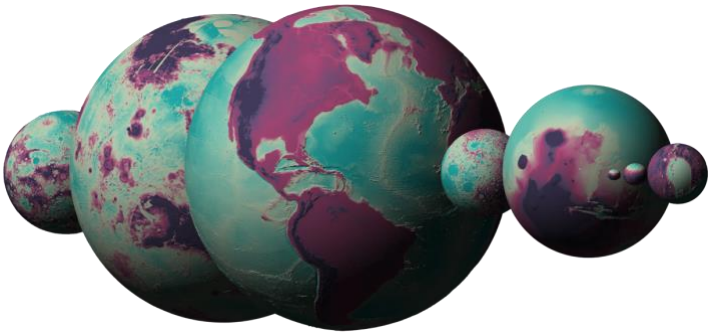

^ Global topography of some of the worlds I study:
Mercury, Venus, Earth, Moon, Mars, Vesta, Ceres, Pluto. Visualization by me.

James Tuttle Keane

Joint Center for Planetary Astronomy Postdoctoral Fellow

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RESEARCH INTERESTS

I am interested in the formation and evolution of solar system planets, satellites, and small bodies. My primary emphasis is on the interaction between tides, rotation, and geologic processes on terrestrial and icy worlds. I employ a combination of analytical and numerical methods, and use a variety of spacecraft-derived datasets, including planetary gravity, topography, and imagery.

EMPLOYMENT

2017—present **Joint Center for Planetary Astronomy Postdoctoral Fellow**: Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA, USA. *Host:* Professor Michael E. Brown.

2013—2017 **Graduate Research Associate**: Department of Planetary Science, University of Arizona, Tucson, AZ, USA.

2011—2013 **Graduate Research/Teaching Assistant**: Department of Planetary Science, University of Arizona, Tucson, AZ, USA.

2008—2010 **Undergraduate Teaching Assistant**: Department of Astronomy, University of Maryland, College Park, MD, USA.

EDUCATION

2017 **Ph.D. Planetary Science**: Department of Planetary Science, University of Arizona, Tucson, AZ, USA.
Thesis: "Tidal/rotational dynamics of solar system objects, from the Moon to Pluto"
Advisor: Associate Professor Isamu Matsuyama

2015 **M.S Planetary Science**: Department of Planetary Science, University of Arizona, Tucson, AZ, USA.

2011 **B.S. Astronomy (with high honors)**: Department of Astronomy, University of Maryland, College Park, MD, USA.
Thesis: "Modes of planetesimal-driven planet migration"
Advisor: Professor Douglas P. Hamilton

2011 **B.S. Geology (with honors)**: Department of Geology, University of Maryland, College Park, MD, USA.
Thesis: "Lithospheric extension on icy satellites"
Advisor: Associate Professor Laurent G. J. Montési

GRANTS AWARDED

(total amount awarded as PI or Science-PI since 2013: $475,482)

(*in review*) **NASA InSIGHT Participating Scientist**: "The Contribution of Impact Basins, Volcanoes, and Other Geologic Processes to Mars's Moments of Inertia." Role: **Science-PI**. Submitted February 2018.

(*in review*) **NASA Solar System Workings (SSW)**: "Tectono-magmatic Evolution of the Procellarum Region and its Influence on the Global Lunar Gravity Field." PI: Patricia M. Gregg, U. Illinois (Urbana-Champaign). Role: **Collaborator**. Submitted February 2018.

(*in review*) **NASA Solar System Workings (SSW)**: "Thermal Processes in Pluto's Icy Surface—Mechanisms for Surface Modification and Evolution." PI: Orkan M. Umurhan, SETI Institute. Role: **Collaborator**. Submitted February 2018.

2017—2020 **NASA Solar System Workings (SSW)**: "Interior Structure, Stresses, and Tectonics of Planets." PI: Isamu Matsuyama, U. Arizona. Role: **Co-I**.

2016—2019 **NASA Solar System Workings (SSW)**: "True Polar Wander of Terrestrial Planets and its Implications for the Long-Term Stability of Polar Volatiles." Role: **Science-PI**. Total award: $382,982.

2016 **University of Arizona Theoretical Astrophysics Program Small Matching Grant**: for work related to the tidal/rotational dynamics of Pluto. Total award: $1,000.

2015 **University of Arizona Theoretical Astrophysics Program Small Matching Grant**: for work related to the analysis of GRAIL gravity data of the Moon. Total award: $1,500.

2013—2016 NASA Earth and Space Science Fellowship (NESSF): "Stability of Asteroid Regolith during Planetary Close Approaches." Role: **Graduate Student Fellow**. Total award: $90,000.

