CHRISTOPHER R. GLEIN

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CONTACT INFORMATION

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RESEARCH SUMMARY

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 October 7, 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)
- 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
- Co-discovered evidence of geothermal activity on the dwarf planets Eris and Makemake (Glein et al., 2024; Grundy et al., 2024)
- Achieved 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 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)
- Helped 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
Role of abiotic organic geochemistry in the search for life
Chemistry of relevance to the emergence of life on Earth and beyond

ACADEMIC QUALIFICATIONS

Ph.D. Geological Sciences, Arizona State University, Tempe, AZ (2012)
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)
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
2024-Present	Adjunct Professor, Department of Earth and Planetary Sciences, University of Texas at San Antonio, 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: 91
First-authored: 17 (includes 4 single-authored papers)

Second-authored: 11
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Metrics as of October 7, 2026
h-index: Google Scholar, 40; Scopus, 35 (14 years since Ph.D.)
Total citations: Google Scholar, 6896; Scopus, 4741
Number of citations last year (2025): Google Scholar, 1174; Scopus, 805

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

91. Davila, A., et al. (incl. **Glein, C.**), The abiotic background: Challenges and opportunities in the search for evidence of life beyond Earth, *Astrobiology*, in press.
90. Cartwright, R.J., et al. (incl. **Glein, C.R.**), Tracing the source of carbon oxides on the large moons of Uranus, *The Planetary Science Journal*, 7, 199, https://doi.org/10.3847/PSJ/ae8818, 2026.
89. Tegler, S.C., et al. (incl. **Glein, C.R.**), Titania's deuterium abundance and the origin of its water, *The Planetary Science Journal*, 7, 191, https://doi.org/10.3847/PSJ/ae8c34, 2026.
88. Hao, J., et al. (incl. **Glein, C.R.**), The chemistry of habitable oceans in the solar system, *Nature Communications*, 17, 5638, https://doi.org/10.1038/s41467-026-74955-4, 2026.
87. Zhang, C., et al. (incl. **Glein, C.**), Dynamic controls on subsurface water chemistry and habitability on icy moons, *The Innovation*, 7, 101420, https://doi.org/10.1016/j.xinn.2026.101420, 2026.
86. 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*, 1003, 194, https://doi.org/10.3847/1538-4357/ae5b6b, 2026.
85. Carrasco-Herrera, R., et al. (incl. **Glein, C.R.**), Electron irradiation of methanol ices: Implications for organic chemical diversity on Europa's surface, *Icarus*, 456, 117136, https://doi.org/10.1016/j.icarus.2026.117136, 2026.
84. Zhong, Y., et al. (incl. **Glein, C.R.**), Abiotic CO_2 reduction promoted by carbonate and phyllosilicate minerals on the primitive seafloor, *Nature Communications*, 17, 3229, https://doi.org/10.1038/s41467-026-71130-7, 2026.
83. Cable, M.L., et al. (incl. **Glein, C.R.**), Cold-water CO_2 geysers as ocean world plume analogs: Investigation of habitability indicators in Crystal and Champagne Geysers pre- and posteruption, *Astrobiology*, 26, 79-98, 2026.
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.
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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, e2201388119, 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.
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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.
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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, https://doi.org/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.
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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.

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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
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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.
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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.

FUNDING HISTORY

Total funds received: $5,804,047
PI grants: 11
Co-I grants: 21

Awarded proposals:

Co-I, James Webb Space Telescope Cycle 5 General Observers Program, "Sources and Seasonal Evolution of CO_2 on Ocean World Enceladus" (PI: Richard Cartwright, Johns Hopkins

University Applied Physics Laboratory), Total Budget: $99,072 (1 October 2025 to 30 September 2027), Funds to Glein: $7,000

Co-I, James Webb Space Telescope Cycle 5 General Observers Program, “Unlocking the Origins of Giant Planet Satellite Systems Through D/H Measurements of Europa, Ganymede, and Callisto” (PI: Will Grundy, Lowell Observatory), Total Budget: $148,751 (1 October 2025 to 30 September 2027), Funds to Glein: $33,000

PI, SwRI Internal Research & Development, “From Disks to Prebiotic Worlds: Building a Linked Exoplanet Astrobiology Pipeline (LEAP) at SwRI”, Total Budget: $348,343 (1 July 2026 to 30 June 2027)

PI, Europa Inspiring Clipper: Opportunities for Next-generation Scientists (ICONS), Jet Propulsion Laboratory, “Understanding the Chemistry of a Carbonic Ocean on Europa”, Total Budget: $61,184 (28 May 2026 to 31 August 2026)

Co-I, SwRI Internal Research & Development, “Deuterium as a Diagnostic of the Interior Composition of Uranus and Neptune (PI: Olivier Mousis, Southwest Research Institute)”, Total Budget: $80,000 (1 April 2026 to 31 July 2026), Funds to Glein: $30,233

