Douglas Hemingway – Curriculum Vitae

Assistant Research Professor, University of Texas Institute for Geophysics, University of Texas at Austin
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RESEARCH INTERESTS

Evolution and behavior of planetary interiors and surfaces, the geophysical processes that govern this evolution, and the diversity we see across our solar system and beyond. Focus areas include planetary magnetism and icy ocean worlds.

EDUCATION

2010–2015	PhD, Earth & Planetary Sciences, University of California Santa Cruz, USA
2008–2009	MSc, *cum laude*, Space Studies, International Space University, Strasbourg, France
1996–2001	BASc, *first class honours*, Systems Design Engineering, University of Waterloo, Canada

EMPLOYMENT

2022-present	Assistant Research Professor, University of Texas Institute for Geophysics, University of Texas at Austin, USA
2020-2022	Chief Scientist and Senior Director, Civil Space Business Development, Maxar Technologies, Palo Alto, CA, USA
2018–2020	Carnegie Fellow, Carnegie Institution for Science, Washington, DC, USA
2015–2018	Miller Fellow, Miller Institute for Basic Research in Science, University of California Berkeley, USA
2010–2015	Graduate Student Researcher, University of California Santa Cruz, USA
2009	Graduate Student Intern, JAXA Institute of Space and Astronautical Science (ISAS), Sagamihara, Japan
2001–2010	Space Robotics Operations & Controls Engineering, MDA Space Missions, Brampton, Canada
1997–2001	Undergraduate Student Researcher, Aerial Robotics, University of Waterloo, Waterloo, Canada

SELECTED AWARDS

2018	Carnegie Postdoctoral Fellowship, Carnegie Institution for Science
2015	Miller Research Fellowship, University of California Berkeley
2014	Student's choice award for outstanding TA, Honorable Mention
2013	Waters Award for outstanding PhD research proposal
2012	Dwornik Award for best graduate student oral presentation at 43rd LPSC
2010	Chancellor's Fellowship, University of California Santa Cruz
2008	European Space Agency full scholarship award, International Space University
2005	NASA Goddard Space Flight Center Outstanding Teamwork Award, and MDA Innovation Award for initial concept development and demonstrations of robotic servicing capability for the Hubble Space Telescope

PROPOSAL WRITING

I have written or contributed to numerous grant proposals including two competitive postdoctoral fellowships (Miller and Carnegie), multiple NASA ROSES research proposals, two NASA Discovery mission proposals, and one proposal for NASA's PRISM (Payloads and Research Investigations on the Surface of the Moon) competition. During my time in industry, I contributed to several proposals for NASA and DARPA, both for research funding and for flight missions.

TEACHING, OUTREACH, MEDIA

2019	Interviewed for CBC (Canadian Broadcasting Corporation) radio "As It Happens" for Enceladus ice shell paper
2015	Instructor, UC Santa Cruz, Earth & Planetary Sciences, *EART110C (Upper Division Geophysics)*
2014	Teaching Assistant, UC Santa Cruz, Earth & Planetary Sciences, *EART110C (Upper Division Geophysics)*
2013	Interviewed for ABC (Australian Broadcasting Corporation) radio "Star Stuff" for Titan ice shell paper
2005	Featured in Discovery Science Channel special "Hubble and Beyond" while at NASA GSFC
2004	Trained NASA and ESA astronauts to carry out tele-robotic servicing of the Hubble Space Telescope
2002–present	Delivering space sciences and engineering outreach talks and activities for students in grades 4-12
2000	Interviewed for Discovery Science Channel special "Airbots" at the International Aerial Robotics Competition

PROFESSIONAL ACTIVITIES

Peer review activity: NASA review panels; NASA Planetary Data System archives; *Earth & Planetary Science Letters*; *Earth & Space Science; Geophysical Research Letters*; *Icarus; Journal of Geophysical Research: Planets; Planetary Science Journal; Nature Geoscience; Nature Astronomy*

Keck Institute for Space Studies: Next Generation Planetary Geodesy, 2021

NASA JPL Planetary Science Summer School (Uranus orbiter mission design with Team X), 2014

