

Physics Colloquium, St. Francis Xavier University

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Dr. Alexander Klotz

*Department of Chemical Engineering
Massachusetts Institute of Technology*

The Physics of Knots in Stretched DNA

I study the physics of polymers using DNA molecules as a model system. Knots occur naturally in biological DNA, a phenomenon relevant for cellular genome organization as well as genetic sequencing technology. Knotted DNA molecules serve as a minimal system to study polymer entanglement, a phenomenon relevant to the flow properties of soft materials. To study the dynamics of knots in DNA, I induce knotting in viral DNA using electric fields and stretch the molecules with an electric circuit inside a microfluidic channel. I will discuss some recent results from my experiments, including the effect of knots on the elasticity of an individual molecule, the motion of knots along elongated molecules, and the process by which knots untie as they reach the end of the molecule.