

Seminar: 11:10 am Friday, April 5 2024

Science 1: Room 1002

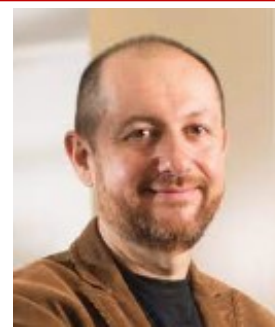
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DNA-Programmable Assembly of Nanoscale Materials

Integrating functional nanocomponents into complex engineered architectures is required to enable novel functions for applications in photonics, biomaterials, computing, mechanics, and sensing. The current top-down fabrication methods are limited in their ability to create designed 3D nanostructures and incorporate nanocomponents in a defined manner. Conversely, self-assembly has uncovered the exciting richness of spontaneously forming structures, but bottom-up methods typically do not provide designability for achieving a specifically prescribed material structure.

The talk will discuss the advances of DNA-programmable self-assembly methods developed in our lab for creating large-scale and finite-size nano-architectures from diverse inorganic and biomolecular nanocomponents with a prescribed organization at different scales. The exploration of assembly design principles and the experimental development of diverse periodic and hierarchical organizations from inorganic nanoparticles and proteins across the scales will be discussed. The combination of equilibrium and non-equilibrium assembly approaches for gaining control over multiple scales will be presented. The established assembly approaches and nanoscale inorganic templating allow for the fabrication of functional nanomaterials with nano-optical, electrical, mechanical, and biochemical functions; examples of these efforts will be illustrated. Finally, the progress on establishing nanomaterials with prescribed reconfigurable states will be discussed.

Research Site: <https://gang.cheme.columbia.edu/>