The mechanical properties of double-stranded RNA in response to force and torque

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Explorations of nucleic acids conformations and their interactions with ions

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While the response of DNA to applied forces and torques has been precisely measured, much less is known about double-stranded RNA (dsRNA). We have measured the elastic response and non-linear transitions of dsRNA using a novel torsionally constrained dsRNA construct and several complementary magnetic tweezers assays. While the bending and torsional persistence lengths and stretch modulus of dsRNA are, overall, similar to dsDNA, we have discovered two striking differences. First, we find the twist-stretch coupling of dsRNA to have an opposite sign from that of dsDNA, i.e. dsRNA, unlike dsDNA, shortens when overwound. Second, we have discovered a striking difference in the energy landscape at the buckling torque under positive twist.

In my talk, I will

1) Briefly explain how magnetic tweezers allow us to apply and measure forces and torques to nucleic acid tethers;
2) Discuss our recent results on dsRNA under forces and torques;
3) Time permitting, I will briefly discuss how we have probed nucleic acid conformations and their interactions with the ion atmosphere using a range of bulk techniques.

Thursday, May 2nd, 2013
16:00
Institute for Computational Physics, Allmandring 3
Room 1.079