

Dr. Kimberly M. Moore

Contact: kmmoore@caltech.edu

EDUCATION

Harvard University, Cambridge, MA

PhD in Earth & Planetary Science, 2020

Thesis: *"Constraining planetary interior structure and evolution using magnetic fields and rotational dynamics"*

Teaching Certificate, Harvard Derek Bok Center for Teaching & Learning, 2019

Yale University, New Haven, CT

B.S. in Applied Physics, 2014

Magna cum laude & departmental distinction

FELLOWSHIPS

2020-Present Heising-Simons Foundation, 51 Pegasi b Fellowship in Planetary Astronomy

2019 Harvard Graduate School of Arts & Sciences Merit Fellowship

2015-2018 National Defense Science & Engineering Graduate Fellowship (NDSEG)

2014-2015 Harvard Smith Family Graduate Fellowship for Science & Engineering

2012 Yale Alan S. Tetelman 1958 Fellowship for International Research in the Sciences

2012 Yale Spanish and Latin American Studies Fellowship

AWARDS

2018, 2017 American Geophysical Union Outstanding Student Presentation Award

2017 Harvard Earth & Planetary Sciences Shaler Teaching Award

2016, 2017 Harvard Certificate of Distinction in Teaching Award

2014 Yale Applied Physics Award

2013 American Geophysical Union Student Travel Grant

2010 Intel Science Talent Search Semifinalist

2010 National Merit Finalist

APPOINTMENTS

2020-Present 51 Pegasi b Postdoctoral Fellow in Planetary Astronomy, Caltech

2014-2020 Graduate Researcher, Harvard University, Dept. of Earth & Planetary Sciences

2019 Principal Investigator, NASA JPL Planetary Science Summer Seminar

Mission: *"BRIDGE to the Stars: Mission to an Interstellar Object"*

2013-2014 Student Researcher, Yale University, Dept. of Mechanical Engineering

2013 Student Researcher, NASA Student Airborne Research Program

2011-2012 Student Researcher, Yale University, Dept. of Applied Physics

2009-2011 Student Researcher, U.S. Naval Research Laboratory, D.C., Acoustics Division

PUBLICATIONS

IN PROGRESS

Moore, K. M., Bolton, B., Cao, H., Dougherty, M. K., & Bloxham, J. (In Review).

PUBLISHED

10. **Moore, K. M.**, Courville, S., Ferguson, S., Schoenfeld, A., Llera, K., Agrawal, R., Buhler, P., Brack, D., Connour, K., Czapinski, E., DeLuca, M., Deutsch, A., Hammond, N., Kuettel, D., Marusiak, A., Nerozzi, S., Stuart, J., Tarnas, J., Thelen, A., Castillo-Rogez, J., Smythe, W., Landau, D., Mitchell, K., & Budney, C. (2021). Bridge to the stars: A mission concept to an interstellar object. *Planetary and Space Science* **197**, 105137.
9. **Moore, K.M.**, Cao, H., Bloxham, J., Stevenson, D. J., Connerney, J. E. P., and Bolton, S. J. (2019). Time variation of Jupiter's magnetic field consistent with zonal wind advection. *Nature Astronomy* **3**, 730-735.
8. **Moore, K. M.**, Yadav, R., Cao, H., Kulowski, L., Bloxham, J., Connerney, J. E. P., Kotsiaros, S., Jorgensen, J. L., Merayo, J. M. G., Stevenson, D. J., Bolton, S. J., & Levin, S. M. (2018). Hemispheric dichotomy of Jupiter's magnetic field indicative of a complex Jovian dynamo. *Nature* **561**, 76-78.
7. Connerney, J. E. P., Kotsiaros, S., Oliverson, R. J., Espley, J. R., Joergensen, J. L., Joergensen, P. A., Merayo, J. M. G., Herceg, M., Bloxham, J., **Moore, K. M.**, Bolton, S. J., & Levin, S. M. (2018). A new model of Jupiter's magnetic field from Juno's first nine orbits. *Geophysical Research Letters* **45**, 2590-2596.
6. **Moore, K. M.**, & Bloxham, J. (2017). The construction of sparse models of Mars' crustal magnetic field. *Journal of Geophysical Research*. DOI: 10.1002/2016JE005238
5. **Moore, K. M.**, Bloxham, J., Connerney, J. E. P., Jorgensen, J. L., & Merayo, J. M. G. (2017). The analysis of initial Juno magnetometer data using a sparse magnetic field representation. *Geophysical Research Letters*, **44**, DOI: 10.1002/2017GL073133
4. **Moore, K. M.**, Chan, N. H., Daradich, A., & Mitrovica, J. X. (2017). Time-dependent rotational stability of dynamic planets with viscoelastic lithospheres. *Icarus*, **289**, 34-41. DOI: 10.1016/j.icarus.2017.01.036
3. Liu, J., Liu, Y., Gong, P., Li, Y., **Moore, K. M.**, Scanley, E., Walker, F., Broadbridge, C. C., & Schroers, J. (2015). Combinatorial exploration of color in gold-based alloys. *Gold Bulletin*, doi: DOI 10.1007/s13404-015-0167-z
2. Martin, T. P., Layman, C. N., **Moore, K. M.**, & Orris, G. J. (2012). Elastic shells with high-contrast material properties as acoustic metamaterial components. *Phys. Rev. B* **85**, 161103.

