Title:
Engineering with DNA

Abstract:
Biologically, nucleic acids manage the information of life *for* life. Analogous to a library, they store, organize, and regulate genetic information to build and maintain vital ecosystems. Similar to a wiki, hereditary content evolves through gene insertion, deletion, and modification, promoting information survival via mutation. From a materials perspective, nucleic acids are information dense, programmable polymers with structural integrity and well-defined boundary conditions. These conditions endow nucleic acids with the power of molecular self-assembly, which is "*the spontaneous association of molecules under equilibrium conditions into stable, structurally well-defined aggregates joined by non-covalent bonds* – Whitesides." By encoding sequence complementarity and initiating hybridization, molecular self-assembly can be exploited to load nucleic acids into tension like a rope, actuate it with fuel like a machine, weave it into networks like a textile, decorate it with organic/inorganic matter like a scaffold, program it into integrated circuits like a computer, and store information into it like a time capsule. Presented from a memory perspective, nucleic acids are programmable polymeric macromolecules with digitally encoded, stored, and retrievable information. Dr. Hughes will describe his research with DNA as an engineering material by providing examples of semiconductor fabrication, memory manufacturing, and biotechnology applications in his lab.