

Curriculum Vitae

Kaveh Pahlevan

CONTACT INFORMATION

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EDUCATION

2010 Ph.D., Planetary Science, California Institute of Technology
2006 M.S., Planetary Science, California Institute of Technology
2004 B.S., Astronomy with Honors, University of Maryland

ACADEMIC APPOINTMENTS

2019 – Principal Investigator, Carl Sagan Center, The SETI Institute
2018 – 19 Visiting Faculty, Earth & Space Exploration, Arizona State University
2016 – 18 Asst Research Scientist, Earth & Space Exploration, Arizona State University
2013 – 15 Poincaré Fellow, Lagrange Laboratory, Observatoire de la Côte d'Azur, Nice
2010 – 13 Bateman Fellow, Geology and Geophysics, Yale University

HONORS, GRANTS, AND AWARDS

2021 NASA Solar System Workings Proposal (PI, \$178,027, active)
2018 NASA Emerging Worlds Proposal (PI, \$144,601, active)
2015 Nature Editor's Choice (for Nature paper published in the same year)
2013 Henri Poincaré Fellowship (Observatoire de la Côte d'Azur)
2010 Bateman Postdoctoral Fellowship (Yale University)
2010 Institute Postdoctoral Fellowship (ETH Zurich – respectfully declined)
2007 Nature Research Highlights (for EPSL paper published in same year)
2004 Institute Research Fellowship (Caltech)

PEER-REVIEWED PUBLICATIONS

2023 Canup, R., Richter, K., Dauphas, N., **Pahlevan, K.**, Ćuk, M., Lock, S., Stewart, S.T., Salmon, J., Rufu, R., Nakajima, M., Magna, T. Origin of the Moon, *Reviews in Mineralogy and Geochemistry*, 89(1): 53-102.
2022 **Pahlevan, K.**, Schaefer, L., Elkins-Tanton, L., Desch, S., Buseck, P. A primordial origin of hydrospheric deuterium enrichment on Mars, *Earth & Planetary Science Letters*, 595, 117772.
2019 **Pahlevan, K.**, Schaefer, L., Hirschmann, M.M. Hydrogen isotopic evidence for early oxidation of silicate Earth, *Earth & Planetary Science Letters*, 526, 115770.
2018 Wu, J., Desch, S., Schaefer, L., Elkins-Tanton, L., **Pahlevan, K.**, Buseck, P.

Origin of Earth's water: chondritic inheritance plus nebular ingassing and storage of hydrogen in the core, *Journal of Geophysical Research – Planets*, 123, 2691–2712.

Greenwood, J. P., Karato, S. I., Vander Kaaden, K. E., **Pahlevan, K.**, Usui, T. Water and Volatile Inventories of Mercury, Venus, the Moon, and Mars. *Space Science Reviews*, 214(5), 92.

2016 **Pahlevan, K.**, Karato, S., Fegley, B. Speciation and dissolution of hydrogen in the proto-lunar disk, *Earth & Planetary Science Letters*. 445, 104-113.

2015 **Pahlevan, K.**, Morbidelli, A. Collisionless encounters and the origin of the lunar inclination, *Nature*, 527, 492-494. News and Views: The Moon's tilt for Gold, 455-456.

2014 **Pahlevan, K.** Isotopes as tracers of the sources of the lunar material and processes of lunar origin. *Philosophical Transactions of the Royal Society A*. 372, 20130257.

Pre-2013 **Pahlevan, K.**, Stevenson, D.J., Eiler, J. Chemical fractionation in the silicate vapor atmosphere of the Earth, *Earth & Planetary Science Letters*. 301, 433-443.

Li, K-F., **Pahlevan, K.**, Kirschvink, J.L., Yung, Y.L. Atmospheric pressure as a natural climate regulator for a terrestrial planet with a biosphere, *Proceedings of the National Academy of Sciences*, 106 (24) 9576-9579.

Pahlevan, K., Stevenson, D.J. Equilibration in the aftermath of the lunar forming giant impact, *Earth & Planetary Science Letters*. 262, 438-449. News and Views: Isotopic Lunacy, *Nature*, 450, 356-357.

