Topological analysis of enzymatic actions: site-specific recombinases and topoisomerases

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(Tea 3:30 pm Math Lounge)

Abstract

DNA topology is the study of geometrical (supercoiling) and topological (knotting) properties of DNA loops and circular DNA molecules. Virtually every reaction involving DNA is influenced by DNA topology, or has topological effects. Site-specific recombinases and topoisomerases are enzymes able to change the topology of circular DNA by breaking the DNA and introducing one or more crossing changes. Mathematical analysis of such changes may provide relevant information about the possible enzymatic pathways, and about DNA conformation at the moment of double-stranded break induction. In this talk I will discuss some of the problems that I am currently interested in, and the topological tools used in their analyses.

First I will talk about Xer recombination and how we applied, and extended, the tangle model for site-specific recombination to propose a unique topological mechanism for this enzymatic action. I will then present the Java applet TangleSolve that makes the tangle model easily accessible to the scientific community. Finally, I will talk about my recent work on DNA unknotting by type II topoisomerase.

This talk should be accessible to graduate students.