

## Sarah Ballard

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EDUCATION & EMPLOYMENT	<b>NASA Carl Sagan Fellow</b> , University of Washington, Seattle WA 98195 <ul style="list-style-type: none"><li>• Fall 2012-Summer 2015</li><li>• Sponsor: Professor Eric Agol</li></ul> <b>Harvard University</b> , Cambridge, MA USA <ul style="list-style-type: none"><li>• <b>Ph.D.</b>, Astronomy &amp; Astrophysics, May 2012<ul style="list-style-type: none"><li>• Thesis title: <i>In Pursuit of New Worlds: Searches for and Studies of Transiting Exoplanets from Three Space-Based Observatories</i></li><li>• Advisor: Professor David Charbonneau</li></ul></li></ul> <b>University of California, Berkeley</b> , Berkeley, CA USA <ul style="list-style-type: none"><li>• <b>B.A.</b>, Astrophysics, May 2007<ul style="list-style-type: none"><li>• With Highest Distinction</li><li>• Minor in Physics</li></ul></li></ul>	
RESEARCH INTERESTS	Detection and study of extrasolar planets with near-infrared and optical photometry, formation of planets, characterization of exoplanetary host stars, photometric techniques	
AWARDS AND SCHOLARSHIPS	L'Oréal <i>For Women in Science</i> Fellowship (2015) Torres Fellowship, Massachusetts Institute of Technology (2015) NASA Carl Sagan Postdoctoral Fellowship, University of Washington (2012) NSF Astronomy & Astrophysics Postdoctoral Fellowship (2012, declined) AAS Roger Doxsey Travel Prize (January 2012) Harvard Bok Center for Teaching, Certificate of Distinction in Teaching (2009)	
PROPOSALS AND GRANTS	<b>Principal Investigator on <i>Spitzer</i> Director's Discretionary Proposal</b> <ul style="list-style-type: none"><li>• "The First Exoplanet Smaller than the Earth" (DDT 541)</li><li>• Awarded 18 hours, 2010</li></ul> <b>Principal Investigator on Apache Point Observatory 3.5 m Proposal</b> <ul style="list-style-type: none"><li>• "Characterizing the M Dwarf Hosts to Super-Earth Sized Planets Identified by the Kepler Mission"</li><li>• Awarded 6 half-nights (2012) and 10 half-nights (2013)</li></ul> <b>Co-Investigator on <i>Spitzer</i> Proposal</b> <ul style="list-style-type: none"><li>• "Two Eyes on the Prize: Revealing the Complete Architectures of Planetary Systems through Transit Timing with <i>Kepler</i> and <i>Spitzer</i>" (PI: Fabrycky; GO 10127)</li><li>• Awarded 100 hours, 2014</li></ul> <b>Co-Investigator on <i>Spitzer</i> Proposal</b> <ul style="list-style-type: none"><li>• "Validating the First Habitable-Zone Planet Candidates Identified by the NASA <i>Kepler</i> Mission" (PI: Charbonneau; GO 80117)</li><li>• Awarded 600 hours, 2011</li></ul>	

ACADEMIC  
SERVICE

NASA *Hubble* Fellowship Proposal Reviewer (2015)  
NASA Astrophysics Data Analysis Program Proposal Reviewer (2014)  
NASA Earth and Space Sciences Graduate Fellowship Proposal Reviewer (2014)  
NASA *Spitzer* Cycle 11 Proposal Reviewer (2014)

Referee for *Science* (2014–), *The Astrophysical Journal* (2012–), *Astronomy & Astrophysics* (2011–), *Publications of the Astronomical Society of the Pacific* (2012–)

Speaker & moderator at Inclusive Astronomy Conference, Vanderbilt University (2015)

**Editorials**

- *What a Just Response to Oppression Can Look Like*, Committee on the Status of Women in Astronomy (CSWA) blog, November 2015
- *Homework for Those Seeking to Be Allies*, CSWA blog, May 2015
- *Two Astronomers Named Sarah Survive Academia with this One Simple Trick!*, *astrobetter.com*, July 2014
- *Build a Smarter Group from Scratch: Converse Equitably, Add Women, Stir*, CSWA blog, April 2014
- *Values Affirmation and You: What You Deeply Care About Affects Your Ability to Do Science*, CSWA blog, December 2012
- *Retaining Women in Academia*, Harvard Crimson, May 2011
- *The Mismeasure of Woman*, The Scientista Foundation, Spring 2011

Developed Impostor Syndrome workshop, conducted at University of Washington, Harvard University, University of Illinois, Vanderbilt, University of Michigan, & MIT [Resources published online here]

Harvard Graduate Women in Science and Engineering (HGWISE) astronomy department representative (2008-2012), treasurer (2010-2011)

- *Organized and led events for graduate women in Harvard science community*

TEACHING &  
ADVISING

**University of Washington, Seattle, WA**

*Graduate Advisor*

- Jack Moriarty (2014–current), *The Kepler Dichotomy in Planetary Disks: Linking Kepler Observables to Simulations of Late-Stage Planet Formation*