PLANETARY EXPLORATION MISSION INVOLVEMENT

2018 Keck Institute for Space Studies (KISS): "Tidal Heating: Lessons from Io and the Jovian System": Contributor to KISS proposal (PIs: Alfred McEwen, U. Arizona; Katherine de Kleer, Caltech; Ryan Park, JPL) and participant in workshop designed to develop a roadmap for understanding tidal heating in the solar system (and Io in particular). KISS studies routinely lead to new technologies, scientific advances, and NASA mission proposals.

2017—present New Horizons: Funded science team member. Attending science team meetings and the flyby of the cold classical Kuiper belt object (486958) MU69. Responsible for live-sketching the encounter and new science results.

2016 Lunar Reconnaissance Orbiter (LRO): Contributor the extended science mission (ESM3) proposal team.

2014—present Gravity Recovery and Interior Laboratory (GRAIL): Funded graduate student and postdoctoral researcher, participant in quarterly science team meetings. Meetings were often held in tandem with Lunar Reconnaissance Orbiter (LRO) Lunar Orbiter Laser Altimeter (LOLA) team meetings.

2014 NASA/JPL Planetary Science Summer School: Argus, an Io Observer mission concept: Participant in a five-month study developing a New Frontiers-class mission concept for exploring Jupiter's volcanic moon, Io. Held the following roles: attitude control subsystem chair, principal investigator of the Io Laser Altimeter (IoLA) instrument, co-investigator of the Io Radio and Gravity Experiment (IRAGE), and Io interiors and geophysics working group lead.

2013—2015 Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer (OSIRIS-REx): Community and public engagement volunteer, focusing on *321Science* YouTube series.

HONORS AND AWARDS

(total amount awarded since 2013: $9,100)

2017 Pellas-Ryder Award, Geological Society of America, Division of Planetary Geology. Award: $500.

2017 Galileo Circle Scholar, College of Science, University of Arizona. Award: $1,000.

2016 Galileo Circle Scholar, College of Science, University of Arizona. Award: $1,000.

2016 Eugene M. Shoemaker Impact Cratering Award, Geological Society of America, Division of Planetary Geology. Award: $2,500.

2015 SSERVI ESF Student Poster Award, Solar System Exploration Research Virtual Institute, Exploration Science Forum. Award: $1,000.

2015 Gerard P. Kuiper Memorial Award, Department of Planetary Science, University of Arizona. Award: $1,000.

2014 AGU Outstanding Student Paper Award (OSPA), American Geophysical Union Fall Meeting. Award: $1,000.

2016 Galileo Circle Scholar, College of Science, University of Arizona. Award: $1,000.

2014 Best Graduate Student Talk Award, Department of Planetary Science, University of Arizona.

2014 Service and Outreach Award, Department of Planetary Science, University of Arizona. Award: $100.

2013 Graduate Student Talk, Honorable Mention, Department of Planetary Science, University of Arizona.

PEER-REVIEWED PUBLICATIONS

(3 first author publications and 7 co-author publications since 2013)

(in prep.) **Keane, J.T.**, Johnson, B.C., Matsuyama, I., Siegler, M.A. The wibbly-wobbly Moon: rotational dynamics of the Moon in the aftermath of large impacts. In preparation.

(in prep.) Bouley, S., Baratoux, D., **Keane, J.T.**, Langlais, B., Matsuyama, B., Monroe, M., Vanderhaegue, O., Sautter, V., Séjourné, A., Costard, F. A new vision of the martian dichotomy. In preparation for *Nature*.

2017 Andrews-Hanna, J.C., Head, J.W., Johnson, B.C., **Keane, J.T.**, Kiefer, W.S., McGovern, P.J., Neumann, G.A., Wieczorek, M.A., Zuber, M.T. Ring faults and ring dikes around the Orientale basin on the Moon. *Icarus*, in press.

2016 **Keane, J.T.**, Matsuyama, I., Kamata, S., & Steckloff, J.K. Reorientation and faulting of Pluto due to volatile loading within Sputnik Planitia. *Nature* **540**, 90-93.

2016 Simon, M., Pascucci, I., Edwards, S., Feng, W., Gorti, U., Hollenbach, D., Rigliaco, E., & **Keane, J.T.** Tracing Slow Winds from T Tauri Stars via Low Velocity Forbidden Line Emission. *The Astrophysical Journal* **831**, 169-199.

