

**Sarah J. Morrison**

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**RESEARCH INTERESTS**


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planetary system formation & evolution, exoplanets, debris disks, protoplanetary disks, orbital dynamics, planet-disk interactions, influence of orbit environment on planetary surfaces, data science, science education, computational astrophysics

**EDUCATION**


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Ph.D. in Planetary Science, minor in Astronomy, University of Arizona, Tucson, AZ: Aug. 2017  
 Dissertation Topic, "The Dynamics and Implications of Gap Clearing via Planets in Planetesimal (Debris) Disks", Advisor: Kaitlin Kratter  
 M.S. in Planetary Sciences, University of Arizona, Tucson, AZ: Dec. 2015  
 B. A. Cum Laude in Astronomy, Cornell University, Ithaca, NY: May 2011

**RESEARCH APPOINTMENTS**


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Pennsylvania State University Center for Exoplanets & Habitable Worlds Postdoctoral Fellow	9/2017-present
Univ. of Arizona (UA) Graduate Research Associate	2013-8/2017
NASA Earth & Space Sciences Fellow	2013-2016
UA Graduate Research Assistant	2011-2013
Cornell University Lunar Reconnaissance Orbiter NAC Research Assistant	2010-2011
Cornell University Cassini Imaging Science Subsystem Research Assistant	2008-2011
Cornell University Mars Exploration Rover Panoramic Camera Image Calibrator	2008-2011
Northern Arizona University NSF REU Summer Intern	2010
Cornell University NSF REU Summer Intern	2008
NASA GSFC High School Student Research Intern, Planetary Geodynamics Lab	2006-2007

**TEACHING/OUTREACH APPOINTMENTS**


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Penn State Course Instructor (Fall 2018): Astro 496: Independent Study (1 student)  
 Penn State Course Instructor (Spring 2018): Astro 5: Sky & Planets (76 students)  
 Penn State Course Instructor (Spring 2018): SC 240: Learning Assistant Experience (9 students)  
 UA Lunar & Planetary Laboratory Graduate Outreach Coordinator (2015-2017)  
 UA Graduate Teaching Associate (Spring 2017, Fall 2016, Spring 2014): Ptys 170A1: Planet Earth: Evolution of a Habitable World, Ptys 214: Astrobiology, Ptys 206: The Golden Age of Space Exploration  
 Participant, Ptys 555 (Spring 2013): Teaching College-Level Astronomy & Planetary Sciences  
 UA Graduate Teaching Assistant (Spring 2013, Fall 2012, Spring 2012): Ptys 170A1: Planet Earth: Evolution of a Habitable World, Ptys 170B1: The Universe and Humanity: Origin and Destiny, Ptys 206: The Golden Age of Space Exploration

**SELECT GRANTS, AWARDS, & OTHER HONORS**


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Penn State Center for Exoplanet & Habitable Worlds Small Grant Award (\$2400) Spring 2019

Co-I, “How directly investigating meteorite samples influences student learning of Solar System astronomy and methods”, Scholarship of Teaching and Learning (SoTL) Grant, Penn State Schreyer Institute for Teaching Excellence (\$3K) Spring 2018

Co-I, “Assessing the Hallmarks of Migration and In Situ Formation in Multi-Exoplanet Systems”, NASA Exoplanets Research Program, PI: Rebekah Dawson (\$150,410 sub-award total over 3 years) 2018-2021

UA Theoretical Astrophysics Program Small Grant Award (~\$690) Fall 2016

NASA Earth & Space Science Fellowship (\$90K total) Fall 2013-Fall 2016  
Title: Multiple Planet-Debris Disk Interactions: Probing Planetary System Stability and Evolution

