CHRISTOPHER R. GLEIN

January 11, 2026

CONTACT INFORMATION

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RESEARCH STATEMENT

I seek to understand planetary history and habitability through geochemistry. By analyzing volatile compositions in surfaces, plumes, and atmospheres—from ocean worlds in our solar system to sub-Neptune exoplanets—I identify the processes that shape planetary evolution and define the chemical conditions for life.

MAJOR CONTRIBUTIONS TO SCIENCE

Updated on January 11, 2026

- Pioneered diverse applications of geochemical approaches for understanding the origin, evolution, and habitability of volatile-rich worlds
- Architect of astro-oceanography (Glein et al., 2015; 2018)
- Co-discovered evidence of geothermal activity on the dwarf planets Eris and Makemake (Glein et al., 2024; Grundy et al., 2024)
- Came up with the first determination of the N_2 inventory on Pluto, shedding new light on the source of Pluto's glacial ice (Glein and Waite, 2018)
- Made the first assessment of energetic habitability on an exoplanet from observational data (Glein, 2024)
- Developed a new framework for translating sub-Neptune atmospheric composition into constraints on interior and formation conditions (Glein et al., 2025)
- Led the development of the leading model for the origin of Titan's atmosphere (Glein, 2015; Miller et al., 2019)
- Made key contributions to the discoveries of a chemical energy source (Waite et al., 2017), organic compounds (Postberg et al., 2018), and phosphorus (Postberg et al., 2023) in materials erupted from Enceladus's subsurface ocean, establishing a strong case that Enceladus is a habitable world
- Helped to discover a carbon source on Europa's surface that most likely came from its subsurface ocean (Villanueva et al., 2023)

RESEARCH INTERESTS

Exploration to assess habitability and search for life on ocean worlds
Compositions of subsurface oceans on icy bodies in the outer solar system
Origin and evolution of volatiles and planetary atmospheres
The mysterious nature of sub-Neptune exoplanets
Ocean chemistry of exoplanets and links to their atmospheric compositions
Thermodynamics of the liquid methane/ethane-driven geochemistry on Titan
Role of abiotic organic geochemistry in the search for life
Chemistry of relevance to the emergence of life on Earth and beyond
Thermodynamics, kinetics, and mechanisms of organic reactions in hydrothermal systems
Geochemical controls on the isotopic composition of organic compounds
Organometallic geochemistry of ore deposits and serpentinites

ACADEMIC QUALIFICATIONS

Ph.D. Geological Sciences, Arizona State University, Tempe, AZ (2012); GPA: 4.0
Area of Specialization: Planetary Geochemistry, Advisor: Everett Shock
Dissertation Title: Theoretical and Experimental Studies of Cryogenic and Hydrothermal Organic Geochemistry

B.S. Major in Chemistry, Minor in Earth and Space Sciences, University of Washington, Seattle, WA (2006); GPA: 3.93
Areas of Specialization: Astrobiology and Planetary Science, Advisor: David Catling

WORK EXPERIENCE

2025-Present	Principal Scientist, Space Science Division, Southwest Research Institute, San Antonio, TX
2022-2025	Lead Scientist, Space Science Division, Southwest Research Institute, San Antonio, TX
2018-2022	Senior Research Scientist, Space Science and Engineering Division, Southwest Research Institute, San Antonio, TX
2015-2018	Research Scientist, Space Science and Engineering Division, Southwest Research Institute, San Antonio, TX
2014-2015	Deane Postdoctoral Fellow, Department of Earth Sciences, University of Toronto, Toronto, ON
2012-2014	McClintock Postdoctoral Fellow, Geophysical Laboratory, Carnegie Institution of Washington, Washington, DC
2006-2012	Graduate Research Assistant, Group Exploring Organic Processes in Geochemistry, School of Earth and Space Exploration, Arizona State University, Tempe, AZ
2003-2006	Undergraduate Research Assistant, Mars Research Group, Department of Earth and Space Sciences, University of Washington, Seattle, WA

PEER-REVIEWED PUBLICATIONS

Total number: 83

First-authored: 17 (includes 4 single-authored papers)
Second-authored: 10
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Metrics as of January 11, 2026
h-index: Google Scholar, 37; Scopus, 31; SAO ADS, 32 (14 years since Ph.D.)
Total citations: Google Scholar, 5756; Scopus, 4004; SAO ADS, 4125
Number of citations last year (2025): Google Scholar, 1106; Scopus, 754; SAO ADS, 789
Papers with >100 citations: Google Scholar, 11
Papers averaging >10 citations per year: Google Scholar, 30
Semantic Scholar, 256 Highly Influential Citations

Papers are listed in reverse chronological order.
Students and postdoctoral advisees are underlined.

83. Cable, M.L., et al. (incl. **Glein, C.R.**), Cold-water, CO_2 geysers as ocean world plume analogues: Investigation of habitability indicators in Crystal and Champagne Geysers pre- and post-eruption, *Astrobiology*, in press.
82. Protopapa, S., et al. (incl. **Glein, C.R.**), JWST detection of hydrocarbon ices and methane gas on Makemake, *The Astrophysical Journal Letters*, 991, L34, https://doi.org/10.3847/2041-8213/adfe63, 2025.
81. **Glein, C.R.**, Truong, N., Phosphates reveal high pH ocean water on Enceladus, *Icarus*, 441, 116717, https://doi.org/10.1016/j.icarus.2025.116717, 2025.
80. Cartwright, R.J., et al. (incl. **Glein, C.R.**), JWST reveals spectral tracers of recent surface modification on Europa, *The Planetary Science Journal*, 6, 125, https://doi.org/10.3847/PSJ/adcab9, 2025.
79. **Glein, C.R.**, Yu, X., Luu, C.N., Deciphering sub-Neptune atmospheres: New insights from geochemical models of TOI-270 d, *The Astrophysical Journal*, 985, 187, https://doi.org/10.3847/1538-4357/adced4, 2025.
78. Xu, W., et al. (incl. **Glein, C.R.**), Enough sulfur and iron for potential life make Enceladus's ocean fully habitable, *The Astrophysical Journal Letters*, 980, L10, https://doi.org/10.3847/2041-8213/adad65, 2025.
77. Moulanier, A.A., Mousis, O., Bouquet, A., **Glein, C.R.**, The role of ammonia in the distribution of volatiles in the primordial hydrosphere of Europa, *The Planetary Science Journal*, 6, 1, https://doi.org/10.3847/PSJ/ad9925, 2025.
76. Luu, C., Yu, X., **Glein, C.R.**, et al., Volatile-rich sub-Neptunes as hydrothermal worlds: The case of K2-18 b, *The Astrophysical Journal Letters*, 977, L51, https://doi.org/10.3847/2041-8213/ad9eb1, 2024.
75. Kiss, C., et al. (incl. **Glein, C.R.**), Prominent mid-infrared excess of the dwarf planet (136472) Makemake discovered by JWST/MIRI indicates ongoing activity, *The Astrophysical Journal Letters*, 976, L9, https://doi.org/10.3847/2041-8213/ad8dcb, 2024.
74. Truong, N., **Glein, C.R.**, Lunine, J.I., A broad set of solar and cosmochemical data indicates high C-N-O abundances for the solar system, *The Astrophysical Journal*, 976, 14, https://doi.org/10.3847/1538-4357/ad7a65, 2024.

73. Liu, C., et al. (incl. **Glein, C.R.**), The potential for organic synthesis in the ocean of Enceladus, *The Astrophysical Journal*, 971, 51, https://doi.org/10.3847/1538-4357/ad534f, 2024.
72. Cartwright, R.J., et al. (incl. **Glein, C.R.**), JWST reveals CO ice, concentrated CO_2 deposits, and evidence for carbonates potentially sourced from Ariel's interior, *The Astrophysical Journal Letters*, 970, L29, https://doi.org/10.3847/2041-8213/ad566a, 2024.
71. Blase, R.C., et al. (incl. **Glein, C.R.**), Biosignature detection from amino acid enantiomers with portable gas chromatography systems, *Advanced Devices & Instrumentation*, 5, 0049, https://doi.org/10.34133/adi.0049, 2024.
70. Becker, T.M., et al. (incl. **Glein, C.R.**), Exploring the composition of Europa with the upcoming Europa Clipper mission, *Space Science Reviews*, 220, 49, https://doi.org/10.1007/s11214-024-01069-y, 2024.
69. Pappalardo, R.T., et al. (incl. **Glein, C.R.**), Science overview of the Europa Clipper mission, *Space Science Reviews*, 220, 40, https://doi.org/10.1007/s11214-024-01070-5, 2024.
68. Napoleoni, M., et al. (incl. **Glein, C.R.**), Probing the oxidation state of ocean worlds with SUDA: Fe (II) and Fe (III) in ice grains, *The Planetary Science Journal*, 5, 95, https://doi.org/10.3847/PSJ/ad2462, 2024.
67. Waite, J.H., et al. (incl. **Glein, C.R.**), MASPEX-Europa: The Europa Clipper neutral gas mass spectrometer investigation, *Space Science Reviews*, 220, 30, https://doi.org/10.1007/s11214-024-01061-6, 2024.
66. Higgins, P.M., Chen, W., **Glein, C.R.**, Cockell, C.S., Sherwood Lollar, B., Quantifying uncertainty in sustainable biomass and production of biotic carbon in Enceladus' notional methanogenic biosphere, *Journal of Geophysical Research: Planets*, 129, e2023JE008166, https://doi.org/10.1029/2023JE008166, 2024.
65. **Glein, C.R.**, The geochemical potential for metabolic processes on the sub-Neptune exoplanet K2-18b, *The Astrophysical Journal Letters*, 964, L19, https://doi.org/10.3847/2041-8213/ad3079, 2024.
64. Cartwright, R.J., et al. (incl. **Glein, C.R.**), Revealing Callisto's carbon-rich surface and CO_2 atmosphere with JWST, *The Planetary Science Journal*, 5, 60, https://doi.org/10.3847/PSJ/ad23e6, 2024.
63. **Glein, C.R.**, et al., Moderate D/H ratios in methane ice on Eris and Makemake as evidence of hydrothermal or metamorphic processes in their interiors: Geochemical analysis, *Icarus*, 412, 115999, https://doi.org/10.1016/j.icarus.2024.115999, 2024.
62. Genova, A., et al. (incl. **Glein, C.R.**), Gravity investigation to characterize Enceladus' ocean and interior, *The Planetary Science Journal*, 5, 40, https://doi.org/10.3847/PSJ/ad16df, 2024.
61. Daubar, I.J., et al. (incl. **Glein, C.**), Planned geological investigations of the Europa Clipper mission, *Space Science Reviews*, 220, 18, https://doi.org/10.1007/s11214-023-01036-z, 2024.
60. Neveu, M., et al. (incl. **Glein, C.**), Future of the search for life: Workshop report, *Astrobiology*, 24, 114-129, 2024.
59. Grundy, W.M., Wong, I., **Glein, C.R.**, et al., D/H and $^{13}C/^{12}C$ ratios in methane ice on dwarf planets Eris and Makemake: Evidence for internal activity, *Icarus*, 411, 115923, https://doi.org/10.1016/j.icarus.2023.115923, 2024.
58. Tosi, F., et al. (incl. **Glein, C.R.**), Salts and organics on Ganymede's surface observed by the JIRAM spectrometer onboard Juno, *Nature Astronomy*, 8, 82-93, 2024.

57. Vance, S.D., et al. (incl. **Glein, C.R.**), Investigating Europa's habitability with the Europa Clipper, *Space Science Reviews*, 219, 81, https://doi.org/10.1007/s11214-023-01025-2, 2023.
56. Villanueva, G.L., et al. (incl. **Glein, C.R.**), Endogenous CO_2 ice mixture on the surface of Europa and no detection of plume activity, *Science*, 381, 1305-1308, 2023.
55. Roberts, J.H., et al. (incl. **Glein, C.**), Exploring the interior of Europa with Europa Clipper, *Space Science Reviews*, 219, 46, https://doi.org/10.1007/s11214-023-00990-y, 2023.
54. Villanueva, G.L., et al. (incl. **Glein, C.R.**), JWST molecular mapping and characterization of Enceladus' water plume feeding its torus, *Nature Astronomy*, 7, 1056-1062, 2023.
53. Postberg, F., Sekine, Y., Klenner, F., **Glein, C.R.**, et al., Detection of phosphates originating from Enceladus' ocean, *Nature*, 618, 489-493, 2023.
52. **Glein, C.R.**, N_2 accretion, metamorphism of organic nitrogen, or both processes likely contributed to the origin of Pluto's N_2, *Icarus*, 404, 115651, https://doi.org/10.1016/j.icarus.2023.115651, 2023.
51. Mousis, O., et al. (incl. **Glein, C.R.**), Early stages of Galilean moon formation in a water-depleted environment, *The Astrophysical Journal Letters*, 944, L37, https://doi.org/10.3847/2041-8213/acb5a4, 2023.
50. Hao, J.*, **Glein, C.R.***, et al., Abundant phosphorus expected for possible life in Enceladus's ocean, *Proceedings of the National Academy of Sciences of the United States of America*, 119, 2201388119, https://doi.org/10.1073/pnas.2201388119, 2022. *corresponding authors
49. Glass, J.B., Dierssen, H.M., **Glein, C.R.**, Schmidt, B.E., Winebrenner, D.P., Defining and characterizing habitable environments in ocean world systems, *Oceanography*, 35, 30-38, 2022.
48. Castillo-Rogez, J.C., Melwani Daswani, M., **Glein, C.R.**, Vance, S.D., Cochrane, C.J., Contribution of non-water ices to salinity and electrical conductivity in ocean worlds, *Geophysical Research Letters*, 49, e2021GL097256, https://doi.org/10.1029/2021GL097256, 2022.
47. MacKenzie, S.M., et al. (incl. **Glein, C.R.**), Science objectives for flagship-class mission concepts for the search for life at Enceladus, *Astrobiology*, 22, 685-712, 2022.
46. National Academies of Sciences, Engineering, and Medicine (incl. **Glein, C.R.**), Origins, Worlds, and Life: A Decadal Strategy for Planetary Science and Astrobiology 2023-2032, The National Academies Press, Washington, DC, https://doi.org/10.17226/26522, 2022.
45. Blase, R.C., et al. (incl. **Glein, C.R.**), MEMS GC column performance for analyzing organics and biological molecules for future landed planetary missions, *Frontiers in Astronomy and Space Sciences*, 9, 828103, https://doi.org/10.3389/fspas.2022.828103, 2022.
44. Higgins, P.M., **Glein, C.R.**, Cockell, C.S., Instantaneous habitable windows in the parameter space of Enceladus' ocean, *Journal of Geophysical Research: Planets*, 126, e2021JE006951, https://doi.org/10.1029/2021JE006951, 2021.
43. Melwani Daswani, M., Vance, S.D., Mayne, M.J., **Glein, C.R.**, A metamorphic origin for Europa's ocean, *Geophysical Research Letters*, 48, e2021GL094143, https://doi.org/10.1029/2021GL094143, 2021.