2016 Zuber, M.T., Smith, D.E., Neumann, G.A., Goossens, S., Andrews-Hanna, J.C., Head, J.W., Kiefer, W.S., Asmar, S.W., Konopliv, A.S., Lemoine, F.G., Matsuyama, I., Melosh, H.J., McGovern, P.J., Nimmo, F., Phillips, R.J., Solomon, S.C., Taylor, G.J., Watkins, M.M., Wieczorek, M.A., Williams, J.G., Jansen, J.C., Johnson, B.C., **Keane, J.T.**, Mazarico, E., Miljković K., Park, R.S., Soderblom, J.M., Yuan, D.-N. Gravity Field of the Orientale Basin from the Gravity Recovery and Interior Laboratory Mission. *Science* **354**, 438-441.

2016 Johnson, B.C., Blair, D.M, Collins, G.S., Melosh, H.J., Freed, A.M., Taylor, G.J., Head, J.W., Wieczorek, M.A., Andrews-Hanna, J.C., Nimmo, F., **Keane, J.T.**, Miljković, K., Soderblom, J.M., & Zuber, M.T. Formation of the Orientale Lunar Multi-Ring Basin. *Science* **354**, 441-444.

2016 Matsuyama, I., Nimmo, F., **Keane, J.T.**, Chan, N.H., Taylor, G.J., Wieczorek, M.A., Kiefer, W.S., Williams, J.G. GRAIL, LLR, and LOLA constraints on the interior structure of the Moon. *Geophysical Research Letters* **43**, 8365-8375.

2016 Thompson, M.S., Zega, T.J., Becerra, P., **Keane, J.T.**, Byrne, S., The oxidation state of Fe nanoparticles in the lunar soil. *Meteoritics and Planetary Science* **51**, 1082-1095.

2015 Siegler, M.A. Miller, R.S., **Keane, J.T.**, Matsuyama, I., Paige, D.A., Poston, J., Lawrence, D.J. Lunar true polar wander inferred from polar hydrogen. *Nature* **531**, 480-484.

2014 **Keane, J.T.**, Matsuyama, I. Evidence for lunar true polar wander and a past low-eccentricity synchronous lunar orbit. *Geophysical Research Letters* **41**, 6610-6619.

2014 **Keane, J.T.**, Pascucci, I., Espaillat, C., Woitke, P., Andrews, S., Kamp, I., Thi, W.-F., Meeus, G., Dent, W.R.F. Herschel Evidence for Disk Flattening or Gas Depletion in Transitional Disks. *The Astrophysical Journal* **787**, 153-177.

SCIENTIFIC ILLUSTRATIONS

(9 published scientific illustrations since 2017)

2018 **Keane, J.T.**, Sketch-up: Wandering exoplanets. *Nature Geoscience* (in press).

2018 **Keane, J.T.**, Sketch-up: Catastrophic glacier collapse. *Nature Geoscience* **11**, 87.

2017 **Keane, J.T.**, Sketch-up: Intra-Plate volcanism. *Nature Geoscience* **11**, 8.

2017 **Keane, J.T.**, Sketch-up: Carbon at continental rifts. *Nature Geoscience* **10**, 886.

2017 **Keane, J.T.**, Sketch-up: Southern Ocean mixing. *Nature Geoscience* **10**, 805.

2017 **Keane, J.T.**, Sketch-up: Impact-induced subduction. *Nature Geoscience* **10**, 716.

2017 **Keane, J.T.**, artwork for editorial, "Moving beyond Cassini," *Nature Astronomy* **1**, 557.

2017 **Keane, J.T.**, cover artwork for the Cassini grand finale issue, *Nature Astronomy* **1**, Issue 9.

2017 **Keane, J.T.**, Sketch-up: Snowstorms on Mars. *Nature Geoscience* **10**, 625.

INVITED PRESENTATIONS, SEMINARS, COLLOQUIA

(6 invited presentations since 2015)

2018 **Technologies for Exo-Planetary Science (NSERC CREATE, York University)**.

2018 **University of Texas Institute for Geophysics (UTIG) seminar**.

2018 **California Institute of Technology, Dix Planetary Science Seminar**, "The Wibbly-Wobbly Moon: Rotational Dynamics of the Moon over Time."

2018 **University of California Santa Cruz, Institute of Geophysics and Planetary Physics seminar**, "The Wibbly-Wobbly Moon: Rotational Dynamics of the Moon over Time."

2017 **California Institute of Technology, Yuk Yung Lunch Seminar**, "Pluto followed its heart: reorientation and faulting of Pluto due to volatile loading in Sputnik Planitia."

2015 **Lowell Observatory colloquium**, "Tidal/Rotational Dynamics of the Moon and Near-Earth Asteroids."

CONFERENCE PRESENTATIONS

(26 first author conference proceedings and 16 co-author conference proceedings since 2013)

2018 **Keane, J.T.**, Matsuyama, I. True Polar Wander of Mercury. Mercury: Current and Future Science of the Innermost Planet, Columbia, MD, USA.