Cassini team associate (RADAR and Radio Science), 2013-2018

Member of the American Geophysical Union, since 2010

Member of the Planetary Society, since 2009

INVITED SEMINARS

2023 Baylor University, Department of Geosciences; University of Texas at Austin, Center for Planetary Systems Habitability

2022 University of Texas at Austin, Institute for Geophysics

2021 University of Oxford, Earth Sciences

2020 Planetary Science Institute; Johns Hopkins University, Earth & Planetary Sciences; University of Maryland, Department of Geology; University of New Mexico, Earth & Planetary Sciences; University of Oxford, Earth Sciences

2019 University of Cambridge, Earth Sciences; Rutgers University, Earth & Planetary Sciences; NASA Jet Propulsion Laboratory; Smithsonian Natural History Museum, Department of Mineral Sciences; University of Nantes, Laboratoire de Planétologie et Géodynamique; Carnegie Institution for Science, Department of Terrestrial Magnetism; NASA Goddard Space Flight Center, Planetary Geology, Geophysics & Geochemistry; University of Maryland, Department of Astronomy

2018 Cornell University, Department of Astronomy; UC Berkeley Center for Integrative Planetary Science; Harvard University, Earth & Planetary Sciences; Rutgers University, Earth & Planetary Sciences; Caltech, Division of Geological & Planetary Sciences

2017 Massachusetts Institute of Technology, Earth, Atmospheric & Planetary Sciences; San Jose State University, Geology Club; UC Berkeley, Earth & Planetary Sciences; Fresno State University, Earth & Environmental Sciences; Caltech, Planetary Sciences Seminar; San Francisco State University, Earth & Climate Sciences

2016 UC Berkeley, Center for Integrative Planetary Science; UC Berkeley, Space Sciences Laboratory / Space Physics Seminar; NASA Jet Propulsion Laboratory, Science Division

2015 UC Berkeley, Berkeley Seismo Lab

2013 Lunar and Planetary Institute

PUBLICATIONS (ORCID: 0000-0001-5617-207X)

26. Park, R. S., Mastrodemos, N., Jacobson, R. A., Berne, A., Vaughan, A. T., **Hemingway, D. J.**, Castillo-Rogez, J. C., Keane, J. T., Konopliv, A. S., Leonard, E. J., Nimmo, F., Riedel, J. E., Simons, M, Vance, S. (2024) The global shape, gravity field, and libration of Enceladus. *Journal of Geophysical Research: Planets, 129* (1). doi:10.1029/2023JE008054

25. Wieczorek, M., Weiss, B., Breuer, D., Cébron, D., Fuller, M., Garrick-Bethell, I., Gattacceca, J., Halekas, J., **Hemingway, D.**, Hood, L., Laneuville, M., Nimmo, F., Oran, R., Purucker, M., Rückriemen, T., Soderlund, K., Tikoo, S. (2023) Lunar Magnetism. *Reviews in Mineralogy & Geochemistry, 89* (1), 207-241. doi:10.2138/rmg.2023.89.05

24. Ermakov, E., Park, R. S., Roa, J., Castillo-Rogez, J., Keane, J. T., Nimmo, F., Kite, E., Sotin, C., Lazio, J., Steinbrügge, G., Howell, S. M., Bills, B., **Hemingway, D. J.**, Viswanathan, V., Tobie, G., and Lainey, V. (2021). A Recipe for Geophysical Exploration of Enceladus. *Bulletin of the American Astronomical Society, 53* (4). doi:10.3847/PSJ/ac06d2

23. **Hemingway, D. J.**, and Driscoll, P. E. (2021). History and future of the Martian dynamo and implications of a hypothetical solid inner core. *Journal of Geophysical Research: Planets, 126.* doi:10.1029/2020JE006663