42. Bouquet, A., Miller, K.E., **Glein, C.R.**, Mousis, O., Limits on the contribution of early endogenous radiolysis to oxidation in carbonaceous chondrites' parent bodies, *Astronomy & Astrophysics*, 653, A59, https://doi.org/10.1051/0004-6361/202140798, 2021.
41. Cable, M.L., et al. (incl. **Glein, C.R.**), The science case for a return to Enceladus, *The Planetary Science Journal*, 2, 132, https://doi.org/10.3847/PSJ/abfb7a, 2021.
40. McKinnon, W.B., **Glein, C.R.**, Bertrand, T., Rhoden, A.R., Formation, composition, and history of the Pluto system: A post-New-Horizons synthesis, In *The Pluto System after New Horizons* (S.A. Stern et al., eds.), pp. 507-543, Univ. of Arizona, Tucson, 2021.
39. Ray, C., **Glein, C.R.**, Waite, J.H., Teolis, B., Hoehler, T., Huber, J.A., Lunine, J., Postberg, F., Oxidation processes diversify the metabolic menu on Enceladus, *Icarus*, 364, 114248, https://doi.org/10.1016/j.icarus.2020.114248, 2021.
38. MacKenzie, S.M., et al. (incl. **Glein, C.R.**), The Enceladus Orbilander mission concept: Balancing return and resources in the search for life, *The Planetary Science Journal*, 2, 77, https://doi.org/10.3847/PSJ/abe4da, 2021.
37. Robinson, K.J., et al. (incl. **Glein, C.R.**), Quantifying the extent of amide and peptide bond synthesis across conditions relevant to geologic and planetary environments, *Geochimica et Cosmochimica Acta*, 300, 318-332, 2021.
36. Libardoni, M., Blase, R., Miller, K., **Glein, C.R.**, Lander, C., Waite, J.H., Multi-dimensional separation of volatile and semi-volatile organic compounds for deep space and outer planetary worlds, *Current Topics in Analytical Chemistry*, 12, 1-13, 2020.
35. Blase, R.C., et al. (incl. **Glein, C.R.**), Experimental coupling of a MEMS gas chromatograph and a mass spectrometer for organic analysis in space environments, *ACS Earth and Space Chemistry*, 4, 1718-1729, 2020.
34. Klenner, F., et al. (incl. **Glein, C.R.**), Discriminating abiotic and biotic fingerprints of amino acids and fatty acids in ice grains relevant to ocean worlds, *Astrobiology*, 20, 1168-1184, 2020.
33. Soderlund, K.M., et al. (incl. **Glein, C.R.**), Ice-ocean exchange processes in the Jovian and Saturnian satellites, *Space Science Reviews*, 216, 80, https://doi.org/10.1007/s11214-020-00706-6, 2020.
32. Fu, X., et al. (incl. **Glein, C.R.**), Direct synthesis of amides from amines and carboxylic acids under hydrothermal conditions, *ACS Earth and Space Chemistry*, 4, 722-729, 2020.
31. Fu, X., et al. (incl. **Glein, C.R.**), Effect of copper salts on hydrothermal oxidative decarboxylation: A study of phenylacetic acid, *Chemical Communications*, 56, 2791-2794, 2020.
30. **Glein, C.R.**, Zolotov, M.Y., Hydrogen, hydrocarbons, and habitability across the solar system, *Elements*, 16, 47-52, 2020.
29. **Glein, C.R.**, Waite, J.H., The carbonate geochemistry of Enceladus' ocean, *Geophysical Research Letters*, 47, e2019GL085885, https://doi.org/10.1029/2019GL085885, 2020.
28. Miller, K.E., et al. (incl. **Glein, C.R.**), Cassini INMS constraints on the composition and latitudinal fractionation of Saturn ring rain material, *Icarus*, 339, 113595, https://doi.org/10.1016/j.icarus.2019.113595, 2020.
27. **Glein, C.R.**, Gould, I.R., Lorance, E.D., Hartnett, H.E., Shock, E.L., Mechanisms of decarboxylation of phenylacetic acids and their sodium salts in water at high temperature and pressure, *Geochimica et Cosmochimica Acta*, 269, 597-621, 2020.

26. Bouquet, A., Mousis, O., **Glein, C.R.**, Danger, G., Waite, J.H., The role of clathrate formation in Europa's ocean composition, *The Astrophysical Journal*, 885, 14, https://doi.org/10.3847/1538-4357/ab40b0, 2019.
25. Truong, N., Monroe, A.A., **Glein, C.R.**, Anbar, A.D., Lunine, J.I., Decomposition of amino acids in water with application to in-situ measurements of Enceladus, Europa and other hydrothermally active icy ocean worlds, *Icarus*, 329, 140-147, 2019.
24. Bouquet, A., **Glein, C.R.**, Waite, J.H., How adsorption affects the gas-ice partitioning of organics erupted from Enceladus, *The Astrophysical Journal*, 873, 28, https://doi.org/10.3847/1538-4357/ab0100, 2019.
23. Fecteau, K.M., et al. (incl. **Glein, C.R.**), Production of carboxylic acids from aldehydes under hydrothermal conditions: A kinetics study of benzaldehyde, *ACS Earth and Space Chemistry*, 3, 170-191, 2019.
22. Miller, K.E., **Glein, C.R.**, Waite, J.H., Contributions from organic nitrogen to Titan's N_2 atmosphere: New insights from cometary and chondritic data, *The Astrophysical Journal*, 871, 59, https://doi.org/10.3847/1538-4357/aaf561, 2019.
21. **Glein, C.R.**, Postberg, F., Vance, S.D., The geochemistry of Enceladus: Composition and controls, In *Enceladus and the Icy Moons of Saturn* (P.M. Schenk et al., eds.), pp. 39-56, Univ. of Arizona, Tucson, 2018.
20. McKay, C.P., Davila, A., **Glein, C.R.**, Hand, K.P., Stockton, A., Enceladus astrobiology, habitability, and the origin of life, In *Enceladus and the Icy Moons of Saturn* (P.M. Schenk et al., eds.), pp. 437-452, Univ. of Arizona, Tucson, 2018.
19. Waite, J.H., et al. (incl. **Glein, C.R.**), Chemical interactions between Saturn's atmosphere and its rings, *Science*, 362, eaat2382, DOI: 10.1126/science.aat2382, 2018.
18. Perry, M.E., et al. (incl. **Glein, C.R.**), Material flux from the rings of Saturn into its atmosphere, *Geophysical Research Letters*, 45, https://doi.org/10.1029/2018GL078575, 2018.
17. Postberg, F., et al. (incl. **Glein, C.R.**), Macromolecular organic compounds from the depths of Enceladus, *Nature*, 558, 564-568, 2018.
16. **Glein, C.R.**, Waite J.H., Primordial N_2 provides a cosmochemical explanation for the existence of Sputnik Planitia, Pluto, *Icarus*, 313, 79-92, 2018.
15. **Glein, C.R.**, A whiff of nebular gas in Titan's atmosphere – Potential implications for the conditions and timing of Titan's formation, *Icarus*, 293, 231-242, 2017.
14. Bouquet, A., **Glein, C.R.**, Wyrick, D., Waite, J.H., Alternative energy: Production of H_2 by radiolysis of water in the rocky cores of icy bodies, *The Astrophysical Journal Letters*, 840, L8, https://doi.org/10.3847/2041-8213/aa6d56, 2017.
13. Waite, J.H.*, **Glein, C.R.***, et al., Cassini finds molecular hydrogen in the Enceladus plume: Evidence for hydrothermal processes, *Science*, 356, 155-159, 2017. *corresponding authors
12. Domagal-Goldman, S.D., Wright, K.E., et al. (incl. **Glein, C.R.**), The Astrobiology Primer v2.0, *Astrobiology*, 16, 561-653, 2016.
11. **Glein, C.R.**, Baross, J.A., Waite, J.H., The pH of Enceladus' ocean, *Geochimica et Cosmochimica Acta*, 162, 202-219, 2015.
10. **Glein, C.R.**, Noble gases, nitrogen, and methane from the deep interior to the atmosphere of Titan, *Icarus*, 250, 570-586, 2015.
9. Neveu, M., Desch, S.J., Shock, E.L., **Glein, C.R.**, Prerequisites for explosive cryovolcanism on dwarf planet-class Kuiper belt objects, *Icarus*, 246, 48-64, 2015.

8. **Glein, C.R.**, Shock, E.L., A geochemical model of non-ideal solutions in the methane-ethane-propane-nitrogen-acetylene system on Titan, *Geochimica et Cosmochimica Acta*, 115, 217-240, 2013.
7. **Glein, C.R.**, Shock, E.L., Sodium chloride as a geophysical probe of a subsurface ocean on Enceladus, *Geophysical Research Letters*, 37, L09204, 2010.
6. Williams, L.B., et al. (incl. **Glein, C.R.**), Birth of biomolecules from the warm wet sheets of clays near spreading centers, In *Earliest Life on Earth: Habitats, Environments and Methods of Detection* (eds. S.D. Golding, M. Glikson), Springer, New York, p. 79-114, 2010.
5. **Glein, C.R.**, Desch, S.J., Shock, E.L., The absence of endogenic methane on Titan and its implications for the origin of atmospheric nitrogen, *Icarus*, 204, 637-644, 2009.
4. Waite, J.H., et al. (incl. **Glein, C.R.**), Liquid water on Enceladus from observations of ammonia and ^{40}Ar in the plume, *Nature*, 460, 487-490, 2009.
3. **Glein, C.R.**, Zolotov, M.Y., Shock, E.L., The oxidation state of hydrothermal systems on early Enceladus, *Icarus*, 197, 157-163, 2008.
2. Catling, D.C., et al. (incl. **Glein, C.R.**), Light-toned layered deposits in Juventae Chasma, Mars, *Icarus*, 181, 26-51, 2006.
1. Catling, D.C., **Glein, C.R.**, Zahnle, K.J., McKay, C.P., Why O_2 is required by complex life on habitable planets and the concept of planetary "oxygenation time", *Astrobiology*, 5, 415-438, 2005.

WORKS IN PROGRESS

Students and postdoctoral advisees are underlined.

Zhong, Y., et al. (incl. **Glein, C.R.**), Abiotic CO_2 reduction promoted by carbonate minerals on the primitive seafloor, *Nature Geoscience*, revision submitted.
Zhang, C., et al. (incl. **Glein, C.R.**), Dynamic controls on subsurface water chemistry and habitability on icy moons, *The Innovation*, submitted.
Hao, J., et al. (incl. **Glein, C.R.**), Amino acid incorporation into high-pressure ices sustains habitability on large ocean worlds, *Science Advances*, submitted.
Yu, X., **Glein, C.R.**, Thorngren, D.P., Murray, D.F., Unusually hot interiors could reconcile the missing methane problem for warm-to-hot exoplanets with hydrogen atmospheres, *The Astrophysical Journal*, submitted.
Carrasco-Herrera, R., et al. (incl. **Glein, C.R.**), Electron bombardment of methanol ices: Implications for organic chemical diversity on Europa's surface, *Icarus*, submitted.
Cai, Y., et al. (incl. **Glein, C.R.**), A potentially habitable ocean on the parent body of Bennu, *Science Advances*, submitted.

FUNDING HISTORY

Total funds received: $5,268,036
PI grants: 9
Co-I grants: 18

Awarded proposals:

Co-I, Europa Clipper Work-MoRE Cycle A, Jet Propulsion Laboratory, "Europa's Ocean Carbon System and its Expressions: Subsurface to Surface" (PI: Elizabeth Spiers, University of Texas at Austin), Total Budget: $210,000 (1 October 2025 to 30 September 2027), Funds to Glein: $35,000

Co-I, James Webb Space Telescope Cycle 4 General Observers Program, "The origin of CO_2 in the Uranian system and possible geologic activity at Ariel" (PI: Richard Cartwright, Johns Hopkins University Applied Physics Laboratory), Total Budget: $134,785 (1 July 2025 to 30 June 2027), Funds to Glein: $5,000

PI, Europa Inspiring Clipper: Opportunities for Next-generation Scientists (ICONS), Jet Propulsion Laboratory, "Developing geochemical models to understand what kinds of organic molecules could feed life in Europa's ocean", Total Budget: $56,251 (3 June 2025 to 31 August 2025)

Co-I, SwRI Presidential Discretion Internal Research & Development, "Entry Probes for Ice and gas giants Characterization (EPIC)" (PI: John Andrews, Southwest Research Institute), Total Budget: $1,641,857 (1 March 2025 to 28 February 2027), Funds to Glein: $47,820

PI, SwRI Internal Research & Development, "Pushing the Frontier of Geochemical Modeling at SwRI to Exoplanets", Total Budget: $74,816 (20 January 2025 to 20 May 2025)

Co-I, Planetary Science and Technology Through Analog Research, "Automated Lander Planetary Analog Composition Analyzer (ALPACA)" (PI: Ryan Blase, Southwest Research Institute), Total Budget: $1,034,811 (1 April 2025 to 31 March 2026), Funds to Glein: $40,530

Co-I, NASA Solar System Workings, "To what extent does Enceladus' plume sample its ocean? Insights from conduit flow modeling" (PI: Jason Rabinovitch, Stevens Institute of Technology), Total Budget: $766,932 (1 September 2024 to 31 August 2027), Funds to Glein: $59,753

Co-I, NASA Habitable Worlds, "Feeding Enceladus' Deep Biosphere" (PI: Laurie Barge, Jet Propulsion Laboratory), Total Budget: $832,971 (1 September 2024 to 31 August 2027), Funds to Glein: $135,000

PI, SwRI Internal Research & Development, "Paleo-Metabolomics: Can We Use the Metabolome to Constrain Conditions Where Life Began?", Total Budget: $75,000 (20 May 2024 to 20 September 2024)

PI, James Webb Space Telescope Cycle 2 General Observers Program, "Seeking New Clues to the Habitability and Plume Activity of the Ocean World Enceladus using JWST-NIRSpec", Total Budget: $247,500 (10 June 2024 to 9 June 2026)

PI, Europa Inspiring Clipper: Opportunities for Next-generation Scientists (ICONS), Jet Propulsion Laboratory, "How do volatile and rock compositions affect the chemistry of Europa's ocean?", Total Budget: $48,127 (3 June 2024 to 31 August 2024)

Co-I, SwRI Presidential Discretion Internal Research & Development, "Uranus Orbiter & Probes: Instrument Concept Preparations" (PI: Kurt Retherford, Southwest Research Institute), Total Budget: $917,993 (1 February 2024 to 1 February 2025), Funds to Glein: $45,807