1. Layman, C. N., Martin, T. P., **Moore, K. M.**, Calvo, D. C., & Orris, G. J. (2011). Designing acoustic transformation devices using fluid homogenization of an elastic substructure. *Appl. Phys. Lett.*, 99, 163503.

WHITE PAPERS

3. **Moore, K. M.**, Castillo-Rogez, J., Meech, K., Courville, S. W., Donitz, B., Ferguson, S., Llera, K., & French, R. (2020). Rapid Response Missions to Explore Fast, High-Value Targets such as ISOs and LPCs. *White Paper submitted to the 2023-2032 Planetary Science and Astrobiology Decadal Survey*.
2. Donitz, B. P. S., Meech, K. J., Castillo-Rogez, J., **Moore, K. M.**, Courville, S. W., Ferguson, S., Llera, K., & Balint, T. (2020). New Frontiers Mission Concept Study to Explore Oort Cloud Comets. *White Paper submitted to the 2023-2032 Planetary Science and Astrobiology Decadal Survey*.
1. Villarreal M., Lillis, R., Luhmann, J. G., Lee, C. O., O'Rourke, J. G., Oran, R., **Moore, K. M.**, and Raymond, C. A. (2020). The Importance of Plasma and Magnetic Investigations in Small Body Missions. *White Paper submitted to the 2023-2032 Planetary Science and Astrobiology Decadal Survey*.

INVITED SCIENTIFIC TALKS & SEMINARS

- 3/2021 **Princeton**, Department of Geosciences, Geodynamics Seminar (virtual). "Time-variation of the magnetic fields of Jupiter and Saturn"
- 3/2021 **MIT**, Department of Earth, Atmospheric, and Planetary Sciences, Colloquium (virtual). "Time-variation of the magnetic fields of Jupiter and Saturn"
- 12/2020 **American Geophysical Union Fall Meeting**, San Francisco, CA (virtual). "What Jupiter's magnetic field reveals about the planet's interior"
- 11/2020 **2023-2032 Planetary Science & Astrobiology Decadal Survey, Panel on Small Solar System Bodies** (virtual). "Rapid response missions to explore fast, high-value targets such as interstellar objects and long period comets"
- 10/2020 **University of California, Santa Cruz**, Departments of Astronomy & Astrophysics & Earth & Planetary Sciences, Planetary Lunch Colloquium (virtual). "Time-variation of Jupiter and Saturn's magnetic fields"
- 8/2020 **Heising-Simons Foundation, 51 Pegasi b Virtual Summit**. "New perspectives on Jupiter from NASA Juno"
- 12/2019 **American Geophysical Union Fall Meeting**, San Francisco, CA. "Secular variation of Jupiter's magnetic field"
- 10/2019 **Harvard University**, Center of Mathematical Sciences & Applications, Fluid Dynamics Seminar. "Using magnetic fields to investigate Jupiter's fluid interior".
- 9/2019 **Lockheed Martin Space**, Denver, CO. "Constraining planetary interiors with magnetic fields".
- 8/2019 **Johns Hopkins University**, Department of Earth & Planetary Sciences. "Constraining planetary interiors with magnetic fields".