OTHER PUBLICATIONS

2021 Rufu, R., Salmon, J., **Pahlevan, K.**, Visscher, C., Nakajima, M., Righter, K. The Origin of the Earth-Moon System as Revealed by the Moon, Planetary Science and Astrobiology Decadal Survey 2023-2032 White Paper, Bulletin of the American Astronomical Society, 53 (4) 238.

2018 **Pahlevan, K.** Telltale tungsten and the Moon, *Nature Geoscience*, 11, 16-18.

2010 **Pahlevan, K.** Chemical and Isotopic Consequences of Lunar Formation via Giant Impact, Ph.D. Thesis, California Institute of Technology.

INVITED TALKS

2023 “Magma oceans and primordial atmospheres of Earth, Mars, and the proto-lunar disk”, University of Maryland, College Park, Department of Geology, Seminar, April 12.

2022 “New models of primordial atmospheres on Earth and Mars”, University of California, Berkeley, CIDER summer workshop on Earth's evolution as an inhabited world, July 7.

2021 “Magma oceans and primordial atmospheres on Earth and Mars”, University of California, Berkeley, Joint Seminar, Department of Earth & Planetary Sciences and Department of Astronomy, October 14.

“New perspectives on the origin of the lunar inclination”, University of California, Berkeley, Thursday Astronomy Short Talks, October 14.

- “Magma ocean outgassing on Earth and Mars recorded in D/H”, Winter Seminar, Bayerisches Geoinstitut (BGI), University of Bayreuth, Germany, January 25.
- 2020 “Hydrogen isotopic constraints on primordial atmospheric evolution on Earth and Mars”, Planetary Lunch, University of California – Santa Cruz, June 29.
- 2019 “The Search for Life on Mars”, Department of Aerospace, Physics, and Space Sciences, Florida Institute of Technology, March 15.
- 2018 "D/H constraints on early planetary evolution on Earth and Mars", Dept. of Geosciences, University of Wisconsin-Madison, Madison, Wisconsin, December 6.
- “Oxygen fugacity of the primordial atmosphere and the early oxidation of the mantle”, Natural Environment Research Council Head Office, Swindon, UK, March 14.
- 2017 "A massive hydrogen-rich Martian greenhouse recorded in D/H", Dept. of Terrestrial Magnetism, Carnegie Institution of Washington, November 16.
- “Chemical and dynamical signatures of Earth-Moon origin”, University of Illinois, Urbana-Champaign, April 12.
- 2016 “Interpreting the isotopic record: signatures of planetary origin”, Institute of Geological Sciences, Freie Universität, Berlin, October 13.
- “Cosmochemical and dynamical signatures of lunar origin”, Institute de Physique du Globe de Paris (IPGP), Paris, January 28.
- 2015 “Cosmochemical and dynamical signatures of lunar origin”, Seminar at the Observatoire de la Côte d’Azur (OCA), Nice, France, November 12.
- “Cosmochemical and dynamical signatures of lunar origin”, Laboratoire de Geology, Ecole Normale Supérieure (ENS), Lyon, November 11.
- 2014 “Cosmochemical signatures of lunar origin via giant impact”, Institute of Geochemistry and Petrology, Swiss Federal Institute of Technology (ETH), Zurich, October 2.
- “Cosmochemical signatures of lunar origin via giant impact”, Le Centre de Recherche Pétrographique et Géochemie (CRPG), Nancy, January 30.
- 2013 “Evolution of the proto-lunar disk: constraints from the isotopic record”, Seminar, Observatoire de la Côte d’Azur (OCA), Nice, France, Sept. 19.
- “Evolution of the proto-lunar disk: constraints from the isotopic record”, Southwest Research Institute (SwRI), Boulder, Colorado, July 10.
- “Evolution of the proto-lunar disk: constraints from the isotopic record”, School of Physics, University of Bristol, Bristol, UK, March 18.
- 2012 “When the Moon was a Cloud: A Creation Myth”, Department of Earth Sciences, Oxford University, Oxford, UK, May 21.
- “When the Moon was a Cloud: A Creation Myth”, Seminar at the Observatoire de la Côte d’Azur (OCA), Nice, France, May 10.
- “When the Moon was a Cloud: A Creation Myth”, Lunar & Planetary Institute (LPI) Spring Seminar Series, Houston, Texas, March 30.
- “When the Moon was a Cloud: A Creation Myth”, GEOTOP Seminar Series, Department of Earth and Planetary Sciences, McGill University, Montreal, February 24.