Co-I, Signatures of Life in the Universe, Heising-Simons Foundation, "A close look at the habitability of water worlds" (PI: Jennifer Bergner, University of California, Berkeley), Total Budget: $165,000 (1 October 2023 to 30 September 2025), Funds to Glein: $55,000

Co-I, NASA Precursor Science Investigations for Europa, "Follow the Energy: Tracing from Europa Surface Chemistry Back to Subsurface Redox Conditions" (PI: Kelly Miller, Southwest Research Institute), Total Budget: $1,915,259 (16 June 2023 to 15 June 2026), Funds to Glein: $209,519

PI, SwRI Internal Research & Development, "Building SwRI expertise in Uranian system science for expected opportunities on a future Uranus Orbiter and Probe mission", Total Budget: $285,055 (1 January 2023 to 31 December 2023)

Co-I, SwRI Internal Research & Development, "Enhancing the capability of MEMS GC columns for enantiomeric separations of biologically relevant compounds in future planetary landed missions (PI: Ryan Blase, Southwest Research Institute)", Total Budget: $74,982 (4 April 2022 to 4 August 2022), Funds to Glein: de minimis

PI, Europa Clipper Composition Working Group, Jet Propulsion Laboratory, Total Budget: $165,489 (31 March 2022 to 28 September 2025)

PI, SwRI Internal Research & Development, "Dating on Enceladus: Taking Habitability to the Next Level for New Frontiers 5", Total Budget: $74,995 (14 March 2022 to 14 July 2022)

Co-I, Cassini Data Analysis, "Further Examination of Hydrogen from the Enceladus Plume by Cassini INMS" (PI: Benjamin Teolis, Southwest Research Institute), Total Budget: $631,687 (2 Jan 2021 to 1 Jan 2024), Funds to Glein: $53,799

Co-I, SwRI Presidential Discretion Internal Research & Development, "Demonstrating Future Mass Spectrometry for Enceladus" (PI: Kelly Miller, Southwest Research Institute), Total Budget: $249,983 (2 March 2020 to 16 June 2020), Funds to Glein: $6,602

Co-I, Simons Collaboration on the Origins of Life, "Environmental Conditions for the Origin of Life and Early Life" (PI: David Catling, University of Washington), Total Budget: $1,219,267 (1 Feb 2020 to 31 Jan 2023), Funds to Glein: $105,000

Co-I, NASA Planetary Mission Concept Studies, "Flagship Concepts for Astrobiology at Enceladus" (PI: Shannon MacKenzie, Johns Hopkins University Applied Physics Laboratory), Total Budget: $146,588 (15 October 2019 to 30 June 2020), Funds to Glein: $6,353

Co-I, SwRI Presidential Discretion Internal Research & Development, "MASPEX-Orbitrap: Towards Detection of Extraterrestrial Life: Phase 1" (PI: Kelly Miller, Southwest Research Institute), Total Budget: $225,573 (29 April 2019 to 29 January 2020), Funds to Glein: $15,997

PI, Instrument Concepts for Europa Exploration 2, "MAss Spectrometer for Planetary EXploration-ORganic Composition Analyzer (MASPEX-ORCA) for Europa Lander", Total Budget: $3,105,126 (4 March 2019 to 3 March 2021)

Co-I, NASA Astrobiology Institute, Cooperative Agreement Notice 8, "Habitability of Hydrocarbon Worlds: Titan and Beyond" (PI: Rosaly Lopes, Jet Propulsion Laboratory), Total Budget: $8,265,278 (1 January 2018 to 31 December 2022), Funds to Glein: $235,653

Co-I, SwRI Internal Research & Development, "Experimental Investigation of the Organic Solar System" (PI: Mark Libardoni, Southwest Research Institute), Total Budget: $249,327 (1 April 2017 to 1 April 2018), Funds to Glein: $48,049

Co-I, Simons Collaboration on the Origins of Life, "Constraining the Environment for Life's Origin and the Spread of Early Life" (PI: David Catling, University of Washington), Total Budget: $899,999 (1 Feb 2017 to 31 Jan 2020), Funds to Glein: $87,046

Fellowships:

Roger Deane Fellowship ($50k + benefits, 1 year), Department of Earth Sciences, University of Toronto, 2014
Barbara McClintock Fellowship ($120k + benefits, 2 years), Carnegie Institution for Science, 2012

HONORS & AWARDS

Carl Sagan Lecture, Recognizing Scientific Interest in Astrobiology and Effective Science Communication Skills, American Geophysical Union, 2025
Research Accolades, January issue of Roadrunner, Southwest Research Institute, 2024
Travel Grant to the Network for Ocean Worlds (NOW) 1st Annual Retreat: Exploring the Science and Technology of Ocean Worlds Across the Solar System, 2023
Scialog Fellow, Signatures of Life in the Universe, Research Corporation for Science Advancement (RCSA) and the Heising-Simons Foundation, 2023
Eos Editors' Highlight, "The Freshest Mineral Water in the Solar System", https://eos.org/editor-highlights/the-freshest-mineral-water-in-the-solar-system, 2020
NASA Group Achievement Award to the Cassini Ion Neutral Mass Spectrometer Team, 2018
Outstanding Contribution to the ESA Rosetta Mission, European Space Agency, 2017
Bradley Prize for Best Talk of the Year, The Geological Society of Washington DC, 2013
NASA Astrobiology Institute Scholarship for travel to the European Planetary Science Congress to give an invited talk, 2010
Sherwood Chang Award for Student Excellence in the Origin of Life, Gordon Research Conference on the Origin of Life, 2010
NASA Astrobiology Institute Scholarship for participation in the Comas i Solà International Summer School in Astrobiology, 2008
Graduate Scholar Award, Arizona State University, 2006-2008
Travel Grant to the Workshop on Ices, Oceans, and Fire: Satellites of the Outer Solar System, 2007
Research Initiation Grant, Department of Geological Sciences, Arizona State University, 2006
American Institute of Chemists Foundation Award for Outstanding Student Majoring in Chemistry at the University of Washington, 2006
Hypercube Scholar Award in Computational Chemistry, Department of Chemistry, University of Washington, 2005
P.C. Cross Award in Physical Chemistry, Department of Chemistry, University of Washington, 2004

SPACECRAFT MISSION INVOLVEMENT

Flown/selected missions:

James Webb Space Telescope (JWST), 2022-Present
Europa Clipper MAss Spectrometer for Planetary EXploration (MASPEX) instrument, Co-Investigator, 2015-Present

Juno, 2022-2023
Cassini Ion and Neutral Mass Spectrometer (INMS) instrument, 2015-2019
Rosetta Spectrometer for Ion and Neutral Analysis (ROSINA) instrument, 2015-2018

Missions/instruments in the preflight stage:

Enceladus Life Finder (ELF) mission concept, 2014-Present
Deputy Principal Investigator, 2021-Present
Proposed to Discovery 2015, New Frontiers 2017
Study team for a Generic European Probe concept to giant planets, 2023-2025
Enceladus Moonraker mission concept, 2022-2024
Europa Lander MAss Spectrometer for Planetary EXploration ORganic Composition Analyzer (MASPEX ORCA) instrument, 2018-2022
Proteus main belt comet mission concept, 2019-2020
Proposed to Discovery 2019
Titan Oceanus mission concept, 2016-2017
Proposed to New Frontiers 2017
Life Investigation For Enceladus (LIFE) mission concept, 2013-2016
Europa Sylph SmallSat concept, 2016
Mass Analyzer for Real-time Investigation of Neutrals at Europa (MARINE) instrument, 2014-2015

SEMINAR PRESENTATIONS

Total number: 36

Europa Clipper Lecture Series, Europa Clipper Mission, Jet Propulsion Laboratory, March 2026
Department of Earth and Space Sciences Mindlin Lecture, University of Washington, February 2026
Planetary Science Seminar, Center for Integrative Planetary Science, Department of Astronomy, University of California, Berkeley, February 2026
Atmospheric Physics of Exoplanets Department Exocoffee, Max Planck Institute for Astronomy, November 2025
Department of Astronomy and Planetary Science Colloquium, Northern Arizona University, November 2024
Department of Physics & Astronomy Colloquium, University of Alabama, September 2024
Laboratory for Atmospheric and Space Physics Seminar, University of Colorado, August 2024
Unjournal Club, Southwest Research Institute, May 2024
Geodynamics Seminar Series, Woods Hole Oceanographic Institution, April 2024
Center for Planetary Systems Habitability Seminar Series, The University of Texas at Austin, February 2024
Institut Origines Seminar, Laboratoire d'Astrophysique de Marseille, October 2023
Department of Chemistry and Chemical Biology Seminar Series, Rensselaer Polytechnic Institute, September 2023
Earth and Planets Laboratory General Seminar Series, Carnegie Institution for Science, June 2023

Institute of Geological Sciences Colloquium, Freie Universität Berlin, June 2023
Planetary Science Directorate Colloquium, Southwest Research Institute Boulder, April 2023
Europa Clipper Composition Working Group Townhall, November 2022
Online Invited Talk, Paleontological Society of China – Geobiology Section, August 2022
Earth and Space Sciences Seminar, University of Washington, June 2021
Institute for Geophysics Seminar, University of Texas, October 2019
Geophysical Laboratory Seminar, Carnegie Institution for Science, April 2018
Planetary Science Seminar, Science Visitor and Colloquium Program, Jet Propulsion Laboratory, June 2017
Department of Astronomy Colloquium, Cornell University, April 2016
Enceladus Seminar Lecture, Center for Integrative Planetary Science, Department of Astronomy, University of California, Berkeley, April 2016
Speaker Series, Department of Geological Sciences, Michigan State University, February 2016
Geological Sciences Seminar, School of Earth, Energy & Environmental Sciences, Stanford University, January 2016
Department of Space Science Seminar, Southwest Research Institute, July 2015
Geophysical Laboratory Seminar, Carnegie Institution of Washington, April 2015
Department of Earth Sciences Seminar, University of Toronto, March 2015
Centre for Planetary Sciences Planet Day, University of Toronto, February 2015
Department of Earth & Environmental Sciences and Lamont-Doherty Earth Observatory Seminar, Columbia University, April 2014
Department of Geosciences Colloquium, Stony Brook University, April 2014
Astrobiology Program Colloquium, University of Washington, November 2013
October Meeting, The Geological Society of Washington DC, October 2013
Deep Carbon Forum, Geophysical Laboratory, Carnegie Institution of Washington, July 2013
Deep Carbon Forum, Geophysical Laboratory, Carnegie Institution of Washington, December 2012
Geophysical Laboratory Seminar, Carnegie Institution of Washington, September 2012

TEACHING

2019-2023	Guest Instructor, Planetary Sciences course, Department of Physics and Astronomy, The University of Texas at San Antonio, San Antonio, TX
2021	Guest Instructor, Summer School in Planetary Sciences, Chinese Academy of Sciences Center for Excellence in Comparative Planetology and University of Science and Technology of China, online
2008-2011	Guest Instructor, Theoretical Geochemistry, and Thermodynamics of Natural Systems courses, School of Earth and Space Exploration, Arizona State University, Tempe, AZ
2007	Teaching Assistant, Introduction to Geology Laboratory, School of Earth and Space Exploration, Arizona State University, Tempe, AZ

TRAINING

2024	Participant, Reactive Transport Modeling, The Geochemist's Workbench Virtual Workshop

2023	Participant, Proposal Mechanics two-day training course, Southwest Research Institute, San Antonio, TX
2021	Participant, Geochemical Reaction Modeling, The Geochemist's Workbench Virtual Workshop
2021	Participant, Introduction to Geochemical Modeling, The Geochemist's Workbench Virtual Workshop
2019	Participant, Project Management three-day training course, Southwest Research Institute, San Antonio, TX
2014	Participant, The Deep Carbon Observatory Early Career Scientist Workshop, San José, Costa Rica
2008	Participant, Josep Comas i Solà International Summer School in Astrobiology, Univeridad Internacional Meñendez Pelayo, Santander, Spain
2005	Research Associate, NASA Academy, Glenn Research Center, Cleveland, OH

PROFESSIONAL SERVICE

Leadership:

Scientific Organizing Committee, Astrobiology Science Conference, 2026
Convener, Europa Exploration: Bridging Laboratory, Field, and Theoretical Approaches for Mission Science, Astrobiology Science Conference, 2026
Chair, Enceladus: An Ocean World Odyssey, American Geophysical Union, Fall Meeting, 2025
Scientific Organizing Committee, Third Texas Area Planetary Science (TAPS) Meeting, 2025
Co-Chair, Composition Working Group, Europa Clipper mission, 2022-2025
Chair, Enceladus: The Storyteller, American Geophysical Union, Fall Meeting, 2024
Scientific Organizing Committee, Second Texas Area Planetary Science (TAPS) Meeting, 2024
Scientific Organizing Committee, Breakthrough Discuss, 2024
Chair, Enceladus: From Inner Workings to the Potential for Life, American Geophysical Union, Fall Meeting, 2023
Scientific Organizing Committee, Workshop on the Origins and Habitability of the Galilean Moons, 2023
Scientific Organizing Committee, First Texas Area Planetary Science (TAPS) Meeting, 2023
Chair, Extraordinary Enceladus, American Geophysical Union, Fall Meeting, 2022
Organizing Committee, Future of the Search for Life (FoSL) workshop, 2022
Chair, Enceladus: Beacon of Ocean Worlds, American Geophysical Union, Fall Meeting, 2021
Member, Ocean Worlds and Dwarf Planets Panel, Planetary Science and Astrobiology Decadal Survey 2023-2032, 2020-2021
Chair, Enceladus: A Habitable World Beckons, American Geophysical Union, Fall Meeting, 2020
Chair, Deep Dive Enceladus, American Geophysical Union, Fall Meeting, 2019
Convener, The Many Layers of Titan, Astrobiology Science Conference, 2019
Convener, Beyond CHNOPS: Exploring Habitability on Icy Ocean Worlds, Astrobiology Science Conference, 2019
Convener, Geochemists Infiltrate the Solar System: The Geological Evolution of Small Bodies, Moons, and Planets, Goldschmidt Conference, 2018

Scientific Organizing Committee, Ocean Worlds: Europa, Enceladus, Titan, and Beyond, Committee on Space Research Scientific Assembly, 2018
Chair, Inside out of Icy Satellites, Lunar and Planetary Science Conference, 2016
Chair, Outer Planetary Bodies, Lunar and Planetary Science Conference, 2015
Postdoctoral Representative, Library Committee, Geophysical Laboratory, 2013-2014

Support of early career scientists:

Supervisor of…
Postdoctoral researcher Ngoc Truong, Southwest Research Institute, 2023-2025
Now: Postdoctoral Research Associate, NASA Goddard Space Flight Center
Postdoctoral researcher Kelly Miller, Southwest Research Institute, 2016-2018
Now: Lead Scientist, Southwest Research Institute