University of Arizona College of Science Galileo Circle Scholar 2013

### PUBLICATIONS

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- Morrison, S. J.** & Kratter, K. M. (2018). Gap Formation in Planetesimal Disks Via Divergently Migrating Planets. *MNRAS*, 481, 5180.
- Su, K., MacGregor, M. A., Booth, M., Wilner, D. J., Flaherty, K., Hughes, A. M., Phillips, N. M., Malhotra, R., Hales, A. S., **Morrison, S.**, Ertel, S., Matthews, B. C., Dent, W. R., Casassus, S. (2017). ALMA 1.3 millimeter map of the HD 95086 system. *AJ*, 154, 225.
- Russell, A., **Morrison, S.**, Moschonas, E. H., & Papaj, D. R. (2017). Patterns of pollen and nectar foraging specialization by bumblebees over multiple timescales using RFID tracking. *Scientific Reports*, 7, 42448.
- Morrison, S. J.** & Kratter, K. M. (2016). Orbital Stability of Multi-Planet Systems: Behavior at High Masses. *ApJ*, 823, 118.
- Stanley, D., Russell, A., **Morrison, S.**, Rogers, C, & Raine, N. (2016). Investigating the impacts of field-realistic exposure to a neonicotinoid pesticide on bumblebee foraging, homing ability and colony growth. *Journal of Applied Ecology*, 53, 1440.
- Morrison, S. J.** (Jan. 24, 2016). Follow the dust to explore other solar systems. University of Arizona College of Science insert in Arizona Daily Star. **[Newspaper article]**
- Su, K. Y., **Morrison, S. J.**, Malhotra, R., Smith, P., Balog, Z., Rieke, G. (2015). Debris distribution in HD 95086-- A young analog of HR 8799. *ApJ*, 799, 146.
- Morrison, S.** & Malhotra, R. (2015). Planetary chaotic zone clearing: destinations and timescales. *ApJ*, 799, 41.
- Morrison, S.** & Hemingway, D. (2014). Grooves (irregular body). In *Encyclopedia of Planetary Landforms*, Springer Science+Business Media, 2015. **Invited Contribution**
- Yelle, R. V., Mahieux, A., **Morrison, S.**, Vuitton, V., Horst, S. M. (2014). Perturbation of the Mars atmosphere by the near-collision with Comet C/2013 A1 (Siding Spring). *Icarus*, 237, 202-210.
- Thomas, P. C., Burns, J. A., Hedman, M., Helfenstein, P., **Morrison, S.**, Tiscareno, M. (2013). The inner small satellites of Saturn: A variety of worlds. *Icarus*, 226, 999-1019.
- Grundy, W., **Morrison, S. J.**, Bovyn, M. J., Tegler, S. C., Cornelison, D. (2011). Remote sensing of D/H ratios in methane ice: Temperature-dependent absorption coefficients of CH<sub>3</sub>D in methane ice and nitrogen ice. *Icarus*, 212, 941-949.
- Morrison, S.**, Thomas, P. C., Tiscareno, M., Burns, J. A., Veverka, J. (2009). Grooves on Saturnian small satellites and other objects: Characteristics and significance. *Icarus*, 204, 262-270.

## SELECT RESEARCH PRESENTATIONS

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### Invited talks:

- January 14, 2019. Do Planets Stay or Do They Go? Not So Simple: In situ formation of (near-) resonant chains in multi-planet systems. Center for Exoplanets & Habitable Worlds Seminar Series, Pennsylvania State University.
- November 8 & 15, 2018. Do Planets Stay or Do They Go? Investigating the role that planet migration plays in shaping planetary systems. Physics & Astronomy Colloquium, Franklin & Marshall College; Physics, Astronomy, and Material Science Colloquium, Missouri State University.
- March 5, 2018. Minding the Gap- Using Orbital Dynamics to Uncover the History of Planetary Systems Near and Far. Physics, Astronomy, and Material Science Colloquium, Missouri State University.
- Feb. 13, 2017. Minding the Gap: the Physics & Implications of Disk Clearing Via Planets. Center for Exoplanets & Habitable Worlds Seminar Series, Pennsylvania State University.
- March 28, 2016. Orbital Stability of High Mass Planets & Implications for Debris Disk Systems. Origins Seminar Series, University of Arizona.
- April 30, 2015. Mind the Gap: Exploring (Exo-)Solar Systems. Presentation to the College of Science Dean's Advisory Board, University of Arizona.
- October 25, 2013. Thermal effects by comet C/2013 A1 (Siding Springs) on the Martian upper atmosphere. Comet Lunch Seminar Series, Planetary Science Institute.

### Select Contributed presentations (student authors denoted by *undergraduate*, graduate):

- Zaidi, S. G.* and **Morrison, S. J.** (2019). Modeling the Dynamical Evolution of Saturn's E Ring Following a Cryovolcanic Eruption on Enceladus. LPSC #50, abstract 2790.
- Morrison, S. J.** & *Zaidi, S. G.* (2019). Why So Muted? The Sources and Dynamical Mechanisms Responsible for Differing Regolith Depths on Satellites Embedded in Saturn's E Ring. LPSC #50, abstract 2788.
- Morrison, S. J.**, Dawson, R., MacDonald, M. (2018). The Nature of Mean Motion Resonant Chains Arising From In Situ Planet Formation. DPS Meeting #50, abstract 101.04.
- Morrison, S. J.** & Kratter, K. M. (2017). Forming Gaps in Debris Disks with Migrating Planets. AAS Meeting #229, abstract 318.02.
- Morrison, S. J.** & Kratter, K. M. (2016). Forming Gaps in Debris Disks with Fewer Planets via Planet Migration. DPS Meeting #48, abstract 119.01.
- Morrison, S. J.** & Kratter, K. M. (2016). Orbital Stability of High Mass Planetary Systems. DDA Meeting #47, abstract 202.02.
- Morrison, S. J.** & Kratter, K. M. (2015). Orbital Stability of Multi-Planet Systems: Behavior at High Masses. ExSS III, abstract 201.06.
- Su, K. Y., **Morrison, S. J.**, Malhotra, R., Balog, Z., Smith, P. (2014). The debris structures of HD 95086-- A young analog of HR 8799. DPS Meeting #46, abstract 204.02.
- Morrison, S. J.**, Malhotra, R., & Su, K. Y. L. (2014). The planetary system of HD 95086-- A young analog of HR 8799? DPS Meeting #46, abstract 204.03.
- Morrison, S.** & Malhotra, R. (2014). Planetary chaotic zone clearing: destinations and timescales. DDA Meeting #45, abstract 400.02.

