

**Dr. Samuel M. Howell**  
NASA Jet Propulsion Laboratory  
Planetary Interiors and Geophysics

**EDUCATION**

PhD 2016 Geology and Geophysics, University of Hawai'i at Mānoa, Honolulu, Hawai'i  
MS 2013 Geology and Geophysics, University of Hawai'i at Mānoa, Honolulu, Hawai'i  
BS 2010 Engineering Physics, Rose-Hulman Institute of Technology, Terre Haute, Indiana

**PROFESSIONAL POSITIONS**

2019 – Pres. Research Scientist, Ocean Worlds Strategic Hire, Planetary Interiors and Geophysics, JPL  
2018 – 2019 JPL Postdoctoral Fellow, Ocean Worlds, JPL/Caltech  
2016 – 2018 Caltech Postdoctoral Scholar, Planetary Chemistry and Astrobiology, JPL/Caltech

**PROFESSIONAL EXPERIENCE**

2019 – Pres. Project Staff Scientist, NASA Europa Clipper Mission  
2019 – Pres. Deputy Principle-Investigator & Concept Scientist, JPL Probe using Radioisotopes for Icy Moon Exploration (PRIME)  
2018 – Pres. Steering Committee, Network for Ocean Worlds (NOW), NASA Astrobiology Program  
2017 – 2019 Project Science Affiliate, Europa Clipper Science Team

**ACTIVE NASA-FUNDED PROJECTS** (PI = Principal Investigator, Co-I = Co-Investigator)

PI (2022-2025) *ORCAA: Ocean Worlds Reconnaissance of Astrobiological Analogues*, PSTAR.  
PI (2021-2024) *Europa's Icy Tectonics: First-Principles and High-Order Modeling*, Solar System Workings.  
Co-I (2021-2024) *Thermal Measurements of Icy European Analog Materials*, Solar System Workings.  
Co-I (2021-2023) *Maturation and demonstration of technology to enable through deep-ice communication (CryoComm) on Europa*, Concepts for Ocean worlds Life Detection Technology.  
Co-I (2021-2023) *SWIM - Sensing with Independent Microswimmers*, NASA Innovative Advanced Concepts  
Co-I (2020-2023) *Did Solid Tides Prevent the Thermodynamic Death of Europa?* Habitable Worlds.  
Co-I (2020-2023) *Compositions of Ice Shells on Ocean Worlds*, Solar System Workings.  
Co-I (2019-2023) *Search for Life Using Submersible Heated Drill (SLUSH)*, Scientific Exploration Subsurface Access Mechanism for Europa. (Collaborator in COLDTech program).

**SELECTED ACTIVITIES**

2022 Session Co-chair, Ocean Worlds and Icy Volcanism: The Briny Deep, 53<sup>rd</sup> LPSC  
2022 Primary Convener, The diverse Ocean Worlds, Astrobiology Science Conference (AbSciCon)  
2022 Co-convener, Ocean Science for Ocean Worlds, Ocean Sciences Meeting (OSM)  
2021 Program Committee, 52nd Lunar and Planetary Science Conference (LPSC)  
2021 Primary Convener, Special Session on The Next Two Decades of Ocean Worlds Exploration (LPSC)  
2021 Subject Matter Expert, Dynamic Radioisotope Power Systems Mission Study, NASA RPS Program  
2020 Co-convener, Icy Satellite Surfaces and Below, AAS Division of Planetary Sciences (DPS) Meeting  
2020 Study Scientist, Radioisotope Power Systems for Pressure Vessels, NASA RPS Program  
2020 Selected Participant, NASA Principle Investigator Launchpad (Mission-focused). NASA SMD  
2019 Study Scientist, Radioisotope Power System Considerations for Ocean Worlds, NASA RPS Program  
2017 Subject Matter Expert, Keck Institute for Space Studies: Accessing Subsurf. Oceans of Icy Worlds