Advisor/co-advisor of…
Graduate researcher Christine Ray, "The Habitability of Ocean Worlds: A Chemical Systems Perspective", University of Texas at San Antonio, 2016-2021
Now: Science & Technology Legislative Fellow, Senator John Hickenlooper

Mentor of…
Graduate researcher Eric Austin, University of Texas at San Antonio, 2025-Present
Graduate researcher Cindy Luu, University of Texas at San Antonio, 2024-Present
Undergraduate researcher Laiba Mahmood, Queens College, City University of New York, 2025-Present
Postdoctoral researcher Elizabeth Spiers, University of Texas at Austin, 2024-2025
Undergraduate summer intern Jared Bouck, Northern Arizona University, 2024
Undergraduate summer intern Carly Davis, McNeese State University, 2024
Graduate researcher Ngoc Truong, Cornell University, 2021-2022
Undergraduate summer intern Nadia Gonzales, University of Texas at Austin, 2022
High school student William Eisen, Nyack High School, 2019-2021
Postdoctoral researcher Jihua Hao, Rutgers University, 2019-2020
Graduate researcher Alexis Bouquet, University of Texas at San Antonio, 2015-2018
Undergraduate researcher Alice Zhu, University of Toronto, 2014-2015
High school intern Robert Martin (semifinalist in the 2013 Siemens Competition in Math:Science:Technology), Carnegie Institution of Washington, 2013-2014
Undergraduate researcher Mark Reineke, Arizona State University, 2009

Peer review:

Manuscript Reviewer for The Astrophysical Journal Letters, Earth and Planetary Science Letters, ACS Earth and Space Chemistry, Geochimica et Cosmochimica Acta, Geophysical Research Letters, Icarus, Journal of Geophysical Research: Planets, Monthly Notices of the Royal Astronomical Society, Nature Communications, Origins of Life and Evolution of Biospheres, Proceedings of the National Academy of Sciences of the United States of America, The Planetary Science Journal
Book Chapter Reviewer for Planetary Astrobiology, The University of Arizona Press

External Reviewer, National Academies Report – Biosignatures Standards of Evidence Workshop, 2022
Application Reviewer, Astrobiology Mission Ideation Factory: The Search for Life on Mars, 2023
Grant Review Panelist, NASA Habitable Worlds Program, 2018
Grant Review Panelist, NASA Cosmochemistry Program, 2013
External Grant Reviewer, NASA Habitable Worlds Program, 2019
External Grant Reviewer, NASA Astrobiology Institute, 2017
External Grant Reviewer, NASA Exobiology Program, 2016, 2024
External Grant Reviewer, NASA Outer Planets Research Program, 2012
SwRI Lunar Mission Instruments Gate Review Committee, 2024-2025

Public outreach:

Advocate at the Save NASA Science Day of Action, American Geophysical Union, United States Capitol, 2025
Guest interviewee on Planetary Radio, https://www.planetary.org/planetary-radio/2025-toi-270-d, 2025
Europa Clipper ambassador to Nature Communications, https://www.nature.com/articles/s41467-025-59094-6, 2025
Presenter of a talk on trans-Neptunian objects, New Jersey Astronomical Association, 2024
Featured scientist in The James Webb Telescope: Are We Alone, The Whole Story with Anderson Cooper, Season 2, CNN, https://youtu.be/-btuvdE29jg?si=wuGajpXInJdtUsGn, 2024
Guest interviewee on Planetary Radio, https://www.planetary.org/planetary-radio/2024-eris-and-makemake, 2024
Advocate at The Planetary Society's Day of Action, United States Capitol, 2023
Guest interviewee on Planetary Radio, https://www.planetary.org/planetary-radio/2023-phosphorus-in-enceladus, 2023
Presenter of a talk on Diving into the Alien Ocean of Enceladus, South Texas Mensa group, 2022
Presenter of a talk in Season 2: Motivations for Ocean Worlds Exploration, Episode 3: Geochemistry & Habitability, Network for Ocean Worlds (NOW) Lecture Series, 2021
Exhibitor in the SwRI Space Science & Engineering booth, Alamo City Comic Con, 2018
Presenter of an Astronomy on Tap talk, Blue Star Brewing Company, San Antonio, 2018
Presenter of a talk on an Introduction to Enceladus, Morningside Ministries, 2018
Presenter of a talk on the past, present, and future of Ocean Worlds exploration, Seventieth Annual Meeting, Southwest Research Institute, 2018
Presenter of a Tom Talk (a "TED-style" talk), Southwest Research Institute, 2017
Panelist for a discussion on the implications for life on Earth and elsewhere from the 40th anniversary of the discovery of deep-sea hot springs, 6th International Symposium on Chemosynthesis-based Ecosystems, Woods Hole Oceanographic Institution, 2017
Presenter of a Cassini-Huygens Analysis and Results from the Mission (CHARM) telecon on Enceladus, https://saturn.jpl.nasa.gov/cassinicharm, 2017
Presenter at Professional Development Day for secondary school teachers, Department of Earth Sciences, University of Toronto, 2015

Education and Public Outreach Exhibitor for the Carnegie Institution at the USA Science and Engineering Festival, Washington DC, 2014

Media Stories

Please see my website for examples: https://www.christopherglein.com/news

Society Memberships

American Association for the Advancement of Science
American Astronomical Society
AAS Division for Planetary Sciences
American Geophysical Union
Geochemical Society
International Society for the Study of the Origin of Life
Planetary Society
Scientific Society for Astrobiology

Software Expertise

Geochemical/planetary data analysis, modeling, and visualization: Geochemist's Workbench, EQ3/6, PyGCC, SUPCRT92, FREZCHEM, HSC Chemistry, GEM-Selektor, MELTS, NIST-REFPROP, MATLAB, Mathematica, IDL, Fortran, OriginLab, Excel, Photoshop, Illustrator

Laboratory Expertise

Organic geochemistry experiments and analysis: 1-atm furnace, Cold-seal vessel, Wet chemistry, Gas chromatography (FID, TCD), Gas chromatography-mass spectrometry (GC-MS), Pyrolysis-GC-MS, Isotope-ratio mass spectrometry, Ion chromatography

Conference Presentations

Total number: 303
Invited talks: 11

−2026−

Glein, C., Deuterium: A key to unlocking the origin, evolution, and habitability of sub-Neptunes, Exoplanet Atmospheres 2026, held 16-20 March in Denver, CO, 2026.

−2025−

Cartwright, R.J., et al. (incl. **Glein, C.R.**), JWST observes Europa's evolving surface composition, American Geophysical Union, Fall Meeting, held 15-19 December in New Orleans, LA, 2025.

Glein, C.R., Seafaring in space: A personal voyage to Enceladus (Invited), American Geophysical Union, Fall Meeting, held 15-19 December in New Orleans, LA, 2025.

Glein, C.R., Miller, K., Waite, J.H., Park, N., Bouquet, A., CO_2 vs. rock on Europa: Which controls ocean chemistry? American Geophysical Union, Fall Meeting, held 15-19 December in New Orleans, LA, 2025.

Klenner, F., et al. (incl. **Glein, C.R.**), An alkaline fluid chemistry on the parent body of Bennu: Evidence from an early ocean world? Fall Meeting, held 15-19 December in New Orleans, LA, 2025.

McKinnon, W.B., et al. (incl. **Glein, C.R.**), Argon-40 production in Europa and MASPEX/Clipper's ability to measure it, American Geophysical Union, Fall Meeting, held 15-19 December in New Orleans, LA, 2025.

Truong, N.T., et al. (incl. **Glein, C.R.**), Habitability does not require active water-rock interaction: Radiogenic salt-driven radiolysis as a metabolic energy source on Europa, American Geophysical Union, Fall Meeting, held 15-19 December in New Orleans, LA, 2025.

Glein, C., Icy moons, habitability, and connection to exoplanets, International Space Science Institute Forum on Planetary Habitability and Origin of Life, held 4-6 December in Beijing, China, 2025.

Yu, X., et al. (incl. **Glein, C.R.**), The role of primordial organics in the formation and evolution of protoplanetary disks: What can we learn from physical characterization of single grains of meteoritic organics in the lab? The Dusty Universe 2025: The Fifth Pan Dust Conference, held 10-14 November in Tucson, AZ, 2025.

Luu, C., et al. (incl. **Glein, C.**), Diving into the mysterious interiors of volatile-rich sub-Neptunes through ammonia chemistry, Third Texas Area Planetary Science Meeting, held 23-24 October in San Antonio, TX, 2025.

Austin, E.C., et al. (incl. **Glein, C.**), Characterizing the mechanical properties of insoluble organic matter with nanoindentation: Implications for planet formation and tidal heating in icy bodies, Geological Society of America Connects Meeting, held 19-22 October in San Antonio, TX, 2025.

Austin, E.C., et al. (incl. **Glein, C.R.**), Mechanical properties of insoluble organic matter and implications for its evolution and influence on planetary processes, EPSC-DPS Joint Meeting, held 7-12 September in Helsinki, Finland, 2025.

Camarca, M., et al. (incl. **Glein, C.**), CO_2-rich terrain on Callisto's leading hemisphere and a global dichotomy in Callisto's H_2O ice as seen with JWST, EPSC-DPS Joint Meeting, held 7-12 September in Helsinki, Finland, 2025.

Cartwright, R.J., et al. (incl. **Glein, C.R.**), JWST observes the CO_2-rich surfaces of Uranus' large moons, EPSC-DPS Joint Meeting, held 7-12 September in Helsinki, Finland, 2025.

Protopapa, S., et al. (incl. **Glein, C.R.**), JWST/NIRSpec observations of Makemake: Hydrocarbon chemistry and surface processes on a methane-rich trans-Neptunian object, EPSC-DPS Joint Meeting, held 7-12 September in Helsinki, Finland, 2025.

Yu, X., **Glein, C.R.**, Unusually hot interiors could reconcile the missing methane problem for warm-to-hot exoplanets with hydrogen atmospheres, EPSC-DPS Joint Meeting, held 7-12 September in Helsinki, Finland, 2025.

Glein, C., Phosphates reveal high pH ocean water on Enceladus, Europa Clipper MAss Spectrometer for Planetary EXploration Team Meeting, held 25 August in Eugene, OR, 2025.

Miller, K.E., et al. (incl. **Glein, C.R.**), Time-of-flight mass spectrometry (TOF-MS) enhances planetary exploration, International Workshop on Instrumentation for Planetary Missions 6, held 4-6 August in Boulder, CO, 2025.

Mousis, O., et al. (incl. **Glein, C.R.**), The scientific rationale for a dedicated Saturn probe mission, International Workshop on Instrumentation for Planetary Missions 6, held 4-6 August in Boulder, CO, 2025.

Rafkin, S.C.R., et al. (incl. **Glein, C.R.**), A broadband, hypertunable laser spectrometer for the next generation of planetary atmospheric probes, International Workshop on Instrumentation for Planetary Missions 6, held 4-6 August in Boulder, CO, 2025.

Glein, C.R., The deep chemistry of Pluto and other large trans-Neptunian objects (Invited), Progress in Understanding the Pluto System: 10 Years After Flyby, held 14-18 July in Laurel, MD, 2025.

McKinnon, W.B., et al. (incl. **Glein, C.R.**), Is there geological, geophysical, or geochemical evidence for the Charon-forming impact? Progress in Understanding the Pluto System: 10 Years After Flyby, held 14-18 July in Laurel, MD, 2025.

Melendy, J.J., et al. (incl. **Glein, C.R.**), Surface compositions of large-diameter TNOs modeled from JWST spectral imaging, Progress in Understanding the Pluto System: 10 Years After Flyby, held 14-18 July in Laurel, MD, 2025.

Austin, E.C., et al. (incl. **Glein, C.R.**), Characterizing the mechanical properties of chondritic insoluble organic matter (IOM) through nanoindentation: Implications for the origins of IOM in carbonaceous chondrites, 87th Annual Meeting of the Meteoritical Society, held 14-18 July in Perth, Western Australia, 2025.

Luu, C., et al. (incl. **Glein, C.**), Revealing the interiors of volatile-rich sub-Neptunes through geochemistry, Exoclimes VII, held 7-11 July in Montreal, Canada, 2025.

Xu, W., et al. (incl. **Glein, C.R.**), Enough sulfur and iron for potential life make Enceladus's ocean fully habitable, Goldschmidt Conference, held 6-11 July in Prague, Czech Republic, 2025.

Higgins, P.M., et al. (incl. **Glein, C.R.**), Explaining Enceladus' methane: A framework for assessing carbon isotope biosignatures against the abiotic baseline, Biennial European Astrobiology Conference, held 1-5 July in Reykjavik, Iceland, 2025.

Glein, C., Deciphering sub-Neptune atmospheres: New insights from geochemical models of TOI-270 d, Juno Science Team Meeting, held 3-5 June in San Antonio, TX, 2025.

Glein, C., Ocean worlds geochemistry (Invited), Exploring the Abiotic Background for Life Detection: A Joint NASA NfoLD – PCE3 – NOW Workshop, held 31 March-3 April in Washington, DC, 2025.

Austin, E.C., et al. (incl. **Glein, C.R.**), Characterizing the mechanical properties of insoluble organic matter: Implications for planet formation and icy-body thermal evolution, 56th Lunar and Planetary Science Conference, p. 2741, 2025.

Cable, M.L., et al. (incl. **Glein, C.R.**), The Enceladus plume: A unique opportunity to address astrobiology questions, 56th Lunar and Planetary Science Conference, p. 2404, 2025.

Cartwright, R.J., et al. (incl. **Glein, C.R.**), JWST observes Europa: Distribution of crystalline H_2O ice potentially consistent with recent activity, 56th Lunar and Planetary Science Conference, p. 1219, 2025.

Cartwright, R.J., et al. (incl. **Glein, C.R.**), CO_2 and CO ices on the large moons of Uranus: Primarily native or radiolytic in origin? 56th Lunar and Planetary Science Conference, p. 1260, 2025.

Truong, N., **Glein, C.R.**, A broad set of solar and cosmochemical data indicates high C-N-O abundances for the solar system, 56th Lunar and Planetary Science Conference, p. 2759, 2025.

Austin, E.C., et al. (incl. **Glein, C.**), Characterizing the mechanical properties of synthetic insoluble organic matter using nanoindentation, Itokawa and the Dawn of Asteroidal Sample Return Workshop, held 28-30 January in Houston, TX, 2025.

−2024−

Austin, E., et al. (incl. **Glein, C.**), Characterizing the mechanical properties of synthetic organic residues: Implications for planet formation and icy-body thermal evolution, American Geophysical Union, Fall Meeting, held 9-13 December in Washington, DC, 2024.

Blase, R., et al. (incl. **Glein, C.R.**), Micro-gas chromatographs provide macro-level impact for future landed planetary science missions, American Geophysical Union, Fall Meeting, held 9-13 December in Washington, DC, 2024.

