Twist, stretch and melt: quantifying how DNA complies to tension

Erwin J.G. Peterman

Vrije Universiteit Amsterdam
Department of physics and astronomy
De Boelelaan 1081
1081 HV Amsterdam
The Netherlands

DNA, the carrier of genetic information, is a long, charged polymer. In our cells, a whole machinery of proteins takes care of its packaging, repair, reading and copying. Our goal is to understand the physics behind the processes involved. To this end, we use optical tweezers in combination with fluorescence microscopy and microfluidics, which allows manipulation of DNA, application and measurement of forces, localization and counting of proteins binding to it, and rapid switching of buffer conditions.

Using this approach, we visualize that DNA melts under high tension and demonstrate that for a proper quantitative description of DNA elasticity it is imperative to include tension-induced winding and unwinding of the double helix.