

Polymer Physics versus DNA Topology

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Abstract:

DNA appears in linear, circular and knotted forms, depending on the situation and conditions. It is therefore an excellent playground for polymer physics to test theoretical concepts. In the present lecture, I will first focus on the properties of linear DNA and show that critical exponents describing the divergence of the end-to-end distance can be determined from Atomic Force Microscopy images of DNA and that the end-to-end distance distribution as a function of the DNA length can be also measured. Then, the properties of knotted DNA in respect to the critical exponents and the localization of the knot crossings will be reported: I will show that two universality classes exist in this case. At the end of the lecture, gel electrophoresis of DNA knots will be discussed and simulation as well as experiments will be present where the knot complexity and its topology play an essential role.