Cartwright, R.J., et al. (incl. **Glein, C.**), JWST reveals the CO_2-rich surfaces of Uranus' largest moons with unprecedented sensitivity, American Geophysical Union, Fall Meeting, held 9-13 December in Washington, DC, 2024.

Glein, C.R., et al., A new recipe for Europa's ocean: Geochemical models of carbonated NaCl solutions, American Geophysical Union, Fall Meeting, held 9-13 December in Washington, DC, 2024.

Lunine, J.I., et al. (incl. **Glein, C.R.**), Searching for biosignatures in the plume of Enceladus: The case for mass spectrometry, American Geophysical Union, Fall Meeting, held 9-13 December in Washington, DC, 2024.

Luu, C., et al. (incl. **Glein, C.**), Can the presence of a supercritical water ocean explain the atmospheric composition of exoplanet K2-18b? American Geophysical Union, Fall Meeting, held 9-13 December in Washington, DC, 2024.

Pappalardo, R.T., et al. (incl. **Glein, C.R.**), Europa Clipper: Science overview, American Geophysical Union, Fall Meeting, held 9-13 December in Washington, DC, 2024.

Protopapa, S., et al. (incl. **Glein, C.R.**), JWST observations of Makemake and Varuna: Informing on volatile loss and irradiation effects in the outer solar system, American Geophysical Union, Fall Meeting, held 9-13 December in Washington, DC, 2024.

Truong, N.T., **Glein, C.R.**, Lunine, J.I., A broad set of solar and cosmochemical data indicates high C-N-O abundances for the solar system, American Geophysical Union, Fall Meeting, held 9-13 December in Washington, DC, 2024.

Cartwright, R., et al. (incl. **Glein, C.**), The Uranian moon Ariel, a carbon dioxide wonderland observed by JWST, 56th Division for Planetary Sciences Meeting, held 6-10 October in Boise, ID, 2024.

Camarca, M., et al. (incl. **Glein, C.**), The surface ices of Callisto's primordial landscape: New JWST NIRSpec results, 56th Division for Planetary Sciences Meeting, held 6-10 October in Boise, ID, 2024.

Diniega, S., et al. (incl. **Glein, C.**), Europa Clipper composition studies and prioritization of measurements, 56th Division for Planetary Sciences Meeting, held 6-10 October in Boise, ID, 2024.

Pappalardo, R., et al. (incl. **Glein, C.**), Europa Clipper: Launch week! 56th Division for Planetary Sciences Meeting, held 6-10 October in Boise, ID, 2024.

Stansberry, J., et al. (incl. **Glein, C.**), Upper limits on HDO on trans-Neptunian objects from JWST spectroscopy, 56th Division for Planetary Sciences Meeting, held 6-10 October in Boise, ID, 2024.

Mousis, O., et al. (incl. **Glein, C.**), Generic Entry Probe Program (GEPP) – An international initiative promoting the development of European descent modules dedicated to the in situ exploration of giant planets, EuroPlanet Science Congress, held 8-13 September in Berlin, Germany, 2024.

Napoleoni, M., et al. (incl. **Glein, C.**), Detecting Fe (II) and Fe (III) in ice grains with mass spectrometry: Implications for the geochemistry and habitability of Europa and Enceladus, EuroPlanet Science Congress, held 8-13 September in Berlin, Germany, 2024.

Hao, J., **Glein, C.**, Availability of nutrients in the Enceladus ocean: Implications for habitability, Goldschmidt Conference, held 18-23 August in Chicago, IL, 2024.

Liu, C., et al. (incl. **Glein, C.R.**), The potential for organic synthesis in the ocean of Enceladus, Goldschmidt Conference, held 18-23 August in Chicago, IL, 2024.

Blase, R.C., et al. (incl. **Glein, C.R.**), Next-generation separation science for landed planetary science missions, Second Texas Area Planetary Science Meeting, held 15-16 August in San Antonio, TX, 2024.

Glein, C.R., Large trans-Neptunian objects as evolved worlds shaped by internally driven processes, Second Texas Area Planetary Science Meeting, held 15-16 August in San Antonio, TX, 2024.

Luu, C., et al. (incl. **Glein, C.R.**), Can the presence of a supercritical water ocean explain the atmospheric composition of exoplanet K2-18b? Second Texas Area Planetary Science Meeting, held 15-16 August in San Antonio, TX, 2024.

Glein, C.R., Enceladus as the best bet for finding life, Breakthrough Discuss, A Cosmic Tapestry for Exploration: Weaving Novel Strands in Artificial Intelligence, Astrobiology and Space Missions, held 18-19 July in Oxford, UK, 2024.

Mousis, O., et al. (incl. **Glein, C.**), Generic Entry Probe Program (GEPP) – An international initiative promoting the development of European descent modules dedicated to the in situ exploration of giant planets, Committee on Space Research Scientific Assembly, held 13-21 July in Busan, Korea, 2024.

Protopapa, S., et al. (incl. **Glein, C.**), Discoveries in the field of trans-Neptunian objects by the James Webb Space Telescope, Committee on Space Research Scientific Assembly, held 13-21 July in Busan, Korea, 2024.

Glein, C.R., et al., Hot times in cool places: JWST measurements of D/H ratios indicate endogenic production of methane on Eris and Makemake (Invited), TNO2024, held 24-28 June in Taipei, Taiwan, 2024.

Vance, S.D., et al. (incl. **Glein, C.R.**), Europa Clipper's investigation of Europa's habitability, Asia Oceania Geosciences Society Meeting, held 23-28 June in Pyeongchang, Gangwon-do, South Korea, 2024.

Truong, N., **Glein, C.**, Improved constraints on the solar abundances from neutrino and solar winds: Implications to giant planet compositions, Exoplanets 5, held 16-21 June in Leiden, The Netherlands, 2024.

Cartwright, R.J., et al. (incl. **Glein, C.R.**), The surface compositions of the large moons of Uranus: Tracers of exogenic processing and possible internal oceans, The Uranus Flagship: Investigating New Paradigms for Outer Planet Exploration, held 21-23 May in Greenbelt, MD, 2024.

Grava, C., et al. (incl. **Glein, C.**), The exospheres of the five major satellites of Uranus and their connection with surface and magnetosphere, The Uranus Flagship: Investigating New Paradigms for Outer Planet Exploration, held 21-23 May in Greenbelt, MD, 2024.

Mousis, O., et al. (incl. **Glein, C.**), Generic Entry Probe Program (GEPP) – Promoting European descent modules for in situ exploration of giant planets, The Uranus Flagship: Investigating New Paradigms for Outer Planet Exploration, held 21-23 May in Greenbelt, MD, 2024.

Blase, R., et al. (incl. **Glein, C.R.**), Biosignature detection with MASPEX at ocean worlds, Astrobiology Science Conference, held 5-10 May in Providence, RI, 2024.

Higgins, P.M., et al. (incl. **Glein, C.**), Ratios of abiotic to biotic carbon inform on the scale, productivity, behavior, and detectability of notional ocean world biospheres, Astrobiology Science Conference, held 5-10 May in Providence, RI, 2024.

Luu, C., et al. (incl. **Glein, C.**), Can the presence of a supercritical water ocean explain the atmospheric composition of exoplanet K2-18b? Astrobiology Science Conference, held 5-10 May in Providence, RI, 2024.

Napoleoni, M., et al. (incl. **Glein, C.**), Detecting Fe (II) and Fe (III) in ice grains: Implications for the geochemistry and habitability of Europa and Enceladus, Astrobiology Science Conference, held 5-10 May in Providence, RI, 2024.

Vance, S., et al. (incl. **Glein, C.**), Europa Clipper's investigation of Europa's habitability, Astrobiology Science Conference, held 5-10 May in Providence, RI, 2024.

Mousis, O., et al. (incl. **Glein, C.**), Generic Entry Probe Program (GEPP) – An international initiative promoting the development of European descent modules dedicated to the in situ exploration of giant planets, European Geosciences Union, General Assembly, held 14-19 April in Vienna, Austria, 2024.

Waite, J.H., et al. (incl. **Glein, C.R.**), The Europa Clipper MASPEX investigation, European Geosciences Union, General Assembly, held 14-19 April in Vienna, Austria, 2024.

Glein, C., Hot times in cool places: JWST measurements of D/H ratios indicate endogenic production of methane on Eris and Makemake, Network for Ocean Worlds Steering Committee Meeting, held 3 April online, 2024.

Blase, R.C., et al. (incl. **Glein, C.R.**), MASPEX for biosignature detection, 55th Lunar and Planetary Science Conference, p. 2720, 2024.

Pappalardo, R., et al. (incl. **Glein, C.**), Europa Clipper: Seven months to launch! 55th Lunar and Planetary Science Conference, p. 1293, 2024.

Truong, N., **Glein, C.R.**, Potential revision to the solar abundances and implications to the formation of Jupiter and Uranus, 243rd Meeting of the American Astronomical Society, held 7-11 January in New Orleans, LA, 2024.

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Glein, C., et al., Deuterium decoded: How the D/H ratio can clarify the origin of methane in the Kuiper belt, New Horizons Science Plenary meeting, held 14 December online, 2023.

Burch, J.L., et al. (incl. **Glein, C.R.**), MASPEX: The Europa Clipper neutral gas mass spectrometer, American Geophysical Union, Fall Meeting, held 11-15 December in San Francisco, CA, 2023.

Castillo, J.C., et al. (incl. **Glein, C.R.**), Internal evolution and current state of Enceladus accreted from cometary material, American Geophysical Union, Fall Meeting, held 11-15 December in San Francisco, CA, 2023.

Daubar, I., et al. (incl. **Glein, C.R.**), Planned geological investigations of the Europa Clipper mission, American Geophysical Union, Fall Meeting, held 11-15 December in San Francisco, CA, 2023.

Genova, A., et al. (incl. **Glein, C.R.**), Gravity investigation of a mission concept to constrain Enceladus' internal structure, American Geophysical Union, Fall Meeting, held 11-15 December in San Francisco, CA, 2023.

Glein, C.R., et al., The tastes, smells, and colors of Europa: How Europa Clipper will reveal Europa's composition as never before, American Geophysical Union, Fall Meeting, held 11-15 December in San Francisco, CA, 2023.

Higgins, P.M., et al. (incl. **Glein, C.R.**), Uncertainty in habitability and sustainable biomass for a hypothetical methanogenic biosphere on Enceladus, American Geophysical Union, Fall Meeting, held 11-15 December in San Francisco, CA, 2023.

Pappalardo, R., et al. (incl. **Glein, C.R.**), Europa Clipper: 10 months to launch, American Geophysical Union, Fall Meeting, held 11-15 December in San Francisco, CA, 2023.

Tosi, F., et al. (incl. **Glein, C.R.**), A close look at Ganymede's surface composition with Juno/JIRAM, American Geophysical Union, Fall Meeting, held 11-15 December in San Francisco, CA, 2023.

Truong, N.T., et al. (incl. **Glein, C.R.**), Revealing the outgassing history and hydrothermal circulation processes of Enceladus, Europa and icy ocean worlds with noble gases, American Geophysical Union, Fall Meeting, held 11-15 December in San Francisco, CA, 2023.

Glein, C., Deuterium decoded: How the D/H ratio can clarify the origin of methane in the Kuiper belt (and Europa too), Europa MAss Spectrometer for Planetary EXploration Team Meeting, held 6 November in San Juan, Puerto Rico, 2023.

Glein, C.R., What does Europa's ocean taste like? Workshop on the Origins and Habitability of the Galilean Moons, held 24-26 October in Marseille, France, 2023.

Cartwright, R.J., et al. (incl. **Glein, C.R.**), Investigating carbon-bearing species on Europa and Callisto with JWST, Workshop on the Origins and Habitability of the Galilean Moons, held 24-26 October in Marseille, France, 2023.

Castillo-Rogez, J.C., et al. (incl. **Glein, C.R.**), Relationships between the origin, internal evolution, and current state of the Galilean moons, Workshop on the Origins and Habitability of the Galilean Moons, held 24-26 October in Marseille, France, 2023.

Miller, K.E., et al. (incl. **Glein, C.**), MASPEX performance for measuring Europa habitability, Workshop on the Origins and Habitability of the Galilean Moons, held 24-26 October in Marseille, France, 2023.

Mousis, O., et al. (incl. **Glein, C.**), Galilean moon formation in a water-depleted environment, Workshop on the Origins and Habitability of the Galilean Moons, held 24-26 October in Marseille, France, 2023.

Pappalardo, R.T., et al. (incl. **Glein, C.R.**), Europa Clipper: A mission to explore Europa's habitability, Workshop on the Origins and Habitability of the Galilean Moons, held 24-26 October in Marseille, France, 2023.

Tosi, F., et al. (incl. **Glein, C.R.**), Ganymede's surface composition with Juno JIRAM data, Workshop on the Origins and Habitability of the Galilean Moons, held 24-26 October in Marseille, France, 2023.

Truong, N., et al. (incl. **Glein, C.R.**), Revealing the outgassing history and hydrothermal circulation processes of Enceladus, Europa and icy ocean worlds with noble gases,

Workshop on the Origins and Habitability of the Galilean Moons, held 24-26 October in Marseille, France, 2023.

Cartwright, R., et al. (incl. **Glein, C.**), Unraveling Callisto's carbon-rich surface with JWST/NIRSpec, 55th Division for Planetary Sciences Meeting, held 1-6 October in San Antonio, TX, 2023.

Glein, C., et al., Deuterium decoded: How the D/H ratio can clarify the origin of methane in the Kuiper belt, 55th Division for Planetary Sciences Meeting, held 1-6 October in San Antonio, TX, 2023.

Postberg, F., et al. (incl. **Glein, C.**), Detection of phosphate in ice grains from Enceladus' ocean and implications for Europa, 55th Division for Planetary Sciences Meeting, held 1-6 October in San Antonio, TX, 2023.

Tosi, F., et al. (incl. **Glein, C.**), Infrared observations by Juno/JIRAM reveal local surface composition on Ganymede, 55th Division for Planetary Sciences Meeting, held 1-6 October in San Antonio, TX, 2023.

Truong, N., et al. (incl. **Glein, C.**), Low-temperature aqueous alteration of cometary rocks: Applications to potential ocean worlds of the Uranian system, 55th Division for Planetary Sciences Meeting, held 1-6 October in San Antonio, TX, 2023.

Villanueva, G., et al. (incl. **Glein, C.**), Comprehensive spectroscopy of Enceladus and Europa with JWST, 55th Division for Planetary Sciences Meeting, held 1-6 October in San Antonio, TX, 2023.

Glein, C., New insights into the origin of methane on hydrocarbon worlds, Titan NAI Team Meeting, held 6-8 September in Seattle, WA, 2023.

Mousis, O., et al. (incl. **Glein, C.**), An entry probe contributed by ESA to Uranus Orbiter and Probe, 20th International Planetary Probe Workshop, held August 28 to September 1 in Marseille, France, 2023.