2018 **Keane, J.T.**, Johnson, B.C., Matsuyama, I. Siegler, M.A. The Wibbly-Wobbly Moon: Rotational Dynamics of the Moon after Large Impacts. New Views of the Moon 2: Asia, Aizuwakamatsu City, Fukushima, Japan.

2018 **Keane, J.T.**, Johnson, B.C., Matsuyama, I. Siegler, M.A. The Tumbling Moon: Rotational Dynamics in the Aftermath of Impact Basin Formation. 49th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2018 **Keane, J.T.** Pluto and Ceres—Illustrated. 49th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2018 Ledbetter, W.G., Sood, R., **Keane, J.T.** The Interior Structure of Asteroids and Comets Revealed by ChipSat Swarm Gravimetry. 49th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2017 **Keane, J.T.**, Johnson, B.C., Matsuyama, I. Siegler, M.A. The Wibbly-Wobbly Moon: Rotational Dynamics of the Moon after Large Impacts. 49th Division for Planetary Sciences Meeting, Provo, Utah, USA.

2017 **Keane, J.T.**, Johnson, B.C., Matsuyama, I. Siegler, M.A. The Wibbly-Wobbly Moon: Rotational Dynamics of the Moon after Large Impacts. American Geophysical Union Fall Meeting, New Orleans, LA, USA.

2017 **Keane, J.T.**, Matsuyama, I. Reorientation Histories of the Moon, Mercury, Venus, and Mars. 12th European Planetary Science Congress, Riga, Latvia.

2017 **Keane, J.T.**, Matsuyama, I. Reorientation Histories of the Moon, Mercury, Venus, and Mars. 48th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2016 **Keane, J.T.**, Matsuyama, I. Reorientation Histories of the Terrestrial Planets. American Geophysical Union Fall Meeting, San Francisco, CA, USA.

2016 Matsuyama, I., **Keane, J.T.**, Kamata, S. Global-scale tectonic patterns on Pluto. American Geophysical Union Fall Meeting, San Francisco, CA, USA.

2016 **Keane, J.T.**, Matsuyama, I., Kamata, S., Steckloff, J. Pluto followed its heart: reorientation and faulting of Pluto due to volatile loading in Sputnik Planum. Joint 48th Division for Planetary Sciences & 11th European Planetary Science Congress Meeting, Pasadena, CA, USA.

2016 Matsuyama, I., **Keane, J.T.** Cassini State Transitions with a Fossil Figure. Joint 48th Division for Planetary Sciences & 11th European Planetary Science Congress Meeting, Pasadena, CA, USA.

2016 **Keane, J.T.**, Matsuyama, I., Kamata, S., Steckloff, J.K. Pluto Followed its Heart: Reorientation and Faulting of Pluto due to Volatile Loading in Sputnik Planum. Geologic Society of America Annual Meeting, Denver, CO, USA.

2016 **Keane, J.T.**, Matsuyama, I., Siegler, M.A. Impact-Driven True Polar Wander of the Moon and its Implications for the Long-Term Stability of Polar Volatiles. Geologic Society of America Annual Meeting, Denver, CO, USA.

2016 **Keane, J.T.**, Matsuyama, I., Siegler, M.A. New Insights into Lunar True Polar Wander. New Views of the Moon 2, Houston, TX, USA.

2016 Matsuyama, I., Nimmo, F., **Keane, J.T.**, Taylor, G.J., Chan, N.H., Williams, J.G., Wieczorek, M.A., Kiefer, W.S. GRAIL, LLR, and LOLA Constraints on the Interior Structure of the Moon. New Views of the Moon 2, Houston, TX, USA.

2016 **Keane, J.T.**, Matsuyama, I. Pluto followed its Heart: True Polar Wander of Pluto due to the Formation and Evolution of Sputnik Planum. 47th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2016 Siegler, M.A., **Keane, J.T.**, Laneuville, M., Chen, Y., Economos, R. Do Lunar Volatiles Record the Geophysical Evolution of the Moon? 47th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2015 **Keane, J.T.**, Siegler, M. A., Miller, R., Matsuyama, I., Paige, D. A., Poston, J., Lawrence, D. J. Hidden in the neutrons: physical evidence for lunar true polar wander. American Geophysical Union Fall Meeting, San Francisco, CA, USA.

2015 **Keane, J.T.**, Siu, H.C., Moskovitz, N.A., Binzel, R.P. Surprise! The oft-ignored Moon might actually be important for changing the spins of asteroids during Earth flybys. 47th Meeting for the Division for Planetary Sciences, National Harbor, MD, USA.

