MATERIALS SCIENCE GRADUATE PROGRAM

SEMINAR ON LIQUID CRYSTALS

Fall 2024

KENT STATE UNIVERSITY

WEDNESDAY, SEPTEMBER 11TH 3:20PM

AMLCI 101

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Materials Science Graduate Program

Building with DNA: Nanostructures and Molecular Mechanics

DNA is a unique polymer. It is the information storage molecule of all known life forms, and can be used to build up almost arbitrary structures and patterns from DNA. These structures can site-specifically be functionalized with a large variety of inorganic nanoparticles, small molecules or large biomolecules such as proteins and antibodies. Our group is leveraging this programmability to engineer nanoarchi-tectures and tools for applications in Biophysics, Molecular Biology, Nanophotonics and Nanomedicine.
An iconic feature of DNA is its double helical nature with an average repeat ho of ~10.45 base pairs per turn, which is currently believed to be independent of curva-ture. We developed a new ligation assay with nicked DNA circles of varying curva-ture, and found that the textbook value for ho is only correct for mechanically relaxed DNA and that tight bending of protein-free DNA significantly unwinds DNA. Our work constitutes a major modification of the physical model of DNA and requires re-assessing the molecular mechanisms and energetics of all processes where DNA is tightly bent or relaxed again.

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