- 8/2019 **Applied Physics Laboratory (JHU-APL)**, Baltimore, MD. “Constraining planetary interiors with magnetic fields”.
- 7/2019 **IUGG General Assembly (IUGG Centennial)**, Montreal, Canada. “Time-variation of Jupiter’s internal magnetic field consistent with zonal wind advection”.
- 5/2019 **Caltech**, Division of Geological & Planetary Sciences, Planetary Science Seminar. “Constraining planetary interiors with magnetic fields”.
- 4/2019 **Yale University**, Department of Geology & Geophysics, Atmosphere, Oceans, and Climate Dynamics Seminar. “Using magnetic fields to constrain Jupiter’s atmospheric dynamics”.
- 4/2019 **European Geophysical Union General Assembly**, Vienna, Austria. “Time-variation of Jupiter’s internal magnetic field consistent with zonal wind advection”.
- 3/2019 **MIT**, Department of Earth, Atmospheric, & Planetary Sciences, Colloquium. “Constraining planetary interiors with magnetic fields”.
- 7/2018 **Study of the Earth’s Deep Interior (SEDI)**, Edmonton, Canada. “Dynamo implications of Jupiter’s magnetic field morphology”.
- 6/2018 **Asia Oceania Geosciences Society**, Honolulu, HI. “Dynamo implications of Jupiter’s magnetic field morphology”.
- 12/2017 **American Geophysical Union Fall Meeting**, New Orleans, LA. “Analysis of initial Juno magnetometer data: Use of an elastic net to probe small-scale dynamo structure”.
- 10/2017 **MIT**, Department of Earth, Atmospheric, & Planetary Sciences, Planetary Colloquium, 2017. “Sparse math methods for planetary magnetic field analysis: Results from Mars & NASA Juno”.

PROFESSIONAL SERVICE

- Reviewer: *Earth, Planets, Space*
Geophysical Research Letters
Journal of Geophysical Research: Planets
Journal of Geophysical Research: Space Physics
- Member: American Geophysical Union
 Association for Women Geoscientists
 Outer Planets Assessment Group
 Small Bodies Assessment Group
- Convener: AGU Fall Meeting (2019 & 2020; Primary Convener x2)
 EGU General Assembly (2020, 2021)
 IAGA-IASPEI Joint Scientific Assembly (2021)
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TEACHING & MENTORING

Teaching Certificate, Harvard University, Derek Bok Center for Education & Learning, 2019

TEACHING EXPERIENCE

- Fall 2020 **Physics Tutor** (Pasadena City College)
Pilot program, virtual tutoring for calc and non-calc- introductory physics classes
- Spring 2020 **Instructor & Course Leader** (Harvard, Derek Bok Center for Teaching & Learning)
“Communicating Science”
Designed & taught 6-week graduate seminar (w/ PhD candidate Kari Taylor-Burt)
- Pedagogy Fellow** (Harvard, Derek Bok Center for Education & Learning)
Teaching consultant for the university—led teaching seminars and workshops,
and performed teaching observations/evaluations
- 2016-2018 **Teaching Fellow** (Harvard University)
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|---|----------------------|
| EPS 10 A Brief History of the Earth (Prof. Jerry Mitrovica) | Fall 2018, Fall 2017 |
| An undergraduate survey class of Earth history | |
| EPS 52 Global Geophysics: A Primer (Prof. Jerry Mitrovica) | Fall 2016 |
| An undergraduate introduction to geophysics | |

