MICHAEL SZAFRON, Department of Mathematics and Statistics, University of Saskatchewan, Saskatoon, SK
The Probability of Knotting after a Local Strand Passage in an Unknotted SAP

Due to DNA's structure, it is prone to several different topological entanglement problems. The cell must be able to resolve each of these problems because the problems interfere with vital cell functions. For instance, knotted DNA cannot replicate successfully. The cell therefore must have some mechanism by which the DNA can be unknotted. This mechanism is the interaction of the DNA with the topoisomerase enzymes.

The topoisomerase enzymes interact locally with the DNA and pass one strand of DNA through itself via the enzyme-bridged transient break in the DNA [RW94]. Since these local strand-passages can potentially change the knot-type of the DNA [DSKC85], [WC91], experimentalists can use the frequency of knots produced to characterize topoisomerase action on DNA topology [WC86].

It is of interest whether these local strand-passages are implemented at random locations in the DNA. In order to investigate this problem, a simplified model of an unknotted ring polymer was implemented via Monte Carlo simulation to estimate the probability that a ring polymer has knot-type K after a local strand passage has occurred within the ring polymer. The model, some estimates of the knotting probabilities, and an observation will be presented.