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10:30am

Steele 006

“Molecular Self-Assembly in Topological Defects of Liquid Crystals”

Biography: Nicholas Abbott received a Bachelor of Engineering (Chemical Engineering) from University of Adelaide, Australia in 1985, and a PhD in Chemical Engineering from Massachusetts Institute of Technology in 1991. He was a postdoctoral fellow in the Chemistry Department of Harvard University from 1991-1993. His initial academic appointment was at University of California-Davis. He moved to the Department of Chemical and Biological Engineering at University of Wisconsin-Madison in 1998, and served as Chairman of the department (2009 to 2012) and Director of the Wisconsin Materials Research Science and Engineering Center (2012 to 2018). In 2018, he joined Cornell University as the Tisch University Professor in the School of Chemical and Biomolecular Engineering. His research accomplishments related to colloids, interfaces and soft materials have been acknowledged by the ACS Award in Colloid and Surface Chemistry and the Alpha Chi Sigma Award of AIChE. He is a member of the US National Academy of Engineering, an elected fellow of the AAAS and APS.

Abstract: Topological defects in liquid crystals (LCs) have been used to organize colloidal dispersions and template polymerizations, leading to a range of elastomers and gels with complex mechanical and optical properties. However, little is understood about molecular-level assembly processes within the cores of topological defects. This presentation will describe how nanoscopic environments defined by LC topological defects can selectively trigger processes of molecular self-assembly. By using fluorescence microscopy, cryogenic transmission electron microscopy and super-resolution optical microscopy, key signatures of molecular self-assembly of amphiphilic and polymeric molecules in topological defects are observed - including cooperativity, reversibility, and controlled growth of the molecular assemblies. By using polymerizable amphiphiles, we demonstrate preservation of molecular assemblies templated by defects, thus providing insights into the nanoscopic structure of the cores of topological defects. We also find that molecular self-assembly can select for and stabilize specific types of defects, leading to soft matter that is exquisitely responsive to the presence of particular classes of synthetic and biological lipids.