

SEMINAR NOTICE

Department of Physics and Engineering Physics
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SPEAKER: Danny Rodriquez Herarra, PhD Candidate
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TOPIC: *Tracking gas hydrate formation in cryogenic water-guest films.*

DATE: Tuesday September 22nd, 2026

TIME: 3:30-4:30 p.m.

Room: Phys 103

Gas hydrates are crystalline inclusion compounds in which hydrogen-bonded water cages encapsulate guest atoms or molecules. On Earth, they occur naturally in marine sediments and in and beneath permafrost, where they store substantial quantities of methane and participate in the global carbon cycle. Beyond Earth, their possible presence in comets, icy planetary bodies, and interstellar ices raises intriguing questions about how volatile molecules are trapped, transported, and released. As cold water-rich ices warm during the evolution of these environments, can initially disordered regions reorganize into gas hydrates before the guests escape?

This seminar explores that question through laboratory experiments on cryogenic water-guest films prepared under vacuum and subsequently warmed. Temperature-resolved synchrotron wide- and small-angle X-ray scattering, complemented by FTIR spectroscopy, provides different perspectives on the changing water framework and the fate of the trapped guests. Beginning with the behavior of pure amorphous water, the discussion will focus on Xe-H₂O and Kr-H₂O, with comparisons across other guests to examine how guest identity influences hydrate formation. Together, these observations support a shared molecular pathway involving guest retention and redistribution within an evolving water network, offering insight into how hydrates may develop under these conditions.