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"Molecular Programming With DNA"

Wednesday, April 10, 2013

Mudd Hall of Philosophy (MHP 106) Lecture 3:00 PM
Mudd Hall of Philosophy Courtyard Reception 4:00 PM
Hosted by Dr. Alice Parker

Inspired by the information processing core of biological organisms and its ability to fabricate intricate machinery from the molecular scale up to the macroscopic scale, research in synthetic biology, molecular programming, and nucleic acid nanotechnology aims to create information-based chemical systems that carry out human-defined molecular programs that input, output, and manipulate molecules and molecular structures. For chemistry to become the next information technology substrate, we will need improved tools for designing, simulating, and analyzing complex molecular circuits and systems. Using DNA nanotechnology as a model system, I will discuss how programming languages can be devised for specifying molecular systems at a high level, how compilers can translate such specifications into concrete molecular implementations, how both high-level and low-level specifications can be simulated and verified according to behavioral logic and the underlying biophysics of molecular interactions, and how design and analysis methods can cope with the inherent stochasticity and uncertainties of molecular systems.



Erik Winfree is Professor of Computer Science, Computation and Neural Systems and Bioengineering at Caltech. He is the recipient of the Feynman Prize for Nanotechnology (2006), the NSF PECASE/CAREER Award (2001), the ONR Young Investigator Award (2001), a MacArthur Fellowship (2000), the Tulip prize in DNA Computing (2000), and MIT Technology Review's first TR100 list of "top young innovators" (1999). Prior to joining the faculty at Caltech in 1999, Winfree was a Lewis Thomas Postdoctoral Fellow in Molecular Biology at Princeton, and a Visiting Scientist at the MIT AI Lab. Winfree received a B.S. in Mathematics and Computer Science from the University of Chicago in 1991, and a Ph.D. in Computation and Neural Systems from Caltech in 1998.