Glein, C.R., Enceladus as the most habitable world we know of beyond Earth, First Texas Area Planetary Science Meeting, held 17-18 August in San Antonio, TX, 2023.

Glein, C.R., et al., Uranus's bulk atmospheric composition from mixing of solar nebula gas with comet-like core material, Uranus Flagship 2023: Investigations and Instruments for Cross-Discipline Science, held 25-27 July in Pasadena, CA, 2023.

Miller, G.P., et al. (incl. **Glein, C.R.**), Mass spectrometry as a tool for exploration of the Uranian system, Uranus Flagship 2023: Investigations and Instruments for Cross-Discipline Science, held 25-27 July in Pasadena, CA, 2023.

Truong, N. (incl. **Glein, C.R.**), Low-temperature aqueous alteration of cometary rocks: Applications to potential ocean worlds of the Uranian system, Uranus Flagship 2023: Investigations and Instruments for Cross-Discipline Science, held 25-27 July in Pasadena, CA, 2023.

Teolis, B.D., et al. (incl. **Glein, C.R.**), Seasonally pulsating sputtered exospheres at the Uranian icy moons, Uranus Flagship 2023: Investigations and Instruments for Cross-Discipline Science, held 25-27 July in Pasadena, CA, 2023.

Grundy, W.M., et al. (incl. **Glein, C.R.**), JWST NIRSpec spectrum of Eris: Methane, deuterated methane, and nitrogen, Asteroids, Comets, Meteors Conference, held 18-23 June in Flagstaff, AZ, 2023.

Faggi, S., et al. (incl. **Glein, C.R.**), Mapping Enceladus' immense water plume with NIRSpec/JWST, Planetary Systems and the Origins of Life in the Era of JWST, held 16-19 May in Baltimore, MD, 2023.

Mousis, O., et al. (incl. **Glein, C.R.**), Dehydration of phyllosilicates at the origin of the Galilean moons' density gradient, Biennial European Astrobiology Conference, held 8-12 May on La Palma Island, Spain, 2023.

Phillips-Lander, C.M., et al. (incl. **Glein, C.**), Role of polyols in creating microhabitable environments during ice formation on Enceladus, Biennial European Astrobiology Conference, held 8-12 May on La Palma Island, Spain, 2023.

Postberg, F., et al. (incl. **Glein, C.R.**), Detection of phosphate in Enceladus' ocean with implications for geochemistry and habitability in the outer solar system, European Geosciences Union, General Assembly, held 23-28 April in Vienna, Austria, 2023.

Glein, C., Does Enceladus host a hidden organic factory? International Conference of Deep Space Sciences, held 22-30 April in Hefei, China, 2023.

Glein, C., New geochemical findings on Enceladus, Enceladus Focus Group Workshop, held 29-30 March in Los Angeles, CA, 2023.

Glein, C., Enceladus: A factory of organic molecules, Enceladus Focus Group Workshop, held 29-30 March in Los Angeles, CA, 2023.

Cartwright, R.J., et al. (incl. **Glein, C.R.**), Investigating the nature and origin of hydrated salts on Europa, 54th Lunar and Planetary Science Conference, p. 2215, 2023.

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Glein, C.R., Enceladus as the most habitable world we know of beyond Earth, American Geophysical Union, Fall Meeting, held 12-16 December in Chicago, IL, 2022.

Sekine, Y., et al. (incl. **Glein, C.R.**), Detection of phosphate in Enceladus' ocean: Its implications for geochemistry and habitability, American Geophysical Union, Fall Meeting, held 12-16 December in Chicago, IL, 2022.

Miller, K., et al. (incl. **Glein, C.**), Onwards to Europa: Results from the final ground calibration of the MASPEX-Europa flight instrument, EuroPlanet Science Congress, held 18-23 September in Granada, Spain, 2022.

Mousis, O., et al. (incl. **Glein, C.**), The role of phyllosilicates in shaping the Galilean moons' density gradient, EuroPlanet Science Congress, held 18-23 September in Granada, Spain, 2022.

Glein, C.R., Geochemical perspectives on habitability and the origin of life in the outer solar system (Invited), Japan Geoscience Union Meeting, held 22-27 May in Chiba, Japan, 2022.

Blase, R., et al. (incl. **Glein, C.R.**), Gas chromatography (GC): The next generation micro-electro-mechanical systems (MEMS) GC columns for future spaceflight missions, Astrobiology Science Conference, held 15-20 May in Atlanta, GA, 2022.

Glein, C.R., et al., How much P is in Enceladus's ocean? Astrobiology Science Conference, held 15-20 May in Atlanta, GA, 2022.

Miller, G.P., et al. (incl. **Glein, C.R.**), MASPEX Europa: A high-resolution mass spectrometer for planetary exploration of ocean worlds, Astrobiology Science Conference, held 15-20 May in Atlanta, GA, 2022.

MacKenzie, S., et al. (incl. **Glein, C.R.**), Enceladus Orbilander: Searching for signs of life in orbit and on the surface, Astrobiology Science Conference, held 15-20 May in Atlanta, GA, 2022.

Truong, N., **Glein, C.R.**, Lunine, J.I., Constraining the age of Enceladus's ocean and the evolution of other icy ocean worlds from the outgassing history of noble gases, Astrobiology Science Conference, held 15-20 May in Atlanta, GA, 2022.

Glein, C., Could Titan's methane be biotic? Titan NAI Team Meeting, held 2-4 May in Honolulu, HI, 2022.

Glein, C., Subsurface oceans, Future of the Search for Life (FoSL) workshop, held 21-25 March online, 2022.

Castillo-Rogez, J.C., et al. (incl. **Glein, C.R.**), Europa's interior structure and salinity based on the origin of its volatiles, 53rd Lunar and Planetary Science Conference, p. 2747, 2022.

Cody, G.D., Alexander, C.M.O'D., Foustoukos, D., **Glein, C.R.**, Aqueous carbonate isotopic (^{13}C) exchange with chondritic organic solids, 53rd Lunar and Planetary Science Conference, p. 1216, 2022.

Miller, K.E., et al. (incl. **Glein, C.R.**), An update on the MASPEX instrument: New capabilities for planetary chemistry and habitability, 53rd Lunar and Planetary Science Conference, p. 2664, 2022.

−2021−

Melwani Daswani, M., Vance, S., **Glein, C.R.**, Clathrate blankets as (in)surmountable barriers for hydrothermal systems in Europa, American Geophysical Union, Fall Meeting, held 13-17 December in New Orleans, LA, 2021.

Ray, C., **Glein, C.R.**, Waite, H., Can abiotic synthesis generate complex organic matter on Enceladus? American Geophysical Union, Fall Meeting, held 13-17 December in New Orleans, LA, 2021.

Spilker, L.J., et al. (incl. **Glein, C.R.**), The science case for a return to Enceladus, American Geophysical Union, Fall Meeting, held 13-17 December in New Orleans, LA, 2021.

Truong, N.T., **Glein, C.R.**, Lunine, J.I., Age estimates of Enceladus's ocean and other outer solar system icy ocean worlds inferred from the evolution of noble gases, American Geophysical Union, Fall Meeting, held 13-17 December in New Orleans, LA, 2021.

Vance, S., et al. (incl. **Glein, C.R.**), Ocean detection and characterization at Enceladus and Mimas using magnetic induction, American Geophysical Union, Fall Meeting, held 13-17 December in New Orleans, LA, 2021.

Waite, H., et al. (incl. **Glein, C.**), The ocean worlds of Enceladus and Europa, The European Astrobiology Institute (EAI) Academy, presented 27 October online, 2021.

Castillo-Rogez, J.C., et al. (incl. **Glein, C.R.**), Role of non-water ices in driving salinity and electrical conductivity in ocean worlds, Outer Planets Assessment Group Meeting, held August 30 to September 1 online, 2021.

MacKenzie, S.M., et al. (incl. **Glein, C.**), Enceladus Orbilander: A mission concept study to search for signs of life, Outer Planets Assessment Group Meeting, held August 30 to September 1 online, 2021.

Glein, C., An update on the origin of Pluto's N_2, Pluto System and Arrokoth Workshops, held 12-16 July in Laurel, MD, 2021.

Ray, C., et al. (incl. **Glein, C.**), What's for lunch on Enceladus? How oxidant production generates a rich metabolic menu, Goldschmidt Conference, held 4-9 July online, 2021.

Glein, C.R., et al., MASPEX-ORCA: A new GC-MS instrument for Europa Lander, In Situ Science and Instrumentation Workshop for the Exploration of Europa and Ocean Worlds, held 20 May online, 2021.

Glein, C., Discussion on Europa ocean geochemistry models, Europa Clipper Composition Working Group Monthly Townhall, held 23 February online, 2021.

Glein, C., Miller, K., Hao, J., Robinson, K., Progress on organic and phosphorus geochemistry inside Titan, Titan NAI Team Meeting, held 11 February online, 2021.

Craft, K.L., et al. (incl. **Glein, C.R.**), On-chip sample purification and biosignature detection instrumentation at ocean worlds, Committee on Space Research Scientific Assembly, held January 28 to February 4 online, 2021.

McKinnon, W., et al. (incl. **Glein, C.**), The Pluto system: New results from the New Horizons flyby, Committee on Space Research Scientific Assembly, held January 28 to February 4 online, 2021.

Miller, K.E., et al. (incl. **Glein, C.R.**), Towards the future of mass spectrometry for biosignature detection, Committee on Space Research Scientific Assembly, held January 28 to February 4 online, 2021.

Mousis, O., Bouquet, A., **Glein, C.**, Danger, G., Waite, J.H., The role of clathrate formation in Europa's ocean composition, Committee on Space Research Scientific Assembly, held January 28 to February 4 online, 2021.

−2020−

Blase, R., et al. (incl. **Glein, C.R.**), Experimental coupling of a MEMS gas chromatograph and a mass spectrometer for organic analysis on icy ocean world landers, American Geophysical Union, Fall Meeting, held 1-17 December online, 2020.

Glein, C.R., A new model for the origin of chlorine on Enceladus, American Geophysical Union, Fall Meeting, held 1-17 December online, 2020.

Hao, J., et al. (incl. **Glein, C.R.**), Abundant phosphorus for life in the Enceladus ocean, American Geophysical Union, Fall Meeting, held 1-17 December online, 2020.

MacKenzie, S.M., et al. (incl. **Glein, C.R.**), Enceladus Orbilander: A Flagship Mission Concept for the Planetary Decadal Survey, American Geophysical Union, Fall Meeting, held 1-17 December online, 2020.

McKinnon, W.B., et al. (incl. **Glein, C.R.**), A Kuiper belt carol (in prose), being an origin story of Pluto and Charon, American Geophysical Union, Fall Meeting, held 1-17 December online, 2020.

Miller, K.E., et al. (incl. **Glein, C.R.**), Organic content of Titan's sub-surface ocean: Constraints from chondrites, American Geophysical Union, Fall Meeting, held 1-17 December online, 2020.

Ray, C., **Glein, C.R.**, Waite, H., Abiotic synthesis as a new source of organic matter on Enceladus, American Geophysical Union, Fall Meeting, held 1-17 December online, 2020.

Miller, K.E., et al. (incl. **Glein, C.R.**), Organic content of Titan's interior ocean from accreted insoluble organic matter, 52nd Division for Planetary Sciences Meeting, held 26-30 October online, 2020.

Phillips-Lander, C., et al. (incl. **Glein, C.**), Flagship concepts for astrobiology at Enceladus, JpGU-AGU Joint Meeting, held 12-16 July online, 2020.

Waite, J.H., et al. (incl. **Glein, C.**), Important Grand Finale results from the Cassini Ion Neutral Mass Spectrometer (INMS), Asia Oceania Geosciences Society Meeting, held June 28 to July 4 in Sono Belle Vivaldi Park, Hongcheon, 2020 (canceled due to coronavirus).

Blase, R.C., et al. (incl. **Glein, C.**), MAss Spectrometer for Planetary EXploration-ORganic Composition Analyzer (MASPEX-ORCA) for Europa Lander, American Society for Mass Spectrometry Conference, held May 31 to June 4 in Houston, TX, 2020 (canceled due to coronavirus).

Klenner, F., et al. (incl. **Glein, C.R.**), A method to discriminate between abiotic and biotic processes on cryovolcanically active ocean worlds, European Geosciences Union, General Assembly, held 3-8 May in Vienna, Austria, 2020 (canceled due to coronavirus).

Blase, R.C., Libardoni, M., Miller, K.E., Waite, J.H., **Glein, C.R.**, Chemical derivatization of amino acids and fatty acids for Gas Chromatography-Mass Spectrometry (GC-MS) analysis with MASPEX-ORCA, In Situ Science and Instrumentation Workshop for the Exploration of Europa and Ocean Worlds, held 28-30 April in Pasadena, CA, 2020 (canceled due to coronavirus).

Glein, C.R., et al., MASPEX-ORCA: A new GC-MS instrument for Europa Lander, In Situ Science and Instrumentation Workshop for the Exploration of Europa and Ocean Worlds, held 28-30 April in Pasadena, CA, 2020 (canceled due to coronavirus).

Libardoni, M., Blase, R., Miller, K.E., Kurabayashi, K., Fan, X., **Glein, C.**, Advanced separation science technology for the identification of complex organic samples on the surface of Europa with MASPEX-ORCA, In Situ Science and Instrumentation Workshop for the Exploration of Europa and Ocean Worlds, held 28-30 April in Pasadena, CA, 2020 (canceled due to coronavirus).

Miller, K.E., Franke, K., Miller, G., Waite, J.H., Blase, R.C., Libardoni, M., **Glein, C.R.**, MASPEX-ORCA isotopic measurements for biosignature detection, In Situ Science and Instrumentation Workshop for the Exploration of Europa and Ocean Worlds, held 28-30 April in Pasadena, CA, 2020 (canceled due to coronavirus).

Perry, M.E., et al. (incl. **Glein, C.R.**), Sample handling and processing for the MASPEX-ORCA, In Situ Science and Instrumentation Workshop for the Exploration of Europa and Ocean Worlds, held 28-30 April in Pasadena, CA, 2020 (canceled due to coronavirus).

Ray, C., **Glein, C.R.**, Waite, J.H., Miller, K.E., The volatile composition of Europa's ocean, 51st Lunar and Planetary Science Conference, p. 2953, 2020 (canceled due to coronavirus).

Craft, K.L., et al. (incl. **Glein, C.R.**), On-chip purification of amino acids for ocean world in situ biosignature analyses, 51st Lunar and Planetary Science Conference, p. 2560, 2020 (canceled due to coronavirus).

Glein, C., The science case for exploring the subsurfaces of Enceladus and Titan (Invited), Microsymposium 61 Planets Underground: The Next Frontier in Planetary Exploration, held 14-15 March in The Woodlands, TX, 2020 (canceled due to coronavirus).