2015 Siu, H.C., **Keane, J.T.**, Siu, H.C., Moskovitz, N.A., Binzel, R.P. Effects of Earth Encounters on the Rotational Properties of Near-Earth Objects. 47th Meeting for the Division for Planetary Sciences, National Harbor, MD, USA.

2015 **Keane, J.T.**, Siegler, M. A., Miller, R., Matsuyama, I., Paige, D. A., Poston, J., Lawrence, D. J. Hidden in the neutrons: physical evidence for lunar true polar wander. SSERVI Exploration Science Forum, NASA Ames, Mountain View, CA, USA.

2015 **Keane, J.T.**, Matsuyama, I. Cleaning up degree-2: the contribution of impact basins and mascons to the gravity fields of the Moon, Mercury, and other terrestrial planets. 46th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2015 Siegler, M. A., Miller, R., **Keane, J.T.**, Matsuyama, I., Paige, D. A., Poston, J., Lawrence, D. J. Hidden in the neutrons: physical evidence for lunar true polar wander. 46th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2015 Thompson, M. S., Zega, T. J., **Keane, J.T.**, Becerra, P., Byrne, S. The oxidation state of Fe nanoparticles in the lunar soil: implications for space weathering processes. 46th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2015 Marcucci, E., Hays, L., Holstein-Rathlou, C., **Keane, J.T.**, Becerra, P., Basu, K., Davis, B., Fox, V.K., Herman, J.F.C., Hughes, A., Mendez Ramos, E., Nelessen, A., Neveu, M., Parrish, N.L., Scheinberg, A.L., Wrobel, J.S. Argus: a concept study for an Io observer mission from the 2014 NASA/JPL Planetary Science Summer School. 46th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2015 Zuber, M. T., Smith, D. E., Goosens, S. J., Andrews-Hanna, J., Head, J. W., Kiefer, W. S., Asmar, S. W., Konopliv, A. S., Lemoine, F. G., Matsuyama, I., McGovern, P. J., Melosh, H. J., Neumann, G. A., Nimmo, F., Phillips, R. J., Solomon, S. C., Taylor, G. J., Watkins, M. M., Wieczorek, M. A., Johnson, B. C., **Keane, J.T.**, Milkjović, K., Park, R. S., Soderblom, J. M., Blair, D. M., Mazarico, E., Yuan, D.-N. Gravity field of the Orientale Basin from the Gravity Recovery And Interior Laboratory (GRAIL). 46th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2015 **Keane, J.T.**, Matsuyama, I. Rejuvenating asteroids during planetary flybys: applications to (99942) Apophis and other near-Earth asteroids. 46th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2014 **Keane, J.T.**, Matsuyama, I. The Contribution of Impact Basins and Mascons to the Lunar Figure: Evidence for Lunar True Polar Wander and a Past Low-Eccentricity, Synchronous Lunar Orbit. American Geophysical Union Fall Meeting, San Francisco, CA, USA.

2014 Hays, L.E., Holstein-Rathlou, C., Becerra, P., Basu, K., Davis, B., Fox, V.K., Herman, J.F.C., Hughes, A.C.G., **Keane, J.T.**, Marcucci, E., Mendez Ramos, E., Nelessen, A., Neveu, M., Parrish, N.L., Scheinberg, A.L., Wrobel, J.S. Argus: an Io observer concept study from the 2014 NASA/JPL Planetary Science Summer. American Geophysical Union Fall Meeting, San Francisco, CA, USA.

2014 **Keane, J.T.**, Matsuyama, I. Rejuvinating NEOs: The Efficiency of Asteroid Resurfacing via Planetary Flybys. 46th Meeting for the Division for Planetary Sciences, Tucson, AZ, USA.

2014 Molaro, J., **Keane, J.T.**, Peacock, S., Schaefer, E., Tanquary, H. The Art of Planetary Science: An Exhibition – Bringing Together the Art and Science Communities to Engage the Public. 46th Meeting for the Division for Planetary Sciences, Tucson, AZ, USA.

2014 Becerra, P., Holstein-Rathlou, C., Hays, L., **Keane, J.T.**, Neveu, M., Basu, K., Davis, B., Mendez Ramos, E., Nelessen, A. Fox, V.K., Herman, J.F.C., Parrish, N.L., Hughes, A.C., Marcucci, E., Scheinberg, A., Wrobel, J.S. Argus: a concept study for an Io observer mission from the 2014 NASA/JPL Planetary Science Summer School. 46th Meeting for the Division for

Planetary Sciences, Tucson, AZ, USA.

2014 Spitz, A., Dykhuis, M., Platts, S., **Keane, J.T.**, Tanquary, H.E., Zellem, R., Hawley, T., Lauretta, D.S., Beshore, E., Bottke, W.F., Hergenrother, C., Dwornik, J.P., Patchell, R., Spitz, S.E., Bentley, Z. Communicating Science on YouTube and Beyond: OSIRIS-REx Presents 321Science! 46th Meeting for the Division for Planetary Sciences, Tucson, AZ, USA.