22. Deca, J., **Hemingway, D. J.**, Divin, A., Lue, C., Poppe, A., Garrick-Bethell, I., Lembège, B., and Horányi, M. (2020). Simulating the Reiner Gamma swirl: the long-term effect of solar wind standoff. *Journal of Geophysical Research: Planets, 125.* doi:10.1029/2019JE006219

21. Zannoni, M., **Hemingway, D. J.**, Gomez Casajus, L., and Tortora, P. (2020). The gravity field and interior structure of Dione. *Icarus 345.* doi:10.1016/j.icarus.2020.113713

20. **Hemingway, D. J.**, Rudolph, M., and Manga, M. (2020). Cascading parallel fractures on Enceladus. *Nature Astronomy 4,* 234-239. doi:10.1038/s41550-019-0958-x
19. McFadden, J., Garrick-Bethell, I., Kyung Sim, C. Kim, S., and **Hemingway, D. J.** (2019). Iron content determines how space weathering flux variations affect lunar soils. *Icarus 333*, 323-342. doi:10.1016/j.icarus.2019.05.033
18. Lopes, R. M. C., Wall, S. D., Elachi, C., … **Hemingway, D.** et al. (2019). Titan as Revealed by the Cassini Radar. *Space Science Reviews 215*:33. doi:10.1007/s11214-019-0598-6
17. **Hemingway, D. J.** and Mittal, T. (2019). Enceladus's ice shell structure as a window on internal heat production. *Icarus 332*, 111-131. doi:10.1016/j.icarus.2019.03.011
16. Durante, D., **Hemingway, D. J.**, Racioppa, P., Iess, L., and Stevenson, D.J. (2019). Titan's gravity field and interior structure after Cassini. *Icarus 326,* 123-132. doi:10.1016/j.icarus.2019.03.003
15. **Hemingway, D. J.** and Tikoo, S. (2018). Lunar swirl morphology constrains the geometry, magnetization, and origins of lunar magnetic anomalies. *Journal of Geophysical Research: Planets, 123,* 2223-2241. doi:10.1029/2018je005604
14. Castillo-Rogez, J. C., **Hemingway, D.**, Rhoden, A., Tobie, G., and McKinnon, W. B. (2018). Origin and evolution of Saturn's mid-sized moons. In *Enceladus and the Icy Moons of Saturn,* pp. 285-305, *Space Science Series*, University of Arizona Press. doi:10.2458/azu_uapress_9780816537075-ch014
13. **Hemingway, D. J.**, Iess, L., Tajeddine, R., and Tobie, G. (2018). The Interior of Enceladus. In *Enceladus and the Icy Moons of Saturn*, pp. 57-77, *Space Science Series*, University of Arizona Press. doi:10.2458/azu_uapress_9780816537075-ch004
12. Citron, R. I., Manga, M., and **Hemingway, D. J.** (2018). Timing of oceans on Mars from shoreline deformation. *Nature 555*, 643-646. doi:10.1038/nature26144
11. **Hemingway, D. J.**, and Matsuyama, I. (2017). Isostatic equilibrium in spherical coordinates and implications for crustal thickness on the Moon, Mars, Enceladus, and elsewhere. *Geophysical Research Letters 44*, 7695–7705. doi:10.1002/2017GL073334
10. Black, B.A., Perron, J.T., **Hemingway, D.**, Bailey, E., Nimmo, F., and Zebker, H. (2017). Global drainage patterns and the origins of topographic relief on Earth, Mars, and Titan. *Science 356* (6339), 727-731. doi:10.1126/science.aag0171
9. Nayak, M., **Hemingway, D. J.**, and Garrick-Bethell, I. (2017). Magnetization in the South Pole-Aitken Basin: Implications for the lunar dynamo and true polar wander. *Icarus 286,* 153-192. doi:10.1016/j.icarus.2016.09.038
8. Hurford, T., Asphaug, E., Spitale, J., **Hemingway, D.**, Rhoden, A., Henning, W., Bills, B., Kattenhorn, S., and Walker, M. (2016). Tidal disruption of Phobos as the cause of surface fractures. *Journal of Geophysical Research: Planets, 121*, 1054-1065. doi:10.1002/2015JE004943
7. Poppe, A., Fatemi, S., Garrick-Bethell, I., **Hemingway, D. J.**, and Holmström, M. (2016). Solar wind interaction with the Reiner Gamma crustal magnetic anomaly: Connecting source magnetization to surface weathering. *Icarus 266*, 261-266. doi:10.1016/j.icarus.2015.11.005
6. Tortora, P., Zannoni, M., **Hemingway, D.**, Nimmo, F., Jacobson, R. A., Iess, L., and Parisi, M. (2016). Rhea gravity field and interior modeling from Cassini data analysis. *Icarus 264,* 264-273. doi:10.1016/j.icarus.2015.09.022
5. **Hemingway, D. J.**, Garrick-Bethell, I., and Kreslavsky, M. A. (2015). Latitudinal variation in spectral properties of the lunar maria and implications for space weathering. *Icarus 261,* 66-79. doi:10.1016/j.icarus.2015.08.004
4. Iess, L., Stevenson, D. J., Parisi, M., **Hemingway, D.**, Jacobson, R. A., Lunine, J. I., Nimmo, F., Armstrong, J. W., Asmar, S. W., Ducci, M., and Tortora, P. (2014). The Gravity Field and Interior Structure of Enceladus. *Science 344* (6179), 78-80. doi:10.1126/science.1250551
3. **Hemingway, D.**, Nimmo, F., Zebker, H., and Iess, L. (2013). A rigid and weathered ice shell on Titan. *Nature 500* (7464), 550-552. doi:10.1038/nature12400
2. Garrick-Bethell, I., Lin, R. P., Sanchez, H., Jaroux, B. S., Bester, M., Brown, P., Cosgrove, D., Dougherty, M. K., Halekas, J. S., **Hemingway, D.**, Lozano, P. C., Martel, F., and Whitlock, C. W. (2013). Lunar magnetic field measurements with a cubesat. *Proceedings of SPIE Defense, Security, and Sensing*, paper 8739-2. doi:10.1117/12.2015666
1. **Hemingway, D.** and Garrick-Bethell, I. (2012). Magnetic field direction and lunar swirl morphology: Insights from Airy and Reiner Gamma. *Journal of Geophysical Research: Planets, 117,* E10012. doi:10.1029/2012JE004165