**AWARDS**

2021 Voyager Award for leadership of the Europa Clipper Lecture Series, JPL  
2021 Team Award for contributions to the Decadal Survey in Planetary Science and Astrobiology, JPL  
2017 Outstanding Postdoctoral Research in Planetary Science and Life Detection, JPL  
2016 *Popular Mechanics* Breakthrough Award for innovative method to study San Andreas Fault motions

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**SELECTED PUBLICATIONS**

- Howell, S.**, C. J. Bierson, K. Kalousová, E. J. Leonard, G. Steinbrügge, N. Wolfenbarger (2022, *in production*). *Jupiter's Ocean Worlds: Dynamic Ices and the Search for Life*, in *Ices in the Solar System: A Volatile Excursion from Mercury and the Moon to the Kuiper Belt and Beyond*, Elsevier.
- Lesage, E., H. Massol, **S. Howell**, F. Schmidt. (2022, *in press*). *Viscoelastic deformation of freezing cryomagma reservoirs: Application to Europa*. The Planetary Science Journal.
- Pappalardo et al., *incl. S. Howell* (2022, *in prod.*). *Ganymede's Geology*, in *Ganymede*, Cambridge Press.
- Leonard, E. J., **S. Howell** et al. (2022). *Finding order in chaos: Quantitative predictors of chaos terrain morphology on Europa*. Geophysical Research Letters, doi:10.1029/2021GL097309.
- DiNicola, M., **S. Howell**, et al. (2022). *Resurfacing: An Approach to Planetary Protection for Geologically Active Ocean Worlds*. The Planetary Science Journal, doi:10.3847/PSJ/ac642d.
- Howell, S.**, et al. (2021). *Ocean Worlds Exploration and the Search for Life*, Bulletin of the American Astronomical Society, doi:10.3847/25c2cf9ae.8920f9ae.
- Ermakov et al., *incl. S. Howell*, (2021). *A Recipe for the Geophysical Exploration of Enceladus*, The Planetary Science Journal, doi:10.3847/PSJ/ac06d2.
- Bairstow, B. Y. Lee, **S. Howell**, B. Donitz, M. Choukroun, S. Perl (2021). *Thermal Analysis of Landers using Radioisotope Power Systems on Ice Worlds*, IEEE, doi:10.1109/AERO50100.2021.9438303.
- Howell, S.**, E. J. Leonard (2021, *in press*). *Ocean Worlds: Interior Processes and Physical Environments*, Handbook of Space Resources, Springer Publishing.
- Howell, S.**, R. T. Pappalardo (2020). *NASA's Europa Clipper—a mission to a potentially habitable ocean world?* Nature Communications, doi:10.1038/s41467-020-15160-9.
- Zacny, K. et al., *incl. S. Howell* (2020). *Extraterrestrial Drilling and Excavation*, in *Advances in Terrestrial and Extraterrestrial Drilling: Ground, Ice, and Underwater*, CRC Press, ISBN 9781138341500.
- Howell, S.**, R.T. Pappalardo (2019). *Can Earth-like plate tectonics occur in the outer ice shells of icy satellites?* Icarus, doi:10.1016/j.icarus.2019.01.011.
- Howell, S.**, J.-A. Olive, G. Ito, M. D. Behn, J. Escartin, B. Kaus (2019), *Seafloor expression of oceanic detachment faults reflects gradients in mid-ocean ridge magma supply*, Earth and Planetary Science Letters, doi:10.1016/j.epsl.2019.04.001.
- Howell, S.**, L. Chou, 18 others (2018). *Centaur reconnaissance mission concept: Chariklo flyby and impact*, Planetary and Space Science, doi:10.1016/j.pss.2018.07.008.
- Howell, S.**, R.T. Pappalardo (2018). *Band formation and ocean-surface interaction on Europa and Ganymede*, Geophysical Research Letters, doi:10.1029/2018GL077594.
- Howell, S.**, B. Smith-Konter, N. Frazier, X. Tong, D. Sandwell (2016). *The vertical fingerprint of earthquake cycle loading in Southern California*, Nature Geoscience, doi:10.1038/ngeo2741.
- Howell, S.**, G. Ito, M. D. Behn, F. Martinez, J.-A. Olive, and J. Escartín (2016), *Magmatic and tectonic extension at the Chile Ridge: Evidence for mantle controls on ridge segmentation*, Geochem. Geophys. Geosyst., doi:10.1002/2016GC006380.
- Olive, J.-A., M. D. Behn, G. Ito, W. R. Buck, J. Escartín, **S. Howell** (2015), *Sensitivity of seafloor bathymetry to climate-driven fluctuations in mid-ocean ridge magma supply*, Science, doi:10.1126/science.aad0715.
- Howell, S.**, G. Ito, A.J. Breivik, A. Rai, R. Mjelde, B. Hanan, K. Sayit, P. Vogt (2014), *The origin of the asymmetry in the Iceland hotspot along the Mid-Atlantic Ridge from continental breakup to present-day*, Earth Planet. Sci. Lett., doi:10.1016/j.epsl.2014.02.020.