*Undergraduate Advisor*

- Justin Long (2013–2014), *Exoplanet Host Star Characterization by Proxy*  
Awarded the Mary Gates Research Scholarship, presented at UW Undergraduate Research Symposium 2013, 222nd and 223rd Meetings of the American Astronomical Society [Abstract link]
- Megan Brehm (2014), *Stellar Magnetic Activity and Planet Parking*  
Presented at Scientista Symposium at MIT, UW Undergraduate Research Symposium 2014 [Abstract link]
- David Bordenave, *In Search of Trojan Asteroids in Exoplanetary Systems*  
Presented at UW Undergraduate Research Symposium 2014 [Abstract link]
- Jessica Shank (2014), *Understanding M Dwarfs and Their Planets*  
Presented at Scientista Symposium at MIT, UW Undergraduate Research Symposium 2014 [Abstract link]

*Guest Lecturer*

- Graduate Observational Techniques (Ay 581), Prof. Hawley, 2014
- Undergraduate Observational Techniques (Ay 481), Prof. Laws, 2014

- Undergraduate Research Seminar (Ay 400), Prof. Dalcanton, 2013, & Prof. Hawley, 2014
- Modern Topics for Non-Science Majors (Ay 190), Prof. Meadows, 2013
- NASA Space Grant Seminar (Earth & Space Science 495), Prof. Hartnett, 2013 [Video link]

## Harvard University, Cambridge, MA

### *Teaching Fellow*

- Science A-35, Professor Bob Kirshner, Spring 2009

### *Student, Astronomy 302: “Scientists Teaching Science”*

- Instructor: Dr. Philip Sadler, Spring 2011
- Course on techniques for effective science education

## TALKS PRESENTED

### **Selected Invited Talks**

- University of Calgary Physics Colloquium, 6 Nov 2015
- University of Michigan Astronomy Colloquium, 1 Oct 2015
- University of Washington Applied Physics Colloquium, 22 May 2015
- Meeting of the American Physical Society, Plenary Talk, 15 May 2015
- McGill University Physics Colloquium, 11 February 2015
- Columbia University Astronomy Colloquium, 30 January 2015
- Case Western Astronomy Colloquium, 12 November 2014
- University of Washington Astrobiology Colloquium, 7 October 2014
- University of Illinois Astronomy Colloquium, 2 September 2014
- University of British Columbia Astronomy Colloquium, 28 July 2014
- University of Oregon Physics Colloquium, 8 May 2014
- Kliegel Lecture in Planetary Science, Caltech, 4 February 2014
- Yale University Astronomy Seminar, 21 January 2014

### **Selected Contributed Talks**

- *Exploring Links Between Orbital Dynamics and Atmospheres in Kepler M Dwarf Planetary Systems*, Extreme Solar Systems III (Kona, Hawaii 2015) [Abstract link]
- *Multiplicity of Planets Among the Kepler M Dwarfs*, AAS #225 (Seattle WA, Jan 2014) [Abstract link]
- *Multiplicity of Planets Among the Kepler M Dwarfs*, AAS #224 (Boston MA, June 2014) [Abstract link]
- *Exoplanet Validation by Asteroseismology*, AAS Meeting #223 (Washington D.C., Jan. 2014)
- *Exoplanet Validation by Asteroseismology for KOI 69*, 2nd Kepler Science Conference (NASA Ames, Nov. 2014) [Video link]
- *Exoplanet Characterization by Proxy for Kepler-61b: How a Nearby Star Bumped a Planet Out of the Habitable Zone*, AAS Meeting #221 (Long Beach CA, Jan. 2013) [Abstract link]
- *Exoplanet Characterization by Proxy for Kepler-61b: How a Nearby Star Bumped a Planet Out of the Habitable Zone*, Sagan Fellow Symposium (Pasadena CA, Oct. 2012)
- *Validation and Characterization of Transiting Exoplanets from Space with EPOXI, Kepler, and Warm Spitzer*, AAS Meeting #219 (Austin TX, Jan. 2012) [Abstract link]
- *Validation of Habitable-Zone Super Earth Kepler Candidates with Warm Spitzer*, Kepler Science Conference (NASA Ames, Dec. 2011) [Video link]

SELECTED PRESS **Profiles & Interviews**

- *3Q: Astrophysics and Gender Equity in Science*, MIT News, 13 Nov 2015
- *The Interstellar Tourist's Guide to Exoplanets*, NPR Science Friday, 6 March 2015
- *Sound Effect: Newness*, KPLU Radio, Seattle, 10 Jan 2015
- *What's Next in the Hunt for Alien Planets? The Spotlight Widens*, nbcnews.com, 22 September 2014
- *Seattle astronomer discovered four planets before she turns 30*, KIRO radio, Seattle, 10 September 2014
- *Small Stars Are a Big Deal*, JPL PlanetQuest, 7 March 2013