- 2011 “When the Moon was a Cloud: A Creation Myth”, Department of Earth and Planetary Sciences Colloquium, Harvard University, Cambridge, Nov. 7.
 “When the Moon was a Cloud: A Creation Myth”, Department of Geosciences, State University of New York (SUNY) at Stony Brook, New York, September 22.
 “Neutrinos and the History of the Sun’s Luminosity”, Institute for Theory and Computation (ITC) Luncheon, Center for Astrophysics (CfA), Harvard University, Cambridge, April 5.
 “When the Moon was a Cloud: A Creation Myth”, Institute for Theory and Computation (ITC) Colloquium, Center for Astrophysics (CfA), Harvard University, Cambridge, April 5.
 “When the Moon was a Cloud: A Creation Myth”, Department of Astronomy Seminar, University of Texas at Austin, Texas, March 14.
- 2010 “When the Moon was a Cloud: A Creation Myth”, Department of Astronomy Seminar, University of Maryland, College Park, November 23.
 “Towards a Predictive Theory of Lunar Origin”, Department of Geosciences Colloquium, Brown University, Providence, November 18.
 “The Giant Impact Hypothesis – Where We Stand”, Department of Geosciences Lunch Seminar, Brown University, Providence, November 18.
 “Chemical and Isotopic Consequences of the Moon-forming Giant Impact” Department of Geosciences, Solid Earth Brown Bag Seminar, Princeton University, Princeton, September 24.
- 2009 “When the Moon was a Cloud: A Creation Myth”, Institute of Geochemistry and Mineral Resources Seminar, Swiss Federal Institute of Technology (ETH), Zurich, July 3.
 “When the Moon was a Cloud: A Creation Myth”, Department of Terrestrial Magnetism (DTM) Seminar, Carnegie Institute of Washington, July 29.
 “Fractionation after the Moon-Forming Giant Impact”, Geochemistry Seminar, Department of Earth, Planetary, and Space Sciences, University of California, Los Angeles (UCLA), May 6.

SELECTED CONFERENCE/WORKSHOP ABSTRACTS & PRESENTATIONS

- 2023 **Pahlevan, K.** “Thermal Dissociation and Hydrodynamic Outflows from Post-Giant Impact Atmospheres”, American Geophysical Union, Fall Meeting, San Francisco.
Pahlevan, K., Schaefer, L., Porcelli, D. “Late mixing of a stably stratified hybrid-source atmosphere on newly accreted Mars”, Goldschmidt Conference, Lyon
- 2022 **Pahlevan, K.** “Primordial Mars as an Analog to a New Class of Terrestrial Exoplanet”, The Exoplanets in Our Backyard 2, Albuquerque, New Mexico.
 Schaefer, L., **Pahlevan, K.,** Elkins-Tanton, L. "Crystallization of Ferrous and Ferric Iron Oxides Drive the Redox Evolution of Crystallizing Magma Oceans", American Geophysical Union, Fall Meeting, Chicago.
- 2021 **Pahlevan, K.,** Schaefer, L., Hirschmann, M.M. "Primordial atmospheric evolution recorded in the Martian mantle" Goldschmidt Conference (virtual)

