

Astronomy Colloquium

Dr. Christopher Glein

Lead Scientist at Southwest Research Institute

The Enceladus-Exoplanet Connection: How Molecular Hydrogen on Ocean Worlds Could Support Life

Saturn's moon Enceladus has a subsurface ocean that erupts into space, forming a plume. We sampled the plume using the Cassini spacecraft and found that it contains materials that can fuel methane formation, namely CO₂ and H₂. Methane was also found. The amount of H₂ is far above the equilibrium abundance, indicating a source of chemical energy. This is the first time that evidence was found of a source of chemical energy from an extraterrestrial ocean. More recently, the James Webb Space Telescope detected CO₂, H₂, and CH₄ in the atmosphere of the sub-Neptune exoplanet K2-18 b. It was proposed that this temperate planet might have a liquid water ocean. If it does, I have found that methanogenesis would be favorable to drive metabolism there. This may represent the identification of a source of chemical energy far beyond our cosmic shoreline. These findings suggest the arrival of a new strategy in the search for habitable environments – follow the energy after water!



Dr. Christopher Glein is a planetary scientist whose research revolves around the “big three” icy ocean worlds – Enceladus, Europa, and Titan. Glein is a recognized expert on the geochemistry of these moons. He develops novel methods of analysis that enable inferences to be made on the geochemical properties of their environments and the governing processes using spacecraft data. He has over 16 years of experience in developing and applying chemical models to constrain the geochemistry of outer solar system bodies. Glein was a member of the instrument team for the Cassini Ion and Neutral Mass Spectrometer (INMS), and he is now a Co-I on the Europa Clipper MAss Spectrometer for Planetary EXploration (MASPEX) team.

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3:30 PM MST

Room 103 in the Physical Sciences building 19

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