**Selected Science Coverage**

- *How Astronomers Will Find Earth 2.0*, Discover Magazine, 16 July 2015
- *The Most Precise Measurement of an Alien World's Size*, NASA/JPL press release, 23 July 2014
- *Best gauge of exoplanet size*, Nature Research Highlights, 7 August 2014
- *Sizing up an exoplanet*, Science@NASA ScienceCasts, 18 August 2014
- *Alien Planet's Size Measured Like Never Before*, Space.com
- *Hidden Worlds: Astronomers Find Invisible Planet 650 Light-Years Away*, TIME, 9 Sept 2011
- *Stealth Alien Planet Discovered by New Technique*, Space.com, 9 Sept 2011
- *Phantom Menace Bullies Alien World*, Discovery.com, 9 Sept 2011

PUBLICATIONS **Refereed Publications** (7 first author, 16 total)

[ADS link]

*The Kepler Dichotomy among the M Dwarfs: Half of Systems Contain Five or More Coplanar Planets*

**Ballard, S.**, & Johnson, J. A. 2014, ApJ, accepted (arXiv:1410.4192)

*Kepler-93b: A Terrestrial World Measured to Within 120 km, and a Test Case for a New Spitzer Observing Mode*

**Ballard, S.**, Chaplin, W. J., Charbonneau, D., et al. 2014, ApJ, 790, 12 (arXiv:1405.3659)

*Exoplanet Characterization by Proxy: a Transiting  $2.15 R_{\oplus}$  Planet Near the Habitable Zone of the Late K dwarf Kepler-61*

**Ballard, S.**, Charbonneau, D., Fressin, F., et al. 2013, ApJ, 773, 98 (arXiv: 1304.6726)

*The Kepler-19 System: A Transiting  $2.2 R_{\oplus}$  Planet and a Second Planet Detected via Transit Timing Variations*

**Ballard, S.**, Fabrycky, D., Fressin, F., et al. 2011b, ApJ, 743, 200 (arXiv: 1109.1561)

*A Search for Additional Planets in Five of the Exoplanetary Systems Studied by the NASA EPOXI Mission*

**Ballard, S.**, Christiansen, J. L., Charbonneau, D., et al. 2011a, ApJ, 732, 41 (arXiv: 1103.0010)

*A Search for a Sub-Earth Sized Companion to GJ 436 and a Novel Method to Calibrate Warm Spitzer IRAC Observations*

**Ballard, S.**, Charbonneau, D., Deming, D., et al. 2010a, PASP, 122, 1341 (arXiv:1009.0755)

*A Search for Additional Planets in the NASA EPOXI Observations of the Exoplanet System GJ 436*

**Ballard, S.**, Christiansen, J. L., Charbonneau, D., et al. 2010b, ApJ, 716, 1047

(arXiv:0909.2875)

*The Kepler Dichotomy in Planetary Disks: Linking Kepler Observables to Simulations of Late-Stage Planet Formation*

Moriarty, J., & **Ballard, S.** 2015, ApJ, submitted (arXiv:1512.03445)

*Low False-Positive Rate of Kepler Candidates Estimated From A Combination Of Spitzer And Follow-Up Observations*

Désert, J. M., et al. 2015, 804, 59 (arXiv:1503.03173)

*Validation of 12 Small Kepler Transiting Planets in the Habitable Zone*

Torres, G., et al. 2015, ApJ, 800, 99 (arXiv:1501:01101)

*Masses, Radii, and Orbits of Small Kepler Planets: The Transition from Gaseous to Rocky Planets*

Marcy, G. W., et al. 2014, ApJ, 210, 20 (arXiv:1401.4195)

*Two Earth-Sized Planets Orbiting Kepler-20*

Fressin, F., et al. 2011, Nature, 482, 195 (arXiv:1112.4550)

*Kepler-22b: A 2.4 Earth-Radius Planet in the Habitable Zone of a Sun-Like Star*

Borucki, W. J., et al. 2011, ApJ, 745, 120 (arXiv:1112.1640)

*The Hot-Jupiter Kepler-17b: Discovery, Obliquity from Stroboscopic Starspots, and Atmospheric Characterization*

Désert, J. M., et al. 2011, ApJS, 197, 14 (arXiv: 1107.5750)

*System Parameters, Transit Times, and Secondary Eclipse Constraints of the Exoplanet Systems HAT-P-4, TrES-2, TrES-3, and WASP-3 from the NASA EPOXI Mission*

Christiansen, J. L., et al. 2011, ApJ, 726, 94 (arXiv:1011.2229)

*Studying the Atmosphere of the Exoplanet HAT-P-7b Via Secondary Eclipse Measurements with EPOXI, Spitzer, and Kepler*

Christiansen, J. L., et al. 2010, ApJ, 710, 97 (arXiv:0912.2132)