- 2020 **Pahlevan, K.** A massive hydrogen-rich primordial greenhouse recorded in Martian D/H, NExSS Quantitative Habitability Science Workshop (virtual)
- Pahlevan, K.**, Schaefer, L., Hirschmann, M.M. Primordial magma ocean outgassing on Earth and Mars recorded in D/H, Goldschmidt Conference, Hawaii.
- 2019 **Pahlevan, K.**, Schaefer, L., Desch, S., Hirschmann, M.M. Evolution of the steam atmosphere and early oxidation of the silicate Earth, American Geophysical Union, Fall Meeting, San Francisco.
- Schaefer, L., **Pahlevan, K.**, Elkins-Tanton, L. T. Coevolution of the Earth's interior and atmospheric oxidation state during planet formation, Astrobiology Science Conference, Bellevue, Washington.
- Pahlevan, K.** Earth's primordial atmosphere evolution recorded in D/H, Exoclimates V: The Diversity of Planetary Atmospheres, Oxford, UK.
- 2018 Schaefer, L., Elkins-Tanton, L. T., **Pahlevan, K.** Ferric Iron Production in Magma Oceans and Evolution of Mantle Oxidation State, Differentiation: Building the Internal Architecture of Planets workshop, Pasadena, California.
- 2017 **Pahlevan, K.**, Schaefer, L., Elkins-Tanton, L., Desch, S. A massive hydrogen-rich primordial greenhouse recorded in Martian D/H, American Geophysical Union, Fall Meeting, New Orleans.
- Schaefer, L., Elkins-Tanton, L. T., **Pahlevan, K.** Redox Evolution in Magma Oceans Due to Ferric/Ferrous Iron Partitioning, American Geophysical Union, Fall Meeting, New Orleans.
- Pahlevan, K.**, Elkins-Tanton, L. Tidal Dissipation on the Post-Giant-Impact Earth, International interdisciplinary workshop on accretion and early differentiation of the terrestrial planets, Nice, France.
- Pahlevan, K.**, Schaefer, L., Elkins-Tanton, L., Desch, S., Karato, S-i. Hydrogen isotopic fractionation during crystallization of the terrestrial magma ocean, Lunar & Planetary Science Conference, The Woodlands, Texas.
- 2016 **Pahlevan, K.**, Karato, S. Hydrogen isotopic fractionation during crystallization of the terrestrial magma ocean, American Geophysical Union, Fall Meeting, San Francisco.
- Pahlevan, K.** Isotopic constraints on proto-lunar disk evolution, 47th Lunar & Planetary Science Conference, The Woodlands, Texas.
- 2015 **Pahlevan, K.** Major element isotopic fractionation in the proto-lunar disk, Goldschmidt Conference, Prague.
- Pahlevan, K.**, Morbidelli, A. Collisionless encounters and the origin of the lunar inclination, Solar System Bombardment III, Houston.
- 2014 **Pahlevan, K.**, Morbidelli, A. Excitation of the lunar inclination via three-body interactions, International interdisciplinary workshop on accretion and early differentiation of the terrestrial planets, Nice, France.
- Pahlevan, K.**, Morbidelli, A. The lunar inclination as a dosimeter for terrestrial late stage accretion, 45th Lunar & Planetary Science Conference, The Woodlands, Texas.

- 2013 **Pahlevan, K.** Isotopic Constraints on Physical Models, Royal Society Meeting on the Origin of the Moon, Chicheley Hall, Buckinghamshire, UK (invited).
Pahlevan, K., Karato, S., Fegley, B. Loss of Volatile Elements After the Moon-Forming Giant Impact, Goldschmidt Conference, Florence.
Pahlevan, K. Developing the Rare Earth Element Constraint for Scenarios of Lunar Origin, 44th Lunar & Planetary Science Conference, The Woodlands, Texas.
- 2012 **Pahlevan, K.** What do Moons of Terrestrial Planets Tell us about their Origins? Planetary Origins and Frontiers of Exploration, Weizmann Institute of Science, Rehovot, Israel (keynote).
Pahlevan, K. Origin of the Moon – Evolution of an Impact-Generated Disk, Micro-symposium 53 (co-sponsored by Brown University, Vernadsky Institute, MIT, and the NASA Lunar Science Institute), The Woodlands, Texas (keynote).
- 2011 **Pahlevan, K.** Isotopic Abundances as Tracers of the Processes of Lunar Formation, American Geophysical Union, Fall Meeting (invited).
Pahlevan, K., Karato, S. Volatile Loss via Outgassing of the Lunar Magma Ocean, Goldschmidt Conference, Prague.
- 2010 Fitoussi, C., Bourdon, B., **Pahlevan, K.**, Wieler, R. Si Isotope Constraints on the Moon-forming Impact, 41st Lunar & Planetary Science Conference, The Woodlands, Texas.
- 2009 **Pahlevan, K.**, Stevenson, D.J. Chemical Fractionation after the Moon-forming Giant Impact, 40th Lunar & Planetary Science Conference, The Woodlands, Texas.
- 2008 **Pahlevan, K.**, Stevenson, D.J. Volatile loss Following the Moon-forming Giant Impact, Goldschmidt Conference, Vancouver.
- 2007 **Pahlevan, K.**, Stevenson, D.J. Equilibration of the Earth-Moon System Following the Giant Impact, Goldschmidt Conference, Cologne.
Pahlevan, K., Stevenson, D.J. “Mixing During Planet Formation and After the Moon-Forming Impact” Theoretical Institute for Advanced Research in Astrophysics Workshop, Academia Sinica, Taipei (invited).
- 2006 **Pahlevan, K.**, Stevenson, D.J. Mixing in the Aftermath of the Giant Impact – Implications for Planet Formation, Meeting of the Division for Planetary Sciences of the American Astronomical Society, Pasadena, CA.
- 2005 **Pahlevan, K.**, Stevenson, D.J. The Oxygen Isotope Similarity of the Earth and Moon: Source Region or Formation Process? 36th Lunar & Planetary Science Conference, Houston, Texas.