2014 **Keane, J.T.**, Matsuyama, I. The Contribution of Mascons to the Lunar Figure. 45th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2014 **Keane, J.T.**, Matsuyama, I. Hill Slope Failure as a Mechanism to Resurface Asteroids During Planetary Flybys. 45th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2014 Molaro, J., **Keane, J.T.** The Art of Planetary Science: an Exhibition – Bringing Together the Art and Science Communities to Engage the Public. 45th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2014 Spitz, A. H., Dykhuis, M., Platts, S., **Keane, J.T.**, Roper, H., Bentley, Z., Pachell, R., Spitz, S.E., OSIRIS-REx Launches 321Science – Engaging the Public in Science and Engineering Through YouTube Videos. 45th Lunar and Planetary Science Conference, The Woodlands, TX, USA.

2013 **Keane, J.T.**, Matsuyama, I. The Contribution of Mascons to the Lunar Figure. American Geophysical Union Fall Meeting, San Francisco, CA, USA.

2013 **Keane, J.T.**, Matsuyama, I. Hill Slope Failure as a Mechanism to Resurface Asteroids During Planetary Flybys. 45th Meeting for the Division for Planetary Sciences, Denver, CO, USA.

2013 **Keane, J.T.**, Pascucci, I., Andrews, S. M., Dent, W.R.F., Espaillat, C. Meeus, G., Thi, W.-F., Woitke, P. From Classical Disks to Transition Disks: An Increasing Dust-to-Gas Ratio? 221st Meeting of the American Astronomical Society, Long Beach, CA, USA.

SELECTED PRESS RELEASES AND NEWS ARTICLES

IMPACT-INDUCED REORIENTATION
(associated with Keane et al. 2018, in prep.)

2018 "The wibbly wobbly Moon," Nola Taylor Redd, *Astronomy Magazine*, 26 February 2018.

2017 "#DPS17: Wobbling the Moon and art by James Tuttle Keane," Emily Lakdawalla, *The Planetary Society Blog*, 24 October 2017.

SCIENTIFIC ILLUSTRATION
(articles about my scientific illustrations)

2018 "Thumbs Up Viz: Handcrafted," Robert Simmon, *Medium*, 4 February 2018.

TRUE POLAR WANDER OF PLUTO
(associated with Keane et al. 2016, *Nature*)

2016 "Planetary science: Pluto's telltale heart," Amy C. Barr, *Nature*, News & Views, 1 December 2016.

2016 "NASA's New Horizons Unveils Its Masterpiece: Pluto's Interior!" Ethan Siegel, *Forbes*, 22 November 2016.

2016 "Pluto's icy heart may hide an underground ocean," Sarah Kaplan, The *Washington Post*, 16 November 2016.

2016 "Pluto has a cold, wandering heart, and maybe a hidden ocean too," Deborah Netburn, *Los Angeles Times*, 16 November 2016.

2016 "Pluto's heart holds key to ocean beneath icy surface," Traci Watson, *USA Today*, 16 November 2016.

2016 "A Hidden Ocean Beneath Pluto's Icy Heart," Rebecca Boyle, *The Atlantic*, 16 November 2016.

2016 "Pluto's Frozen Heart may hide an Ocean Inside," Sarah Fecht, *Popular Science*, 16 November 2016.

2016 "Pluto's icy surface may conceal a vast ocean, say researchers," Nicola Davis, *The Guardian*, 16 November 2016.

2016 "A Heavy Heart May Have Rolled Pluto Over," Kenneth Chang, *The New York Times*, 16 November 2016

2016 "How Pluto Got Its Mysterious Heart," Maddie Stone, *Gizmodo.com*, 16 November 2016.

2016 "How the Pull of an Icy 'Heart' Sent Pluto's Poles Wandering," Ben Panko, *Smithsonian.com*, 16 November 2016.

2016 "Pluto's Icy Heart Broke Pluto," Emma Grey Ellis, *Wired.com*, 16 November 2016.

2016 "Pluto's Wandering Heart Hints at a Subsurface Ocean," Mike Wall, *Space.com*, 16 November 2016.

2016 "Pluto's Icy Heart May Hide an Ocean," Lee Billings, *Scientific American*, 16 November 2016.

2016 "Pluto 'has slushy ocean', below surface," Paul Rincon, *BBC News*, 16 November 2016.

2016 "Pluto's cold heart could be hiding an OCEAN: Dwarf planet's strange spin points to a subsurface sea," Harry Pettit, *DailyMail.com*, 16 November 2016.