Glein, C., Europa's habitability gold mine, Europa Clipper Project Science Group Meeting #8, held 11-13 February in Pasadena, CA, 2020.

Blase, R., et al. (incl. **Glein, C.**), MAss Spectrometer for Planetary EXploration-ORganic Composition Analyzer (MASPEX-ORCA) for Europa Lander, Outer Planets Assessment Group Meeting, held 3-4 February in Houston, TX, 2020.

Miller, K., **Glein, C.**, Further insights into deep carbon and nitrogen geochemistry on Titan and beyond, Titan NAI Team Meeting, held 9-10 January in Pasadena, CA, 2020.

−2019−

Glein, C.R., et al., What does Europa smell like? American Geophysical Union, Fall Meeting, held 9-13 December in San Francisco, CA, 2019.

Miller, K.E., **Glein, C.R.**, Foustoukos, D., Alexander, C., Experimental and theoretical exploration of Titan's ocean chemistry, American Geophysical Union, Fall Meeting, held 9-13 December in San Francisco, CA, 2019.

Fu, X., et al. (incl. **Glein, C.R.**), Does copper control the fate of organic acids in hydrothermal systems? American Geophysical Union, Fall Meeting, held 9-13 December in San Francisco, CA, 2019.

Glein, C., Alien oceans as an opportunity for the deep carbon community (Invited), Deep Carbon 2019: Launching the Next Decade of Deep Carbon Science, held 24-26 October in Washington, DC, 2019.

Vance, S., et al. (incl. **Glein, C.**), Titan's bulk interior structure and inferred composition: Perspective from radial structure models, Titan after Cassini-Huygens Scientific Workshop, held 23-25 September in Madrid, Spain, 2019.

Bouquet, A., Mousis, O., Danger, G., **Glein, C.R.**, Waite, J.H., Clathrate formation and the volatile evolution of Europa's ocean, EPSC-DPS Joint Meeting, held 15-20 September in Geneva, Switzerland, 2019.

Ray, C., **Glein, C.**, Miller, K., Waite, J.H., Modeling the volatile speciation of high temperature fluids on Europa, EPSC-DPS Joint Meeting, held 15-20 September in Geneva, Switzerland, 2019.

Postberg, F., et al. (incl. **Glein, C.R.**), The long journey of organic material from Enceladus hydrothermal core into the plume, EPSC-DPS Joint Meeting, held 15-20 September in Geneva, Switzerland, 2019.

Waite, J.H., et al. (incl. **Glein, C.**), MASPEX-Europa aboard Clipper: A mass spectrometer for investigating the habitability of Europa, EPSC-DPS Joint Meeting, held 15-20 September in Geneva, Switzerland, 2019.

Waite, H., Bolton, S., Miller, K., **Glein, C.**, Miller, G., The importance of mass spectrometry in the Horizon 2061 program, Planetary Exploration 2061, Step 3: Synthesis Workshop, held 11-13 September in Toulouse, France, 2019.

Glein, C.R., Alien oceans as a new frontier for geochemistry (Invited), Goldschmidt Conference, held 18-23 August in Barcelona, Spain, 2019.

McKinnon, W., **Glein, C.**, More about Pluto's surface ice composition, New Horizons Science Plenary meeting, held 8 August online, 2019.

Waite, J.H., Miller, K., **Glein, C.**, The D/H ratio of water throughout the solar system, Asia Oceania Geosciences Society Meeting, held July 28 to August 2 in Singapore, 2019.

Waite, J.H., et al. (incl. **Glein, C.**), The determination of the He/H_2 ratio in the atmospheres of Saturn and Jupiter and implications for giant planet formation and evolution, Asia Oceania Geosciences Society Meeting, held July 28 to August 2 in Singapore, 2019.

McKinnon, W.B., **Glein, C.R.**, Rhoden, A.R., Formation, composition, and history of the Pluto system: A post-New Horizons synthesis, Pluto System after New Horizons Conference, held 14-18 July in Laurel, MD, 2019.

Glein, C., et al., MAss Spectrometer for Planetary EXploration-ORganic Composition Analyzer (MASPEX-ORCA) for Europa Lander and other missions to icy ocean worlds, Astrobiology Science Conference, held 24-28 June in Bellevue, WA, 2019.

Catling, D.C., **Glein, C.R.**, Cody, G.D., Toner, J.D., Are metal carbonyls prebiotically plausible? Astrobiology Science Conference, held 24-28 June in Bellevue, WA, 2019.

Malaska, M., Vance, S., **Glein, C.R.**, A depth transect of potential Titan environments, Astrobiology Science Conference, held 24-28 June in Bellevue, WA, 2019.

Miller, K.E., **Glein, C.R.**, Waite, J.H., Zahnle, K.J., The evolution of Titan's accreted organics: From refractory to volatile, Astrobiology Science Conference, held 24-28 June in Bellevue, WA, 2019.

Postberg, F., et al. (incl. **Glein, C.R.**), Origins of organic matter in Enceladus' plume, Astrobiology Science Conference, held 24-28 June in Bellevue, WA, 2019.

Ray, C., **Glein, C.**, Waite, J.H., Modeling the volatile composition of hydrothermal fluids on Europa, Astrobiology Science Conference, held 24-28 June in Bellevue, WA, 2019.

Toner, J.D., Catling, D.C., **Glein, C.R.**, Alkaline lake settings for concentrated prebiotic cyanide and the origin of life, Astrobiology Science Conference, held 24-28 June in Bellevue, WA, 2019.

Waite, H., et al. (incl. **Glein, C.**), Results from the Cassini Grand Finale at Saturn using Cassini INMS, UVIS, CIRS, and RSS, Revealing Saturn's deep interior for the first time with Cassini, Royal Society Meeting, held 17-18 June in Newport Pagnell, UK, 2019.

Glein, C., Overview on the geochemistry of Europa's ocean, Europa Clipper Project Science Group Meeting #7, held 11-14 June in Ithaca, NY, 2019.

Glein, C., Update on new ocean models for Europa, Europa Clipper MAss Spectrometer for Planetary EXploration Team Meeting, held 10 June in Ithaca, NY, 2019.

Glein, C.R., Catling, D.C., Cody, G.D., Toner, J.D., Are metal carbonyls prebiotically plausible? Simons Collaboration on the Origins of Life Annual Symposium, held 22-24 April in New York, NY, 2019.

Waite, J.H., Bell, J., Miller, K., **Glein, C.**, He/H_2 ratio in the atmosphere of Saturn, European Geosciences Union, General Assembly, held 7-12 April in Vienna, Austria, 2019.

Waite, J.H., et al. (incl. **Glein, C.**), The Europa Clipper MASPEX Europa investigation, European Geosciences Union, General Assembly, held 7-12 April in Vienna, Austria, 2019.

Glein, C., The hydrothermal solar system: Enceladus as an example of Everett Shock's legacy, American Chemical Society National Meeting & Exposition, Spring Meeting, held March 31 to April 4 in Orlando, FL, 2019.

Waite, J.H., Perryman, R., **Glein, C.**, Miller, K., The legacy of Cassini-Huygens mass spectrometry at Saturn, American Chemical Society National Meeting & Exposition, Spring Meeting, held March 31 to April 4 in Orlando, FL, 2019.

Miller, K.E., **Glein, C.R.**, Waite, J.H., Bolton, S.J., Using D/H ratio of water and volatile organics to constrain thermogenic processes inside ice-rock bodies, 50th Lunar and Planetary Science Conference, p. 3013, 2019.

Waite, J.H., **Glein, C.**, Postberg, F., Lunine, J., Enceladus as revealed by the Cassini-Huygens mission, 50th Lunar and Planetary Science Conference, p. 1290, 2019.

Waite, J.H., et al. (incl. **Glein, C.**), Sampling systems that support atmospheric probe mass spectrometry objectives, Workshop on In Situ Exploration of the Ice Giants, held 25-27 February in Marseille, France, 2019.

Glein, C., Miller, K., Waite, H., Contributions from accreted organics to Titan's atmosphere: New insights from cometary and chondritic data, Titan NAI Team Meeting, held 23-24 January in Pasadena, CA, 2019.

−2018−

Waite, J.H., et al. (incl. **Glein, C.R.**), Implications from Cassini Ion Neutral Mass Spectrometer (INMS) Grand Finale measurements on atmospheric and interior processes at Saturn, American Geophysical Union, Fall Meeting, held 10-14 December in Washington, DC, 2018.

Miller, K.E., et al. (incl. **Glein, C.R.**), Cassini Ion Neutral Mass Spectrometer measurements of D Ring influx to Saturn's atmosphere, American Geophysical Union, Fall Meeting, held 10-14 December in Washington, DC, 2018.

Ray, C., **Glein, C.R.**, Waite, J.H., Teolis, B.D., Hoehler, T.M., Huber, J.A., Exploring oxidation chemistry and energy availability in Enceladus' ocean, American Geophysical Union, Fall Meeting, held 10-14 December in Washington, DC, 2018.

Truong, N.T., **Glein, C.R.**, Monroe, A., Anbar, A.D., Lunine, J.I., Decomposition of amino acids in water with application to Enceladus and other ocean worlds, American Geophysical Union, Fall Meeting, held 10-14 December in Washington, DC, 2018.

Lopes, R.M.C., et al. (incl. **Glein, C.**), Habitability of hydrocarbon worlds: Titan and beyond, American Geophysical Union, Fall Meeting, held 10-14 December in Washington, DC, 2018.

Miller, K.E., et al. (incl. **Glein, C.**), Constraints on Saturn D ring composition from Cassini Ion Neutral Mass Spectrometer, 50th Division for Planetary Sciences Meeting, held 21-26 October in Knoxville, TN, 2018.

McKinnon, W.B., **Glein, C.**, Lunine, J., Mousis, O., Shock, E.L., Vance, S.D., Waite, J.H., Interpreting Enceladus' D/H ratio in light of the 'Jovian Gap', 50th Division for Planetary Sciences Meeting, held 21-26 October in Knoxville, TN, 2018.

Postberg, F., et al. (incl. **Glein, C.R.**), Macromolecular organic compounds emerging from the Enceladus ocean, European Planetary Science Congress, held 16-21 September in Berlin, Germany, 2018.

Ray, C., **Glein, C.**, Waite, J.H., Teolis, B., Huber, J., Exploring oxidative chemistry and metabolic pathways in Enceladus' ocean, European Planetary Science Congress, held 16-21 September in Berlin, Germany, 2018.

Waite, J.H., Ray, C., **Glein, C.**, Kempf, S., Postberg, F., Lunine, J., Observing the potential for a diversity of metabolic pathways in the ocean of Enceladus, European Planetary Science Congress, held 16-21 September in Berlin, Germany, 2018.

Glein, C.R., Ray, C., Waite, J.H., Radiolysis in Titan's subsurface ocean provides a new source of deep energy for possible life, Cassini Science Symposium, held 12-17 August in Boulder, CO, 2018.

Miller, K.E., Waite, J.H., Perryman, R., Perry, M., **Glein, C.R.**, INMS compositional constraints on organics and other volatiles in Saturn ring rain, Cassini Science Symposium, held 12-17 August in Boulder, CO, 2018.

Glein, C.R., Ray, C., Waite, J.H., H_2 production from radiolysis in a subsurface ocean on Titan, Goldschmidt Conference, held 12-17 August in Boston, MA, 2018.

Toner, J.D., Catling, D.C., **Glein, C.R.**, The formation of ferrocyanide evaporites on early Earth, Goldschmidt Conference, held 12-17 August in Boston, MA, 2018.

Glein, C., What controls the concentration of sea salt in planetary oceans? Committee on Space Research Scientific Assembly, held 14-22 July in Pasadena, CA, 2018.

Ray, C., **Glein, C.R.**, Waite, J.H., Teolis, B.D., Huber, J.A., Exploring metabolic pathways and the availability of chemical energy in Enceladus' ocean, Astrobiology Australasia Meeting, held 25-26 June in Rotorua, New Zealand, 2018.

Glein, C., Some geochemical implications of elements leached into the oceans of icy worlds, International Space Science Institute Workshop on ExoOceans: Space Exploration of the Outer Solar System Icy Moons Oceans, held 18-22 June in Bern, Switzerland, 2018.

Glein, C., Determining geochemical properties of Europa using MASPEX, Europa Clipper MAss Spectrometer for Planetary EXploration Team Meeting, held 11 June in Pasadena, CA, 2018.

Ray, C., **Glein, C.R.**, Waite, J.H., Teolis, B.D., Exploring the oxidation chemistry of Enceladus' ocean, 3nd Ocean Worlds meeting, held 21-24 May in Houston, TX, 2018.

Postberg, F., et al. (incl. **Glein, C.R.**), Macromolecular organic compounds emerging from the Enceladus ocean, 3nd Ocean Worlds meeting, held 21-24 May in Houston, TX, 2018.

McKinnon, W.B., Waite, J.H., **Glein, C.R.**, Vance, S.D., Zolotov, M.Y., Ocean-rock interactions on Europa and Enceladus: Origin and compositional perspectives, 3nd Ocean Worlds meeting, held 21-24 May in Houston, TX, 2018.

Miller, K.E., Waite, J.H., Perryman, R., **Glein, C.R.**, Perry, M., Cassini's Ion and Neutral Mass Spectrometer observes carbon-rich grains in Saturn's exosphere, Carbon in the Solar System Workshop, held 25-27 April in Denver, CO, 2018.

Catling, D., **Glein, C.**, Environment of early Earth, Simons Collaboration on the Origins of Life Annual Symposium, held 23-25 April in New York, NY, 2018.

Glein, C., A perspective on the astrobiological legacy of Cassini-Huygens (Invited), European Geosciences Union, General Assembly, held 8-13 April in Vienna, Austria, 2018.

Glein, C.R., Colley, M.E., Catling, D.C., Toner, J.D., A new lesson from Titan: Nitrogen isotopes as a possible recorder of prebiotic chemistry on the early Earth, 49th Lunar and Planetary Science Conference, p. 2182, 2018.

Vance, S.D., **Glein, C.R.**, Bouquet, A., Cammarano, F., McKinnon, W.B., Desch, S.J., Exploring the parameter space of Europa's ocean salinity through time, 49th Lunar and Planetary Science Conference, p. 1707, 2018.

Miller, K.E., Waite, J.H., Perryman, R., **Glein, C.R.**, Perry, M., Mitchell, D., Cassini Ion and Neutral Mass Spectrometer observes organic molecules in the upper atmosphere of Saturn, 49th Lunar and Planetary Science Conference, p. 1475, 2018.

Glein, C., The cosmochemistry of Pluto: N_2 edition, New Horizons Science Plenary meeting, held 8 March online, 2018.

−2017−

Glein, C.R., Waite, J.H., The cosmochemistry of Pluto: A primordial origin of volatiles? American Geophysical Union, Fall Meeting, held 11-15 December in New Orleans, LA, 2017.

