



Yale Institute for Nanoscience
and Quantum Engineering

Special YINQE Seminar

Thursday- November 13, 2014
4:00 to 5:00 p.m.

MANN STUDENT CENTER
DUNHAM LAB

Professor Nadrian C. Seeman
Department of Chemistry, New York University

"DNA: Not Merely the Secret of Life"

We build branched DNA species that can be joined using Watson-Crick base pairing to produce N-connected objects and lattices. We have used ligation to construct DNA topological targets, such as knots, polyhedral catenanes, Borromean rings and a Solomon's knot.

Nanorobotics is a key area of application. We have made robust 2-state and 3-state sequence-dependent devices and bipedal walkers. We have constructed a molecular assembly line using a DNA origami layer and three 2-state devices, so that there are eight different states represented by their arrangements. We have demonstrated that all eight products can be built from this system.

Recently, we have self-assembled a 3D crystalline array and reported its crystal structure to 4 Å resolution. We can use crystals with two molecules in the crystallographic repeat to control the color of the crystals. Rational design of intermolecular contacts has enabled us to improve crystal resolution to better than 3 Å. We are now doing strand displacement in 3D to change the color of crystals. Thus, structural DNA nanotechnology has fulfilled its initial goal of controlling the internal structure of macroscopic constructs in three dimensions. A new era in nanoscale control awaits us.