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**Ice nucleation without supercooling:
On the search for the most potent ice nucleants.**

Understanding and controlling ice formation and adhesion are the central aims of the MURI project “Unraveling the Mechanisms of Ice Nucleation and Anti-Icing Through an Integrated Multiscale Approach”. The quest to develop potent ice nucleants was never as pronounced as post World War II, when research in the seeding of clouds to produce precipitation boomed. Hundreds of organic compounds were tested for their ability to nucleate ice, and dozens of them were found to crystallize water with little supercooling. Several of these organic crystals become so potent nucleants at high pressure that they allow ice formation within 1K of the equilibrium melting temperature. The molecular interaction of these exceptional nucleants with ice, and the mechanisms by which they promote water crystallization have long been debated, but only recently it has been possible to access them through molecular simulations. This presentation will introduce the MURI Ice project, discuss our work to elucidate the mechanism by which organics nucleate ice, and our quest to find even stronger ice nucleants that can prefreeze water above the melting temperature and form ice without supercooling.