observatory.

Department of Astronomy Senior Honors Thesis Aug 2010 – Dec 2012

"Numerical Modeling of Rotational Fission of Contact Binary Asteroids" with Professor Derek Richardson, five semesters.

– Modeled binary asteroid systems in Python and interfaced with an N-body integrator to probe the relative configuration equilibria of continuously torqued contact binary asteroid systems. Used resources at the Department of Astronomy's Center for Theory and Computation and UMD's High Performance Computing Cluster, computed for more than 4 years of CPU time.

– Cited with "High Honors" by the Department of Astronomy for this work.

Publications

First author:

– **Morris, B.M.**, Mandell, A.M., Deming, D. "Kepler's Optical Secondary Eclipse of HAT-P-7b and Probable Detection of Planet-Induced Stellar Gravity Darkening." The Astrophysical Journal Letters, Volume 764, Issue 2, article id. L22, 5 pp. (2013).

n^{th} author:

– Hallakoun, N.; Maoz, D.; Kilic, M.; Mazeh, T.; Agol, E.; Bell, K. J.; Bloemen, S.; Brown, W. R.; Debes, J.; Faigler, S.; Gianninas, A.; Kull, I.; Kupfer, T.; Loeb, A.; **Morris, B. M.**; Mullally, F. "SDSS J1152+0248: An eclipsing double white dwarf from the Kepler K2 campaign." Submitted, arXiv:1507.06311.

Honors And Awards

– Pacific Science Center Science Communication Fellow (2016)

– Chambliss Astronomy Achievement Graduate Student Award Honorable Mention. 225th AAS, Seattle, WA (2015), and 222nd AAS, Indianapolis, IN (2013).

– Astrobiology Fellow, University of Washington, 2013-2014.

– "Audience Choice Award" at the *Astrobiology Speaks!* public outreach speaking competition. AbGradCon 2013, McGill University, Montreal, Canada.

– Invited to present thesis for Department of Astronomy Honors, awarded High Honors citation (2012).

Observing Experience

– **Principle investigator** on Keck Observatory/MOSFIRE proposal: "Probing Giant Planet Formation with MOSFIRE Exoplanet Transmission Spectroscopy", awarded 2 nights (2014)

– **Co-investigator** on Very Large Telescope/KMOS proposal: "Exoplanet transits with KMOS: Is GJ 1214b a water-world Super Earth or a cloudy Mini-Neptune?", awarded 2 nights (PI: D. Angerhausen, 2014)

– **Co-investigator** on Keck Observatory/MOSFIRE proposal: "Comprehensive Characterization of CoRoT-2b and XO-1b with Keck Observatory/MOSFIRE", awarded 2 nights (PI: A. Mandell, 2013)

[2] http://oscaar.github.io

- **Co-investigator** on Kitt Peak National Observatory 2.1m/FLAMINGOS proposal: "A Near-infrared Exoplanet Transit and Eclipse Survey", awarded 6 nights (PI: D. Deming, 2012)
- Undergraduate research at the University of Maryland Observatory, 152 mm (2010-2013): >100 hours collecting photometry of transiting exoplanets and asteroids.

Professional Presentations

- Poster: "Exoplanet Transmission Spectroscopy in the Near-Infrared with Keck/MOSFIRE." 225$^{\text{th}}$ American Astronomical Society Meeting. Seattle, WA. January 6, 2015.
- Poster: "Kepler's Optical Secondary Eclipse of HAT-P-7b and Probable Detection of Planet-Induced Stellar Gravity Darkening." Second Kepler Science Conference, NASA Ames Research Center, Mountain View, CA. November 6, 2013.
- Talk: "Kepler's Optical Secondary Eclipse of HAT-P-7b and Probable Detection of Planet-Induced Stellar Gravity Darkening". AbGradCon 2013, McGill University, Montreal, Canada. June 11, 2013.
- Poster: "Differential Photometry with OSCAAR: Open Source Differential Photometry Code for Amateur Astronomical Research". 222$^{\text{nd}}$ American Astronomical Society Meeting. Indianapolis, IN. June 4, 2013.
- Talk: "Secondary Eclipse and Transiting Timing of Extra-Solar Planet HAT-P-7b." 2012 NASA Goddard Space Flight Center Summer Research Associate Symposium. Goddard Center for Astrobiology, NASA Goddard Space Flight Center, Greenbelt, MD, August 9, 2012.
- Undergraduate Thesis defense: "Numerical Simulations of Rotational Fission of Contact Binary Asteroids." Department of Astronomy, University of Maryland, College Park, MD. May 4, 2012.