MENTORSHIP EXPERIENCE

Research Mentor:

- 2019 A. Sheat (Undergraduate, Cambridge University)
 B. Bolton (High School Student, Texas)

Academic/Career Mentor:

- 2021-present, Pasadena City College, Natural Sciences STEM Center & MESA (Pilot Program)
2020 (Oct), Caltech FUTURE Ignited Program
 Demystifying the PhD application process to promote diversity in STEM

TEACHING & MENTORING WORKSHOPS (Presenter and/or Organizer)

- 9/23/2020 **Caltech 2020 Teaching Conference** (Small group discussion leader, Caltech CTLO)
 Provided virtual training to new Caltech graduate students on best practices for teaching
- 8/4/2020 **Inclusive classrooms beyond the classroom** (Co-organizer, Caltech CTLO)
 A discussion about inclusive fieldwork
- 4/30/2020 **Equity in online education** (Discussion leader, Harvard Bok Center)
 A discussion emphasizing issues faced by first-generation students in online education
- 10/3/2018, 10/31/2017 **How to get an undergraduate summer research internship**
 (Organizer & discussion leader x2, Harvard EPS Department)
 Annual panel to inspire/inform students & increase Dept recruitment

TEACHING & MENTORING TRAINING (Attendee)

- 12/21/2020 **Mentoring Do's & Don'ts** (Pasadena City College Mentorship Program)
- 10/8/2020 **How to break the ice in Zoom and remote classes** (Caltech CTLO)
- 8/11/2020 **Presenting in a remote world** (Caltech CTLO)
- 4/28/2020 **Trauma-informed pedagogy: Teaching in uncertain times**
(Magna Online Seminars, Dr. Mays Imad)
- 3/27/2020 **Online teaching** (Harvard Bok Center)
- 3/05/2020 **Teaching with objects and images** (Harvard Bok Center, Harvard Art Museum)
- 2/28/2020 **Course and assignment design** (Harvard Bok Center)
- 1/31/2020 **Disciplinary transparency: Curriculum and taxonomies"** (Harvard Bok Center)
- 2019-2020 **Harvard Museums of Science & Culture: Science Education Partner**
Multi-day science communication workshop, with ongoing museum outreach role
- Fall 2019 **Foundations of teaching in STEM** (Harvard Bok Center, 6-week seminar)
- Spring 2019 **Let's Play! What games can teach us about motivation & engagement**
(Harvard Bok Center, 6 week seminar)
- 1/10/2019 **Mentoring undergraduates** (Harvard FAS, Science Education)
Developing research projects, recommendation letters, fellowships, diversity & inclusion
- 9/05/2017 **Teaching fellow training lunch** (Harvard Earth & Planetary Science Dept)
- 2/22/2017 **Tricky situations** (Harvard EPS Dept, Prof. John Shaw)
- 8/30/2016 **First-time teaching fellow workshop** (Harvard EPS Dept)
- Spring 2015 **First-year teaching seminar series** (Harvard EPS Dept; multi-week)

OUTREACH

- 2021 **Co-Organizer**, Astronomy Night, Sierra Madre Middle School, Pasadena, CA
- 2021 **Guest Speaker (Video)**, LabXChange (Online open-education STEM learning platform)
- 2020-present **Volunteer**, Pasadena City College
- 2020 **Guest Speaker (Television)**, "How the Universe Works", Season 8 Ep. 6, Science Channel
- 2019-2020 **Harvard Museums of Science & Culture—Science Education Partner**
Gallery Guide, Ongoing volunteer role with the mineral gallery
Co-Planner & Volunteer, Space Week (K-2nd grade) (Summer 2019)
Volunteer, A Lunar Soirée (50-year anniversary of Apollo 11) (2019)
Volunteer, I Heart Science Festival—Tabletop science demo (2019)
Volunteer, Family Science Festival—Tabletop science demo (2019)
- 2017 **Volunteer**, Cambridge Public Schools 8th Grade Science & Engineering Showcase
- 2017 **Physical Sciences Panelist**, E3 (mentorship program for high school girls)
- 2017 **Lab Tour**, 2017 APS Conference for Undergraduate Women in Physics
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SCIENTIFIC WORKSHOPS