- Morrison, S. J.** & Yelle, R. (2013). Thermal effects from Comet 2013/A1 (Siding Spring) on Mars' upper atmosphere. DPS Meeting #45, abstract 313.18.
- Morrison, S.**, Helfenstein, P., Thomas, P. C., Veverka, J. (2010). Color photometry of the small Saturnian satellites: Global and regional variations on Prometheus and Calypso. DPS Meeting #42, abstract 09.05.
- Morrison, S.**, Helfenstein, P., Thomas, P., Veverka, J., Denk, T. (2009). Color variations on Saturn's small satellites: The ring connection. DPS Meeting #41, abstract 03.02.
- Thomas, P., **Morrison, S.**, Burns, J. A. (2008). Small Satellites, Asteroids, and Comets: Surface Expressions of Internal Structures. AGU Fall Meeting, abstract P23A-1363.
- Morrison, S.**, Thomas, P.C., Veverka, J., Burns, J. A., Tiscareno, M. S., Porco, C. C. (2008). Grooves on Small Saturnian Satellites: Possible Evidence for Tidal Stressing. DPS Meeting #40, abstract 45.04.
- Morrison, S.** & Frey, H. V. (2007). Crater Densities in Noachis Terra: Evidence for Overlapping Ejecta from Argyre and Hellas. LPSC 38, abstract 1355.

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### SELECT PROFESSIONAL AND ACADEMIC SERVICE

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- Member, Penn State Planetary Science Initiative Science Programming Committee (11/2018-03/2019)
- Member, Penn State Eberly College of Science Climate & Diversity Committee (09/2018-ongoing)
- Elected Member, AAS Division of Dynamical Astronomy Committee (07/2018-07/2020)
- Chair, Organizing Committee for Emerging Researchers in Exoplanet Science IV (9/2017-9/2018): conference June 21-22, 2018
- Proposal Reviewer & Executive Secretary, NASA Review Panels
- Lunar and Planetary Laboratory Conference Organizer (2012, 2013): Organized annual, 2-day Tucson-area planetary science conference

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### COMMUNITY ENGAGEMENT/SYNERGISTIC ACTIVITIES

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- Bringing Big Data to Small Bees** 2015-2017  
 Applied problem-solving algorithms and computational methodologies from analysis of astrophysical simulations to RFID-tracking datasets of bees in pollination ecology research. So far resulted in 2 publications (see publication list). The analysis codes I developed have been adopted by two separate pollination research groups with the potential for additional collaborations.
- LPL Graduate Outreach Coordinator** Fall 2014-2017  
 Managed LPL graduate student & postdoc outreach activities around the state of Arizona. Grew LPL's annual outreach audience over tenure, centralized LPL's outreach assessment+record keeping, developed new outreach activities (particularly exoplanet and orbit-related) for wider range of audiences, created LPL graduate outreach funding source through local business partnerships with Astronomy on Tap-Tucson
- Co-founder, Astronomy on Tap-Tucson (Space Drafts Public Talk Series)** 2015-2017  
 Transitioned monthly public talk series held at Borderlands Brewery in downtown Tucson to be Tucson's local flavor of the national Astronomy on Tap movement, grew average event attendance by >2x over tenure, typical audiences ~80-100 people, created an external outreach funding source for UA astronomy/planetary sciences graduate

students via food and merchandise sales during these events in partnership with Borderlands Brewery and local food vendors

**Select Invited Public Engagement Talks/Panels**

Live televised interview with Phoenix 3TV meteorologist Kim Quintero 1/28/17

Invited Panelist (for expertise in orbital dynamics), Physics of Space Battles Panel, Tucson Comic-Con 11/6/2016

Invited Panelist, Lunar and Planetary Laboratory Conference Outreach & Science Communication Panel 8/20/2015

Talks about career path: Connect2Careers 1/28/17, Connect2STEM festival 1/9/16, Chess & Science Festival at Flandrau Planetarium 11/7/15

Talks about research: Huachuca Astronomy Club 4/15/16, Pima Air & Space Museum 2/11/16, Southern Arizona Association for the Visually Impaired 10/22/2015, West Valley Astronomy Club 3/3/15, Sonora Astronomical Society 2/10/15

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**PROFESSIONAL AFFILIATIONS**

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**Member**

American Astronomical Society	
Astronomy Ambassador	2014-present
Division of Dynamical Astronomy	2012-present
Division of Planetary Science	2008-present
American Geophysical Union	2008-present