2016 "Cracked, frozen and tipped over: New clues from Pluto's past," *ScienceDaily.com*, 16 November 2016.

2016 "Cracked, Frozen and Tipped Over: New clues from Pluto's past," *UA News*, 16 November 2016.

2016 "Icy heart could be key to Pluto's strange geology," Alexandra Witze, *Nature News*, 21 October 2016.

2016 "DPS/EPSC update on New Horizons at the Pluto system and beyond," Emily Lakdawalla, *Planetary Society Blog*, 26 October 2016.

2016 "Pluto May Have a Wandering Heart," Nola Taylor Redd, *Smithsonian Magazine*, 30 March 2016.

2016 "Pluto Follows Its Cold, Cold Heart," Daniel Stolte, *UA News*, 28 March 2016.

TRUE POLAR WANDER OF THE MOON RECORDED IN POLAR VOLATILES
(associated with Siegler et al. 2016, *Nature*)

2016 "Planetary science: Signs of a wandering Moon," Ian Garrick-Bethell, *Nature*, News & Views, 24 March 2016.

2016 "Moon's tilt changed by volcanic activity over three billion years ago," Nicola Davis, *The Guardian*, 23 March 2016.

2016 "Tales of a Tilting Moon Hidden in Its Polar Ice," Daniel Stolte, *UA News*, 23 March 2016.

2016 "Volcanic activity may have shifted the moon's axis" Rachel Feltman, *The Washington Post*, 23 March 2016.

2016 "Did the moon once flop over on its side? Well here's what scientists say," Lee Roop, *Al.com*, 23 March 2016.

2016 "The Moon spun on a different axis billions of years ago, study finds," Loren Grush, *The Verge*, 23 March 2016.

2016 "Earth's moon wandered off axis billions of years ago, study finds," *Phys.org*, 23 March 2016.

2016 "Moon used to spin 'on different axis,'" *BBC News*, 23 March 2016.

2016 "Moon's lack of water down to ancient shift in its spin axis," Rebecca Boyle, *New Scientist*, 23 March 2016.

2016 "Volcanoes may have caused the Moon's poles to wander, according to ancient ice deposits," Dani Cooper, *ABC News*, 23 March 2016.

2016 "The moon's poles have no fixed address," Christopher Crockett, *ScienceNews*, 23 March 2016.

2015 "Lopsided ice on the moon points to past shift in poles," Eric Hand, *Science News*, 19 March 2015.

THE MOON'S FOSSIL FIGURE
(associated with Keane & Matsuyama 2014, *Geophysical Research Letters*)

2015 "How Did the Moon Get Its Shape?" Catherine Minnehan, *AGU Research Spotlight*, 23 June 2015.

THE ART OF PLANETARY SCIENCE
(a University of Arizona planetary science themed art show that I helped to organize and run)

2015 "UA Students Bring Together Art, Science," Rebecca Peiffer, *University of Arizona News*, 5 November 2015.

2015 "See astronomy-inspired art this weekend at the Lunar and Planetary Laboratory's Art of Planetary Science exhibit," Mikayla Mace, *The Daily Wildcat*, 15 October 2015.

2014 "At the intersection of Art and Science," *University of Arizona News*, 22 October 2014.

2014 "UA hosts art show exploring beauty in science," Dan Desrochers, *Arizona Daily Star*, 14 October 2014.

321SCIENCE
(an OSIRIS-REx outreach program that I helped to execute)

2014 "YouTube for Science," Anna H. Spitz, *Mercury*, Vol. 44, No. 1, Winter 2015.

PROFESSIONAL ACTIVITIES AND SERVICE

2017—present **Reviewer for publications**: *Journal of Geophysical Research: Planets*, *Icarus*.

2017—present **Grant proposal reviewer**: NASA Solar System Workings (SSW) program, NASA Astrobiology Program, NASA Earth Space Science Fellowship (NESSF) program.

2014—2017 **University of Arizona, Department of Planetary Science Departmental Life Committee (DLC)**, graduate student representative for a committee that assessed the quality of life, student-advisor relationships, biases and harassment within the department.

2014—2016 **University of Arizona, Department of Planetary Sciences Graduate Student Colloquia**, graduate student organizer.

2010—2011 **University of Maryland, Campus Student Technology Fee Advisory Committee**, college representative—reviewed proposals for usage of the campus student technology fee, particularly with respect to innovative programs.

2010 **University of Maryland, Enhancing Computational Abilities with MATLAB**, volunteer coder—developed instructional MATLAB scripts for use with astronomy major courses, in order to bolster computational strength of the undergraduate class.