- 2020 Ice Giants System 2020 (Royal Society Meeting), London, UK, Jan. 20-21.
2019 NASA JPL Planetary Science Summer Seminar (Role: Principal Investigator)
2018 Rayleigh tutorial (magnetohydrodynamics/dynamo code), Boulder, CO, Sept. 15.
2015 ASPECT Hackathon (mantle convection code), Bodega Bay, CA, May 19-30.

SELECTED PRESS

FILM/TELEVISION

- 2020 How the Universe Works, Season 8 Episode 6: “When NASA met Jupiter”

PRESS CONFERENCES

- Panelist, “The New Jupiter: A Mid-Mission Report on the Discoveries of NASA’s Juno”. American Geophysical Union Fall Meeting, December 2018.

ARTICLES

- 2020 How to plan a space mission (*The New Yorker*)
2019 Feedback between Jupiter’s atmosphere and magnetic environment
(*Nature Reviews Physics News & Views*)
NASA’s Juno finds changes in Jupiter’s magnetic field (*NASA Press Release*)
2018 Jupiter’s bizarre magnetic field is unlike anything scientists have ever seen (*NBC News*)
Jupiter’s dynamo is unlike any other (*Physics Today*)
Jupiter’s magnetic field revealed by the Juno spacecraft (*Nature News & Views*)
Jupiter’s magnetic field has weird structure (*Sky & Telescope*)
Jupiter’s magnetic field is surprisingly weird (*Science News*)
2017 Jupiter’s secrets revealed by NASA probe (*Nature*)
Juno Reveals Jupiter’s Deep Secrets (*Scientific American*)

ADDITIONAL CONFERENCE PROCEEDINGS (FIRST OR PRESENTING AUTHOR)

* indicates the presenting author

- Moore, K.M.**, Courville, S.W., Connour, K., Ferguson, S., Agrawal, R., Brack, D., Buhler, P., Czapinski, E., DeLuca, M., Deutsch, A., Hammond, N., Llera, K., Marusiak, A., Nerozzi, S., Schoenfeld, A., Tarnas, J., Thelen, A., Stuart, J., Castillo, J., Landau, D., Smythe, W., Budney, C., Mitchell, K. (2020). Bridge to the stars: A mission concept to an interstellar object. American Geophysical Union Fall Meeting, San Francisco, CA, Dec 7-11.
- Moore, K.M.***, Cao, H., Bloxham, J., Stevenson, D. J., Connerney, J. E. P., & Bolton, S. J. (2019). Connecting Jupiter’s atmosphere and magnetic field. American Geophysical Union Fall Meeting, Washington, D. C., Dec 9-13.
- Moore, K.M.***, Cao, H., Bloxham, J., Stevenson, D. J., Connerney, J. E. P., & Bolton, S. J. (2019). Connecting Jupiter’s atmosphere and magnetic field: Wind-driven advection of the

