On Constructing Tile-less DNA Ribbons and Tubes

Peng Yin[1,2,4*] Sudheer Sahu[6] Rizal Hariadi[3] Harry M. T. Choi[2] Sung Ha Park[1,5]
Bethany Walters Thomas H. LaBean[6*] John H. Reif[6*]

Dept. of Computer Science[1], Dept. of Bioengineering[2], Dept. of Applied Physics[3], Center for Biological Circuit Design[4], Center for Physics of Information[5], Caltech, Pasadena, CA 91125
Dept. of Computer Science[6], Duke University, Durham, NC 27708

E-mail Address: py@caltech.edu, thl@cs.duke.edu, reif@cs.duke.edu

In this talk, we will present some preliminary investigation on using a tile-less approach to construct DNA lattice structures, in which the intermediate construct of tiles is circumvented, both conceptually and physically. Instead, single stranded DNA is used to directly form the intended DNA lattice. The tile-less approach is intended to serve as a complementary approach to the current dominant paradigm of tile-based approach for the construction of DNA lattice structures. The tile-less approach can often offer the following desirable properties: conceptual and structural simplicity, finer-grained programmability/higher information density, and higher thermal stability. As an investigative and illustrational example, we will describe a general scheme that has been proved successful for the construction of extended DNA ribbons with programmable width and the construction of long DNA tubes.