Non-refereed publications

Keane, J.T., Sori, M.M., Ermakov, A.I., … **Hemingway, D.** et al., (2023). Next-Generation Planetary Geodesy. *Keck Institute for Space Studies*, Final Report.

Hemingway, D. (2015). Lunar Magnetism, Space Weathering, and Icy Satellite Interiors. *Doctoral Dissertation, University of California Santa Cruz*, Santa Cruz, California.

Hemingway, D. (2009). An Autonomous Navigation System for Lunar and Planetary Exploration Rovers. *JAXA Internship Project Report for the Master of Space Studies, International Space University*, Strasbourg, France.

Hemingway, D. (2009). Mitigating the Lunar Dust Hazard. *Research Project for the Master of Space Studies, International Space University*, Strasbourg, France.

SELECTED CONFERENCE PRESENTATIONS

Hemingway, D. J. and Driscoll, P. History and Future of the Martian Dynamo. *AGU Fall Meeting*, December 2023, San Francisco, CA.

Hemingway, D. J. and Driscoll, P. History and Future of the Martian Dynamo. *Texas Area Planetary Science Meeting*, August 2023, San Antonio, Texas.

Hemingway, D. J. (invited), and Driscoll, P. The Life, Death, and Resurrection of Thermal-Compositional Dynamos. *AGU Fall Meeting*, December 2019, San Francisco, California.

Hemingway, D. J., Rudolph, M., and Manga, M. Cascading Parallel Fractures on Enceladus: Origin of the Tiger Stripes. *AGU Fall Meeting*, December 2019, San Francisco, California.

Hemingway, D. J. (invited) Insights from magnetic field direction. *Core of the Moon workshop*, May 2019, Marseille, France.