- Great Blue Spot. EPSC-DPS Joint Meeting, Geneva, Sept 15-20. Oral presentation.
- Bloxham, J., **Moore, K.M.***, Yadav, R. K., Kulowski, L., Cao, H., Connerney, J. E. P., Kotsiaros, S., Jorgensen, J. L., Merayo, J. M. G., Stevenson, D. J., Bolton, S. J., & Levin, S. M. (2018). Secular variation of Jupiter's magnetic field. American Geophysical Union Fall Meeting, Washington, D. C., Dec 11-15. Poster presentation. PS43D-3804.
- Moore, K.M.***, Cao, H., Bloxham, J., Stevenson, D. J., & Connerney, J. E. P. (2018). Secular variation of Jupiter's magnetic field. American Geophysical Union Fall Meeting, Washington, D. C., Dec 11-15. Oral presentation.
- Moore, K.***, Yadav, R., Kulowski, L., Cao, H., Bloxham*, J., Connerney, J. E. P., Kotsiaros, S., Jorgensen, J. L., Merayo, J. M. G., Stevenson, D. J., Bolton, S. J., & Levin, S. M. (2018). Jupiter's magnetic field morphology and implications for its dynamo. European Planetary Science Congress, Berlin, Germany, Sept 16-21, 2018. Oral presentation.
- Moore, K.***, Bloxham, J., Connerney, J., Jørgensen, J., Merayo, J., Levin, S., & Bolton, S. (2018). Implications of Initial Juno Magnetic Field Models for the Jovian Dynamo. European Geophysical Union General Assembly, Vienna, April 8-13, 2018. Oral presentation: PS3.2.
- Moore, K.***, Bloxham, J., Connerney, J. E. P., Jørgensen, J. L., & Merayo, J. M. G. (2018). Analysis of Juno magnetometer data: Use of an elastic net to probe small-scale dynamo structure. Jupiter Day, Boston University, Jan 10, 2018. Oral presentation.
- Moore, K.**, Bloxham, J.*, Connerney, J. E. P., Jørgensen, J. L., & Merayo, J. M. G. (2017). Juno at Jupiter: Initial Magnetic Field Results. Fifty years after Roberts' MHD: Dynamos and planetary flows today, Royal Astronomical Society, Piccadilly, London, Nov 16-17, 2017. Oral presentation.
- Moore, K.**, Bloxham, J.*, Connerney, J. E. P., Jørgensen, J. L., & Merayo, J. M. G. (2017). Analysis of initial Juno magnetometer data: Use of an elastic net to probe small-scale structure. IAGA, Cape Town, South Africa, Aug 27-Sept 1, 2017. Oral presentation.
- Moore, K.**, Bloxham, J.*, Connerney, J. E. P., Jørgensen, J. L., & Merayo, J. M. G. (2017). Analysis of initial Juno magnetometer data: Use of an elastic net to probe small-scale structure. Asia Oceania Geosciences Society, Singapore, Aug 6-11, 2017. Poster: PS08-A001.
- Moore, K.**, Bloxham, J.*, Connerney, J. E. P., Jørgensen, J. L., & Merayo, J. M. G. (2017). Analysis of initial Juno magnetometer data using a new method of magnetic field analysis. European Geophysical Union General Assembly, Vienna, April 23-28, 2017. Invited Poster: EGU2017-3783.
- Moore, K.***, & Bloxham, J. (2017). The construction of sparse models of Mars' crustal magnetic field. European Geophysical Union General Assembly, Vienna, April 23-28, 2017. Poster: EGU2017-3787
- Moore, K.***, & Bloxham, J. (2017). The construction of sparse models of Mars' crustal magnetic field. European Geophysical Union General Assembly, Vienna, April 23-28, 2017. Poster: EGU2017-11349
- Moore, K.***, Chan, N.-H., Daradich, A., & Mitrovica, J. (2017). Long-term rotational stability of terrestrial planets with viscoelastic lithospheres: Theory and application to Martian True Polar Wander (TPW). European Geophysical Union General Assembly, Vienna, April 23-28, 2017. Poster: EGU2017-11349
- Chan, N.-H., **Moore, K.***, Daradich, A., & Mitrovica, J. (2016). The long-term rotational stability of terrestrial planets with viscoelastic lithospheres: A new theory with application to

Mars. American Geophysical Union Fall Meeting, San Francisco, Dec 12-16, 2016. Oral presentation: Abstract #167669.

Moore, K.*, & Bloxham, J. (2016). The construction of sparse models of Mars' crustal magnetic field. American Geophysical Union Fall Meeting, San Francisco, Dec 12-16, 2016. Poster: #149373.

Moore, K*., Broughton, J., & Kudela, R.M. (2013). *Remote sensing of Akashiwo sanguinea in the vertical column*. American Geophysical Union Fall Meeting, San Francisco, Dec 9-13, 2013. Poster: #OS33A-1742