Press

- *Press release:* "NASA-funded Program Helps Amateur Astronomers Detect Alien Worlds". NASA Goddard Space Flight Center, Greenbelt, Md. September 4, 2013.
- Feature article in the UMD "Scholars Newsletter" for research achievements (Feb 2012).

Teaching Experience

- ASTR150 The Planets: Teaching assistant for three quarters (Fall 2013, Spring 2014, Spring 2015).
- ASTR101 Intro Astronomy: Teaching assistant for one quarter (Winter 2014).

Mentorship

- 2014-present: Formed the Search for Planets Around post-Main Sequence stars (SPAMS) research group with five undergraduates in the University of Washington's Pre-Major in Astronomy Program (Pre-MAP), which searches for transiting planetary material orbiting white dwarfs
- 2015-2016: Academic mentor (paid position) for Pre-MAP Cohort 11

Consulting

Center for Inquiry Science at the Institute for Systems Biology, Seattle, WA 2014-2015

Bringing professional STEM experience to middle school classrooms in the Puget Sound area

- Worked with school science teachers in Renton School District to adapt their curriculum to comply with new state standards as part of the Partnership in Science and Engineering Practices project.
- Collaborated with science teachers at Meeker Middle School (Tacoma, WA) to update a Sun-Moon-Earth system lab as part of the Observing for Evidence of Learning professional development model.

Public Outreach

- Co-founded and co-host of the Seattle branch of Astronomy on Tap (2015-present)
- Developed open source differential photometry routine with educational documentation for amateur transiting exoplanet observations (OSCAAR).
- President of the "AstroTerps" (2011-2012), the UMD Astronomical Society.
- Volunteer for Visitor Services at the Smithsonian Air and Space Museum in Washington, D.C., May – Aug 2011

Public Talks

- "Pluto-Palooza – a First Look at Images from New Horizons." Astronomy on Tap, Bad Jimmy's Brewery, Seattle, WA. July 15, 2015.
- "Dear Grandpa: Here's What NASA Actually Does." Astronomy On Tap, Bad Jimmy's Brewery, Seattle, WA. March 11, 2015.
- "Exoplanets and Astrobiology." University of Washington Planetarium Open House, Seattle, WA. February 6, 2015.
- "Exoplanets: How to find them and their inhabitants." Seattle Art Institute, Seattle, WA. May 29, 2014.
- "Ask A Scientist Day." Highlands Intermediate School, Pearl City, Hawaii. April 24, 2014.
- "Exoplanets: How to find them and their inhabitants." Boeing Employee Astronomical Society, Seattle, WA. April 10, 2014.
- "Transiting Exoplanets: The Meek Telescopes Shall Inherit The Earths." Seattle Astronomical Society, Seattle, WA. December 18, 2013.
- "Astrobiology In The Age Of Kepler." TEDxRainier "after-day" at the University of Washington Planetarium, Seattle, WA. November 10, 2013.
- "Exoplanets: How To Find Them And Their Inhabitants." Kopernik Observatory and Science Center, Vestal, NY. July 17, 2013.
- "Earthlings: Get Over Yourselves." *Astrobiology Speaks!* Series, Redpath Museum, McGill University, Montreal, Canada. June 11, 2013.