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

Submitted proposals:

PI, Guggenheim Fellowship, The John Simon Guggenheim Memorial Foundation, "Rule #1 in the Search for Life on an Ocean World: Know Thy Abiotic Background", Total Budget: Pending (2026)
PI, Solar System Science, "Understanding Hydrogen Production on Enceladus", Total Budget: Pending (2026)
Co-I, James Webb Space Telescope Cycle 6 General Observers Program, "Assessing Salt Signatures on Enceladus' Surface with MIRI MRS" (PI: Matthew Hedman, University of Idaho), Total Budget: Pending (2026)
Co-I, James Webb Space Telescope Cycle 6 General Observers Program, "Investigating irradiation chemistry and internal evolution of TNOs through the surface compositions of Sedna, Gonggong, and Quaoar" (PI: Joshua Emery, Northern Arizona University), Total Budget: Pending (2026)

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

Lecturer, American Geophysical Union College of Fellows Distinguished Lecture Series, 2026-2027
Department of Earth and Space Sciences Mindlin Lecture, University of Washington, https://youtu.be/7kH08g4OQSE?si=QYMbllXY3WZ5k-ii, February 2026
Carl Sagan Lecture, Recognizing Scientific Interest in Astrobiology and Effective Science Communication Skills, American Geophysical Union, 2025
Scialog Fellow, Signatures of Life in the Universe, Research Corporation for Science Advancement (RCSA) and the Heising-Simons Foundation, 2023

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

SPACECRAFT MISSION INVOLVEMENT

Flown/selected missions:

James Webb Space Telescope (JWST), 2022-Present
Principal Investigator of Cycle 2 General Observer Program 4320
Europa Clipper MAss Spectrometer for Planetary EXploration (MASPEX) instrument, Co-Investigator, 2015-Present
Juno mission, 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

Department of Physics Colloquium, Loyola University Chicago, October 2026
Space Studies Seminar, Georgetown University, August 2026
Planetary Science Directorate Colloquium, Southwest Research Institute Boulder, April 2026
College of Sciences Research Symposium, University of Texas San Antonio, April 2026
Europa Clipper Lecture Series, Europa Clipper Mission, Jet Propulsion Laboratory, March 2026
Earth and Space Sciences Colloquium, 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
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
Geophysical Laboratory Seminar, Carnegie Institution of Washington, September 2012

INVITED CONFERENCE TALKS

Glein, C.R., Seafaring in space: A personal voyage to Enceladus (Carl Sagan Lecture), American Geophysical Union, Fall Meeting, held 15-19 December in New Orleans, LA, 2025.
Glein, C.R., The deep chemistry of Pluto and other large trans-Neptunian objects, Progress in Understanding the Pluto System: 10 Years After Flyby, held 14-18 July in Laurel, MD, 2025.

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

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, TNO2024, held 24-28 June in Taipei, Taiwan, 2024.

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

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

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

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

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

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

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

TEACHING & SUPPORT OF EARLY-CAREER SCIENTISTS

Courses:

2019-Present	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

Postdoctoral & graduate student advising:

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

Graduate researcher Christine Ray, "The Habitability of Ocean Worlds: A Chemical Systems Perspective", University of Texas at San Antonio, 2016-2021

Now: Colorado Liaison with the Western Fire and Forest Resilience Collaborative

Primary supervision of undergraduate research:

Summer intern Gracie Threadgill, Western Carolina University, 2026
Summer intern Laiba Mahmood, Queens College, City University of New York, 2025
Summer intern Jared Bouck, Northern Arizona University, 2024
Summer intern Carly Davis, McNeese State University, 2024

Collaborative mentorship:

Graduate researcher Eric Austin, University of Texas at San Antonio, 2025-Present
Graduate researcher Cindy Luu, University of Texas at San Antonio, 2024-Present
Postdoctoral researcher Elizabeth Spiers, University of Texas at Austin, 2024-2025
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

PROFESSIONAL SERVICE

Leadership:

Co-Chair, Composition Working Group, Europa Clipper mission, 2022-2025
Member, Ocean Worlds and Dwarf Planets Panel, Planetary Science and Astrobiology Decadal Survey 2023-2032, 2020-2021
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
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
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

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

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

PUBLIC OUTREACH

Panelist for a webinar on ocean world missions, Future Leaders of Ocean Worlds, Network for Ocean Worlds, 2026
Presenter of an Astronomy on Tap talk, Blue Star Brewing Company, San Antonio, 2026
Panelist for a plenary on Missions to Icy Ocean Worlds—Expectations and Scientific Capabilities, Astrobiology Science Conference, 2026
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, 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