Vance, S., **Glein, C.**, Bouquet, A., Cammarano, F., McKinnon, W.B., Europa's compositional evolution and ocean salinity, American Geophysical Union, Fall Meeting, held 11-15 December in New Orleans, LA, 2017.

Ray, C., Waite, J.H., **Glein, C.**, Teolis, B.D., Oxidation in Enceladus' ocean (Outstanding Student Presentation Award), American Geophysical Union, Fall Meeting, held 11-15 December in New Orleans, LA, 2017.

Vance, S., **Glein, C.R.**, Bouquet, A., McKinnon, W.B., Cammarano, F., Permeability and hydration state of Europa's rocky interior, American Astronomical Society, 49th Division for Planetary Sciences Meeting, held 15-20 October in Provo, UT, 2017.

Miller, K.E., **Glein, C.R.**, Waite, J.H., Origin of Titan's nitrogen: Contributions from organics in the core, American Astronomical Society, 49th Division for Planetary Sciences Meeting, held 15-20 October in Provo, UT, 2017.

Glein, C., Habitability of Europa from surface and plume measurements, Europa Clipper Project Science Group Workshop, held 15 October in Provo, UT, 2017.

Waite, J.H., et al. (incl. **Glein, C.R.**), Estimating icy satellite oceanic metabolic potential from in situ gas ratios, Asia Oceania Geosciences Society Meeting, held 6-11 August in Singapore, 2017.

Glein, C., Enceladus H_2 paper, Europa MAss Spectrometer for Planetary EXploration Team Meeting, held 16 May in Columbia, MD, 2017.

Monroe, A.A., et al. (incl. **Glein, C.R.**), Amino acid destruction considerations for in situ measurements of Enceladus and other ocean worlds, Astrobiology Science Conference, held 24-28 April in Mesa, AZ, 2017.

Bouquet, A., **Glein, C.**, Wyrick, D., Waite, J.H., Radiolysis of water in the cores of ocean worlds: a potential steady source of H_2 to sustain habitability, Astrobiology Science Conference, held 24-28 April in Mesa, AZ, 2017.

Waite, J.H., et al. (incl. **Glein, C.**), The INMS case for habitability at Enceladus, European Geosciences Union, General Assembly, Abstract #EGU2017-1750, 2017.

Miller, K.E., **Glein, C.R.**, Waite, J.H., A new source for Titan's N_2 atmosphere: Outgassing from accreted organic-rich dust in Titan's interior, Titan through Time IV: Science Workshop on Titan's Formation, Evolution and Fate, held 3-5 April in Greenbelt, MD, 2017.

Miller, K.E., **Glein, C.R.**, Waite, J.H., A new source for Titan's N_2 atmosphere: Outgassing from accreted organic-rich dust in Titan's interior, 48th Lunar and Planetary Science Conference, p. 2072, 2017.

Bouquet, A., **Glein, C.**, Wyrick, D., Waite, J.H., Production of H_2 by radiolysis of water in the cores of icy bodies increases the habitability of the outer solar system, 48th Lunar and Planetary Science Conference, p. 1429, 2017.

Postberg, F., et al. (incl. **Glein, C.**), Complex organic macromolecular compounds in ice grains from Enceladus, 48th Lunar and Planetary Science Conference, p. 1401, 2017.

Crouch, J., et al. (incl. **Glein, C.**), Ocean worlds explorer, Planetary Science Vision 2050 Workshop, held 27 February to 1 March in Washington, DC, 2017.

Glein, C.R., The geochemistry of Enceladus: Composition and controls, Workshop Without Walls: Serpentinizing Systems Science, held 31 January to 2 February online, 2017.

−2016−

Glein, C.R., et al., Hydrothermal vs. primordial and radiolytic sources of H_2 on Enceladus, American Geophysical Union, Fall Meeting, held 12-16 December in San Francisco, CA, 2016.

Waite, J.H., et al. (incl. **Glein, C.**), The INMS case for habitability at Enceladus, American Geophysical Union, Fall Meeting, held 12-16 December in San Francisco, CA, 2016.

Glein, C., Applications of Rosetta/ROSINA data to the cosmochemistry of Pluto. Rosetta US Co-I Meeting, held 11 December in San Francisco, CA, 2016.

Waite, J.H., et al. (incl. **Glein, C.**), The INMS case for habitability at Enceladus, American Astronomical Society, 48th Division for Planetary Sciences Meeting, held 16-21 October in Pasadena, CA, 2016.

Glein, C., H_2 at Enceladus: Geochemical and biotic implications, Cassini Project Science Group Meeting #70, held 10-14 October in Monrovia, CA, 2016.

Glein, C., H_2 at Enceladus: Geochemical and biotic implications, CAPS/INMS Team Meeting, held 20-22 September in San Antonio, TX, 2016.

Glein, C., Geochemical modeling for Enceladus's ocean, 2nd Annual Ocean Worlds Meeting, held 25-26 August in Woods Hole, MA, 2016.

Perry, M.E., et al. (incl. **Glein, C.R.**), Enceladus habitability, Asia Oceania Geosciences Society Meeting, held 31 July-5 August in Beijing, China, 2016.

Glein, C.R., Zolotov, M.Y., Vance, S.D., Shock, E.L., Postberg, F., The geochemistry of Enceladus' ocean toward the end of the Cassini mission, Enceladus and the Icy Moons of Saturn Conference, held 26-29 July in Boulder, CO, 2016.

Glein, C., The beginnings of an integrated chemical oceanography on icy worlds, Europa Project Science Group Meeting #4, held 19-21 July in Ann Arbor, MI, 2016.

Glein, C., The ocean world Enceladus (Invited), 228th American Astronomical Society Meeting, held 12-16 June in San Diego, CA, 2016.

Glein, C., Enceladus' ocean chemistry, Enceladus Focus Group Workshop, held 8-9 June in Berkeley, CA, 2016.

Glein, C., Modeling hydrothermal systems at Enceladus, Europa MAss Spectrometer for Planetary EXploration Team Meeting, held 2-4 May in San Antonio, TX, 2016.

Glein, C., The power of radiogenic noble gases to reveal Europa's interior, Europa MAss Spectrometer for Planetary EXploration Team Meeting, held 2-4 May in San Antonio, TX, 2016.

Waite, J.H., **Glein, C.R.**, INMS Science Team, Update on the Ion Neutral Mass Spectrometer measurements during the E21 flyby of Enceladus, European Geosciences Union, General Assembly, Abstract #EGU2016-18052, 2016.

Glein, C.R., Waite, J.H., Lunine, J.I., How much hydrothermal hydrogen might we find in Enceladus' plume? 47th Lunar and Planetary Science Conference, p. 2885, 2016.

McDermott, J., et al. (incl. **Glein, C.**), Distinguishing abiotic from biological carbon sources in the deep biosphere, Geological Society of America Northeastern Section Meeting, held 21-23 March in Albany, NY, Abstract #32-4, 2016.

Glein, C., Geochemical modeling of H_2 in the Enceladus plume, CAPS/INMS Team Meeting, held 1-3 March in Grenoble, France, 2016.

Waite, J.H., et al. (incl. **Glein, C.R.**), H_2 in the Enceladus plume, Cassini Project Science Group Meeting #68, held 8-12 February in Pasadena, CA, 2016.

−2013-2015− (Postdoc years)

Glein, C.R., Baross, J.A., Waite, J.H., A high pH ocean on Enceladus as evidence of serpentinization: Setting the stage for life? (Invited) American Geophysical Union, Fall Meeting, Abstract #P11D-01, 2015.

Waite, J.H., et al. (incl. **Glein, C.R.**), Enceladus flyby 21: The final Cassini INMS flyby, American Geophysical Union, Fall Meeting, Abstract #P11D-02, 2015.

McDermott, J.M., et al. (incl. **Glein, C.R.**), Abiogenic and microbial controls on volatile fatty acids in Precambrian crustal fracture waters, American Geophysical Union, Fall Meeting, Abstract #B33B-0646, 2015.

Glein, C., Waite, J.H., MASPEX Europa Team, Opportunities for synergy between MASPEX and SUDA, Europa SUrface Dust Mass Analyzer Team Meeting, held 10-11 December in Boulder, CO, 2015.

Glein, C.R., Zhu, X., Sutcliffe, C.N., McDermott, J.M., Sherwood Lollar, B., The potential for abiotic organic synthesis in an ancient ore deposit: Echoes of an iron-sulfur world, Goldschmidt Conference, held 16-21 August in Prague, Czech Republic, 2015.

Sherwood Lollar, B., et al. (incl. **Glein, C.R.**), Contributions to abiotic and biological deep carbon cycling from H_2 sources in the Precambrian continental lithosphere. Goldschmidt Conference, held 16-21 August in Prague, Czech Republic, 2015.

McDermott, J.M., et al. (incl. **Glein, C.R.**), Abiogenic and microbial cycling of volatile fatty acids in ancient crustal fracture waters in the Canadian Shield. Goldschmidt Conference, held 16-21 August in Prague, Czech Republic, 2015.

Sutcliffe, C.N., et al. (incl. **Glein, C.R.**), Tracing $\delta^{18}O$-$\delta^{2}H$ isotopic evolution of ancient fracture fluids: A novel approach using Sr stable isotopes. Goldschmidt Conference, held 16-21 August in Prague, Czech Republic, 2015.

Neveu, M., Desch, S.J., Shock, E.L., **Glein, C.R.**, Cryovolcanism on dwarf planets, Astrobiology Science Conference, held 15-19 June in Chicago, IL, p. 7618, 2015.

Glein, C., Baross, J., Waite, H., A high pH ocean on Enceladus as evidence of serpentinization, 2nd International Science Meeting of the Deep Carbon Observatory, held 26-28 March in Munich, Germany, 2015.

Glein, C.R., Baross, J.A., Waite, J.H., The chemistry of Enceladus' ocean from a convergence of Cassini data and theoretical geochemistry, 46th Lunar and Planetary Science Conference, p. 1685, 2015.

Glein, C.R., Cooked volatiles and the origin of Titan's atmosphere: Evidence of deep hydrothermal activity? American Geophysical Union, Fall Meeting, Abstract #P31C-3996, 2014.

Glavin, D.P., et al. (incl. **Glein, C.**), Plume collection strategies for future icy body sample return missions, International Workshop on Instrumentation for Planetary Missions, held 4-7 November in Greenbelt, MD, p. 1012, 2014.

Glein, C., Chemical oceanography of Enceladus, 5th National Capital Area Disks Meeting, held 8-9 July in Washington, DC, 2014.

Glein, C., The geochemistry of Enceladus' ocean as a guide for Europa Clipper, Europa Clipper Science Definition Team Meeting, Invited Advisory Session on Potential Plume Measurements, held 2-3 June in Laurel, MD, 2014.

Tsou, P., et al. (incl. **Glein, C.**), LIFE: Enceladus plume sample return via Discovery, 45th Lunar and Planetary Science Conference, p. 2192, 2014.

Glein, C., Cody, G., Isotopic exchange between organic and inorganic aqueous species at the molecular level, The Deep Carbon Observatory Early Career Scientist Workshop, held 18-21 February in San José, Costa Rica, 2014.

Neveu, M., et al. (incl. **Glein, C.R.**), Enceladus' fully cracked core: Implications for habitability, Workshop on the Habitability of Icy Worlds, held 5-7 February in Pasadena, CA, p. 4028, 2014.

Glein, C.R., Cody, G.D., Rapid carbon-carbon bond formation and cleavage revealed by carbon isotope exchange between the carboxyl carbon and inorganic carbon in hydrothermal fluids, American Geophysical Union, Fall Meeting, Abstract #B13B-0459, 2013.

Neveu, M., et al. (incl. **Glein, C.R.**), Exotic sodas: Can gas exsolution drive explosive cryovolcanism on Pluto and Charon? The Pluto System on the Eve of Exploration by New Horizons: Perspectives and Predictions, held 22-26 July in Laurel, MD, 2013.

Glein, C.R., A chemical view of where Enceladus' plumes come from and where they may take us, US/Japan Workshop for the Enceladus LIFE mission, held 14-15 June in Monrovia, CA, 2013.

Glein, C.R., Shock, E.L., Introducing a new kind of geochemistry: The thermodynamics of cryogenic fluvial geochemistry on Titan, 44th Lunar and Planetary Science Conference, p. 1229, 2013.

−2004-2012− (Undergrad/grad school years)

Lorance, E.D., **Glein, C.R.**, Gould, I.R., Shock, E.L., Computational simulation of decarboxylation in water at high pressure and temperature: Accuracy, insights, and unexpected results, 243rd American Chemical Society National Meeting & Exposition, GEOC-40, 2012.

Glein, C.R., Gould, I.R., Lorance, E.D., Shock, E.L., New perspectives on mechanisms of decarboxylation in hydrothermal fluids from studies of substituted phenylacetic acids, American Geophysical Union, Fall Meeting, Abstract #V11B-2521, 2011.

Glein, C., Shock, E., Sodium chloride as a clue to Enceladus' ocean mystery (Invited), European Planetary Science Congress, held 20-24 September in Rome, Italy, p. 451, 2010.

Glein, C.R., et al., Mechanistic organic geochemistry of carboxylic acids, Goldschmidt Conference, Geochimica et Cosmochimica Acta, 74(12), A338, 2010.

Glein, C., Desch, S., Shock, E., Titan's methane as a primordial chemical species, American Astronomical Society, Division for Planetary Sciences Meeting, #33.07, 2009.

Waite, J.H., et al. (incl. **Glein, C.R.**), Ammonia, radiogenic argon, organics, and deuterium measured in the plume of Saturn's icy moon Enceladus, American Geophysical Union, Spring Meeting, Abstract #P32A-02, 2009.

Glein, C.R., Zolotov, M.Y., Shock, E.L., Liquid water vs. hydrogen cyanide on Enceladus, American Geophysical Union, Fall Meeting, Abstract #P23B-1365, 2008.

Glein, C.R., Shock, E.L., A geochemical model for the origin of methane on Titan, American Geophysical Union, Fall Meeting, Abstract #P23B-1361, 2007.

Zolotov, M.Y., Mironenko, M.V., **Glein, C.R.**, Shock, E.L., The formation and nature of early oceans on icy satellites: Geochemical constraints, Workshop on Ices, Oceans, and Fire: Satellites of the Outer Solar System, held 13-15 August in Boulder, CO, p. 159-160, 2007.

Glein, C.R., Zolotov, M.Y., Shock, E.L., Hydrothermal geochemistry as the source of plume gases on Enceladus: A thermodynamic evaluation, 38th Lunar and Planetary Science Conference, p. 1251, 2007.

Wood, S.E., et al. (incl. **Glein, C.R.**), Thermal inertia and albedo mapping of Juventae Chasma, American Astronomical Society, Division for Planetary Sciences Meeting, #38.08, 2004.