Sweet Confinement: Carbohydrate Osmolytes in Reverse Micelles

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Confinement to nanoscopic proportions can have dramatic impact on the properties of materials. We explore the impact that soft nanoconfinement in reverse micelle has on water properties. This presentation will focus on the effects of water on carbohydrates and carbohydrates on water in reverse micelles. When introduced to reverse micelles, carbohydrates such as glucose, sorbitol, and trehalose result in smaller particles than those prepared with only water. Through a range of measurements we are developing a model to explain the reverse micelle size variations. At the same time, we explore the impact of carbohydrates on water in the reverse micelle nanoconfined environment, where we measure dramatic slowing of chemical exchange rates between carbohydrates hydroxyl groups and water. This presentation will discuss implications of these results for interfacial chemistry and implications for cryopreservation of cells.

Research in Professor Levinger’s group has two main thrusts: dynamics of molecules in confined environments and fundamental processes governing cell cryopreservation. For many years, researchers have explored the role of nanoconfinement on the structure and dynamics of molecules in the condensed phase. They are particularly interested in learning how the heterogeneous environment at liquid interfaces influences molecules residing there and the resulting chemistry. A new thrust for the Levinger group explores how and why some cells can withstand freezing conditions that would normally kill them. This project aims to uncover how small molecules cross cell membranes, where they reside in cells, and how they protect cells from cold.

Professor Levinger earned her bachelor’s degree with double majors in integrated science and physics from Northwestern University, and her doctorate in chemical physics at the University of Colorado, Boulder. From 1990 to 1992, she performed research as a National Science Foundation post-doctoral fellow, working with Paul Barbara at the University of Minnesota. Levinger began her independent career at Colorado State University in 1992, rising through the ranks to professor in 2005. In 2007, she was named a University Distinguished Teaching Scholar, one of the two highest honors given by Colorado State University. She is a Fellow of the American Physical Society, the American Association for the Advancement of Science, and the American Chemical Society.

Information: z.umn.edu/NancyLevingerSeminar

Hosts: Professor Aaron Massari & Graduate Student Evan Anderson
Refreshments will be served prior to the seminar.
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