SERVICE TO THE PROFESSION

2009-2024 Peer-Review Referee Service

Science, Nature, Nature Geoscience, Nature Communications, Science Advances, Icarus, Earth & Planetary Science Letters, Journal of Geophysical Research, Astronomy & Astrophysics, Astrophysical Journal, Planetary

Science Journal, Geochimica et Cosmochimica Acta, Philosophical Transactions of the Royal Society A

2013-2024 **Grant Proposal/Fellowship Review Service**
External Reviewer, Austrian Science Fund (FWF)
External Reviewer, Swiss National Science Foundation (SNSF)
External Reviewer, UK Natural Environment Research Council (NERC)
External Reviewer, NASA Earth & Space Science Fellowship (NESSF)
External Reviewer, US National Science Foundation (NSF)
Service on various NASA panels as panelist and group chief

2014-2024 **Conference Service**
Contributed talk co-convenor on proposed session “Origins and planetary budgets of volatile elements in the interior of terrestrial bodies: accretion, outgassing, & ingassing”, Goldschmidt Conference, Honolulu, 2022
Contributed talk session co-chair on “Formation, composition and evolution of atmospheres”, Exoclines V Conference, Oxford, August, 2019
Contributed talk session co-chair on “Signatures of Accretion and Core Formation”, Goldschmidt Conference, Paris, August, 2017
Scientific Organizing Committee, Workshop on Solar System Bombardment III held at the Lunar and Planetary Institute, Houston, Texas, February, 2015
Contributed talk session co-chair on: “Protolunar Disk and Magma Ocean: Models and Sample Constraints”, Lunar & Planetary Science Conference, The Woodlands, Texas, March, 2014.

PROFESSIONAL SOCIETY MEMBERSHIPS

2004- American Geophysical Union
2006- American Astronomical Society
2007- Geochemical Society

SELECTED PRESS COVERAGE

2022 The Guardian, “Ancient Mars could have been teeming with microbial life, researchers find”; Link: <https://tinyurl.com/2p8v8vwj>

2018 American Geophysical Union Newsroom, “Scientists theorize new origin story for Earth’s water” by Lauren Lipuma; Link: <https://bit.ly/2KpYkgb>

2015 The NY Times, “Scientists Link Moon’s Tilt and Earth’s Gold” By Kenneth Chang; Link: <https://nyti.ms/2Ty4H5j>

The LA Times, “Gold and platinum offer clues about the moon’s mysterious tilt” By Karen Kaplan, Link: <http://shorturl.at/IBSZ9>

Science Magazine, “How the moon got its tilt—and Earth got its gold” By Sid Perkins, Link: <http://shorturl.at/dyEX2>

New Scientist, "Flying gold knocked the moon off course and ruined eclipses" By Jacob Aron, <https://bit.ly/2scadRy>

The Christian Science Monitor, "A strong tug might have pulled the moon to its inclined orbit" By Eva Botkin-Kowacki, <https://bit.ly/2DXi08u>

ABC Science, "Moon's orbit was tilted by close encounters with passing planetesimals" By Stuart Gary, <https://ab.co/2PurUUH>

2012 The Chicago Tribune, March 29, 2012, "Moon struck?" by Cynthia Dizikes; Link: <https://trib.in/2AcJcOz>

2011 New Scientist, January 5, 2011, "Did magma rain on the early Earth?"; Link: <https://bit.ly/2Tvnv57>