Hemingway, D. J., Rudolph, M., and Manga, M. Cascading Parallel Fractures Due to Thinning Ice and Bending Stresses: Implications from Enceladus's Tiger Stripes. *50th Lunar and Planetary Science Conference*, March 2019, Houston, Texas.

Hemingway, D. J. and Tikoo, S. Lunar swirl morphology constrains the geometry, magnetization, and origins of lunar magnetic anomalies. *AGU Fall Meeting*, December 2018, Washington, DC.

Hemingway, D. J. (invited) Isostasy on a small icy moon: implications for Enceladus's ice shell structure. *Geological Society of America Fall Meeting*, October 2017, Seattle, Washington.

Hemingway, D. J. and Tikoo, S. Lunar crustal magnetization inferred from characteristics of lunar swirls. *48th Lunar and Planetary Science Conference*, March 2017, Houston, Texas.

Hemingway, D. J. Structure of Enceladus' Ice Shell. *AGU Fall Meeting*, December 2016, San Francisco, California.

Hemingway, D. (invited), Iess, L., Tajeddine, R., and Tobie, G. Interior of Enceladus. *Enceladus and the Icy Moons of Saturn*, July 2016, Boulder, Colorado.

Hemingway, D., Zannoni, M., Tortora, P., Nimmo, F., and Asmar, S. Dione's Internal Structure Inferred from *Cassini* Gravity and Topography. *47th Lunar and Planetary Science Conference*, March 2016, Houston, Texas.

Hemingway, D., Garrick-Bethell, I., and Kreslavsky, M., Latitudinal Variation in the Color of the Lunar Maria and Implications for Space Weathering. *AGU Fall Meeting*, December 2015, San Francisco, California.

Hemingway, D., Garrick-Bethell, I., and Kreslavsky, M., Latitudinal Variation in Spectral Properties of the Lunar Maria and Implications for Space Weathering. *Workshop on Space Weathering of Airless Bodies*, November 2015, Houston, Texas.

Hemingway, D., Nimmo, F., Tortora, P., Zannoni, M., Iess, L., Parisi, M., and Thomas, P. Rhea's Internal Structure Inferred from *Cassini* Gravity and Topography. *46th Lunar and Planetary Science Conference*, March 2015, Houston, Texas.

Pieters, C., Garrick-Bethell, I., and **Hemingway, D.**, Magnetic Sorting of the Regolith on the Moon: Lunar Swirls. *AGU Fall Meeting*, December 2014, San Francisco, California.

Hemingway, D. (invited), Garrick-Bethell, I., and Kreslavsky, M., Space Weathering at Lunar Swirls and at High Lunar Latitudes. *Lunar Science Workshop*, *Kyung Hee University*, May 2014, South Korea.

Hemingway, D., Garrick-Bethell, I., and Kreslavsky, M., Space Weathering at Lunar Swirls and at High Lunar Latitudes. *45th Lunar and Planetary Science Conference*, March 2014, Houston, Texas.

Hemingway, D., Nimmo, F., and Iess, L., Enceladus' interior structure inferred from Cassini-derived gravity and topography. *AGU Fall Meeting*, December 2013, San Francisco, California.

Hemingway, D., Nimmo, F., Zebker, H., and Iess, L., A rigid and weathered ice shell on Titan. *Titan Surface Workshop, MIT*, August 2013, Cambridge, Massachusetts.

Hemingway, D., Nimmo, F., Zebker, H., and Iess, L., Elastic thickness of Titan's ice shell estimated from a combined study of gravity and topography. *44th Lunar and Planetary Science Conference*, March 2013, Houston, Texas.

Hemingway, D. and Garrick-Bethell, I., Insights into Lunar Swirl Morphology and Magnetic Source Geometry: Models for the Reiner Gamma and Airy Anomalies. *43rd Lunar and Planetary Science Conference*, March 2012, Houston, Texas.

Hemingway, D. and Garrick-Bethell, I., How magnetic field direction influences lunar swirl morphology. *AGU Fall Meeting*, December 2011, San Francisco, California.