2009 **University of Maryland, College of Computer, Mathematical, and Physical Science Student Technology Advisory Committee**, astronomy department representative—reviewed proposals for the college's expenditure of their portion of the campus student technology fee, particularly with respect to innovative programs.

PROFESSIONAL AFFILIATIONS

2014—present International Association of Astronomical Artists (IAAA), Journeyman.
2014—2017 University of Arizona Theoretical Astrophysics Program (TAP), Graduate Student Member.
2013—present American Geophysical Union (AGU), Member.
2010—present American Astronomical Society (AAS), Junior Member.
2010—present AAS Division of Dynamical Astronomy (DDA), Junior Member.
2010—present AAS Division for Planetary Sciences (DPS), Junior Member.

TEACHING EXPERIENCE

2012, 2013, 2016 Guest Lecturer (University of Arizona), developed and presented guest lectures for: PTYS170B1: The Universe and Humanity: Origins & Destiny (Dr. Caitlin Griffith); PTYS170A1: Planet Earth: Evolution of a Habitable Planet (Dr. Isamu Matsuyama).

2012, 2016 Graduate Teaching Assistant (University of Arizona), assisted with in-class activities, tutoring students, running review sessions, and grading assignments for: PTYS170B1: The Universe and Humanity: Origins & Destiny (Dr. Caitlin Griffith); PTYS170A1: Planet Earth: Evolution of a Habitable Planet (Dr. Isamu Matsuyama).

2008—2010 Undergraduate Teaching Assistant (University of Maryland), assisted with in-class activities, tutoring students, running review sessions, creating and grading assignments, and developing lab exercises for: ASTR100: Introduction to Astronomy (Dr. Stacy McGaugh, Dr. Douglas P. Hamilton, Dr. Melissa Hayes-Gehrke), ASTR101: General Astronomy (Dr. Christopher Hunt), ASTR220: Collisions in Space (Dr. Melissa Hayes-Gehrke).

PUBLIC OUTREACH

2016 Tucson Amateur Astronomy Association, guest speaker—presented results related to Keane et al. 2016, *Nature*, in a talk titled: "A Tale of a Tipping Moon, Recorded in Lunar Ice."

2016 Space Drafts / Art on Tap, guest speaker—presented the results of the NASA GRAIL mission.

2015 Space Drafts / Art on Tap, artist—created graphics, posters, and t-shirts for this public astronomy lecture series.

2014—2015 Pima Air and Space Museum, guest speaker—developed mini lectures and activities explaining lunar phases for Tucson middle school students.

2014—present Astronomy Camp, camp counselor for Advanced Camp (ages 14-19)—responsible for campers' safety, astronomy education, and developing observational projects using facilities at the Kitt Peak National Observatory (including the 0.9-meter WIYN, Steward Observatory 90" Bok, and 16"-20" telescopes).

2013—2017 The Art of Planetary Science, organizer—developed, advertised, and ran a multi-night planetary science themed art show at the University of Arizona Lunar and Planetary Laboratory, which included the involvement of >200 artists, and an event with >500 persons in attendance, and managing a budget of several thousand dollars.

2013—2015 321Science, artist—developed and executed a series of planetary science themed "fast-draw" YouTube videos, for education and public outreach associated with the OSIRIS-REx mission and Lunar and Planetary Laboratory.

2013—2016 Tucson Festival of Books, volunteer

2013—2016 International Observe the Moon Night, volunteer

2012—2013 Starlight Science Cinema, volunteer and artist—assisted with organization and running of a monthly science-themed movie night, including the development of posters and graphics for advertisement.

2012—2017 OSIRIS-REx, "ambassador" —volunteer representative for OSIRIS-REx outreach events.

2012—2016 Summer Science Saturday/Sunday, volunteer—developed posters, graphics, and educational activities for K-12 students focusing on the robotic exploration of the solar system.

2012 Math, Science, and Technology Funfest, volunteer

2012 Science and Astronomy Expo, volunteer

2012 Science Downtown, art director and volunteer—helped to organize and run two large (>300 persons) planetary science themed events for K-12 students, including the development of original graphics for all museum activities and advertisement.

2009 Space Camp Turkey, İzmir, Turkey, counselor for international youth (ages 9-18)—responsible for campers' safety, astronomy and space exploration education, developed new educational programs, and revamped the science curriculum

2007—2011 AstroTerps, member and volunteer—helped run various public outreach events, including "Maryland Day" activities.

2007—2008 Explore the Universe, volunteer and student mentor—assisted local high school students with science fair projects involving the use of the University of Maryland Observatory.

2007 Association des Jeunes Engagés pour la Promotion de la Santé, Maroua, Cameroon, volunteer—worked with HIV-positive youth in improving their public image through the design and painting of large building mural.