"Engineering the Crystallization of Water Using Molecular and Biomolecular Agents"

Wednesday
September 22, 2021
3:30 pm
Wu and Chen Auditorium
Levine Hall

Ran Drori
Assistant Professor
Chemistry and Biochemistry
Yeshiva University

Abstract

The crystallization of water affects various processes, both globally and in our daily lives. Ice crystals cause freezing and death when they grow in the extracellular fluids of organisms living in sub-freezing conditions. Similarly, the formation of gas hydrates in flowlines transporting gas/oil causing safety and economic risks, and the release of methane from gas hydrates to the atmosphere contributing to global warming. Antifreeze proteins (AFPs) are evolution's answer to the problem of freezing in organisms, and some synthetic inhibitors of gas hydrates are currently in use. However, the mechanisms by which these natural and synthetic inhibitors work remain largely unclear.

My lab is using a unique combination of cold-stages (millikelvin resolution), fluorescence microscopy and microfluidics to study the effects of molecular agents on the crystallization of water. In my talk, I will describe how AFPs: a) bind to ice and inhibit its growth, b) synergistically enhance their activity, and c) accelerate and inhibit ice growth. I will then present our work with a synthetic dye molecule that assembles in solution and forms supramolecular assemblies that inhibit both ice and clathrate hydrates.

Bio

Ran Drori has been an Assistant Professor of the Department of Chemistry and Biochemistry at Yeshiva University, since 2017. He was trained as a postdoctoral researcher at NYU's Chemistry department, working with Profs. Michael Ward and Bart Kahr on supramolecular ice growth inhibitors and isotopic effects on ice growth. During his PhD studies, Dr. Drori investigated the interactions between ice crystals and antifreeze proteins with Prof. Ido Braslavsky at the Hebrew University of Jerusalem in Israel. Dr. Drori is a co-founder of MicroIce, a company that makes microscope-mounted cold-stages.

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