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**INVITED TALKS and LECTURES**

- (2022) *Powering Fire and Ice with Iron: The role of metal core dissipation in the Galilean satellites*. Geology and Geophysics of Active Satellites and Small Bodies, AGU Fall Meeting
- (2022) *Core activity in the Galilean satellites*. NASA Europa Clipper Mission Geodesy Focus Group
- (2022) *Going Under the Ice with Dr. Samuel Howell*. Universe Today.
- (2022) *Exploring Europa with the Europa Clipper Mission*. Princeton Center for Theoretical Science.
- (2022) *Panelist: Habitability and Astrobiology*. Princeton Center for Theoretical Science.
- (2022) *Plate Tectonics and the Search for Life*. University of Hawai'i at Mānoa, School of Ocean and Earth Science and Technology (SOEST).
- (2021) *Early Career Panelist*, 12th annual Lunar and Small Bodies Graduate Forum (LunGradCon).
- (2020) *The Likely Thickness of Europa's Icy Shell*, Europlanet Science Congress (EPSC).
- (2020) *Linking ice shell deformation to Europa's habitability*. Earth Life Science Institute (ELSI) Second Annual Winter School on Aquaplanetology (Aso, Japan).
- (2020) *The Exploration of Europa, an Alien Ocean World*, University of Hawai'i at Mānoa Department of Earth Sciences.
- (2019) *Europa's habitability: Dynamic ice processes and future Ocean World exploration*. Alternative Earths Astrobiology Seminar, University of California, Riverside, Department of Earth and Planetary Sciences.
- (2019) *Exploring Europa: A dynamic ocean world*. Boise State / KBSX. Astronomy Lecture Series.
- (2019) *Ocean world ice shell transport processes*. NASA Astrobiology Institute Titan Meeting (JPL).
- (2018) *Facilitating ocean-surface exchange through ice shell tectonics*. NASA Astrobiology Institute Icy Worlds Meeting (Monrovia, CA)
- (2018) *Simulating tectonic windows into ocean worlds*, California Institute of Technology, Dix Planetary Science Seminar.
- (2018) *Extensional Terrains: Tectonic windows into ocean worlds*. University of California, Los Angeles Earth, Planetary, and Space Sciences Colloquium.

**IN THE NEWS**

- (2022) *Swarm of Tiny Swimming Robots Could Look for Life on Distant Worlds*, NASA Feature Article, SciTechDaily, Phys.org, Space.com, CNET, The Sun, New York Post
- (2020) *NASA's Europa Clipper Will Find Out if Europa is Habitable*, Discover Magazine.
- (2020) *Diving into Ocean Worlds*, ECO Magazine.
- (2020) *Alien-life hunters are eyeing icy ocean moons Europa and Enceladus*, Space.com.
- (2018) *Europa's Ocean Ascending*, NASA Feature Article, Phys.org.
- (2016) *A Better Understanding of Earthquakes*, Popular Mechanics Magazine, EOS, LA Times, Forbes, Snopes, Hawaii Public Radio, All Things Considered (KCRW, NPR member station).

**PROJECTS**

[Europa Clipper](#)