

Molly Hansen...Published!

It completely caught me off guard. I sent an email off to my former advisor, Udayan Mohanty (at Boston College) to see if he wanted to write a letter of recommendation for me for my application for tenure and promotion this year. He said yes (of course), and suggested I add the following reference to my list of publications:

A. Spasic, G. Hess, K. Becker, M. Hansen, R. Bleil and U. Mohanty, "Asymmetric Charge Neutralization of DNA," Curvature and Deformation of Nucleic Acids: Recent Advances, New Paradigms, Nancy C. Stellwagen and Udayan Mohanty, eds. (Oxford University Press, 2004).

Notice the fourth name along the list; it's MOLLY! Yes yes yes, and I am there as well. This book is not available yet (sorry, Molly; no royalties!), but when it is, I will definitely be buying a copy.

So what did Molly do? Well, she asked a pretty cool question; if DNA is about four feet long, how can one fit inside a cell? Well, the answer, of course, is it is coiled up (a "supercoil"). So, how does the DNA get coiled?

One partial answer (there are many more mechanisms than this, but it is a contributing factor) is a charge imbalance on two sides of the DNA. See, the DNA backbone is lined with negatively charged phosphate groups. So, what would happen if you neutralize some of the charges on just one side? You get a charge imbalance, leading to a force wherein the charged phosphates are trying to repel one another, but this repulsion is not present on the neutralized side. The result is a "kink" in the DNA.

Molly wrote a mathematical model of the free energy differential on the two sides of such a DNA, and calculated the angle of the bend as a function of the number of neutralized charge!

So was this all Molly? No, not really. Spasic, Becker and Mohanty had already worked out the details and the mathematical model. Mohanty asked me to check the work, and I asked Molly to help me out with some rather involved and complicated derivatives. Honestly, I had forgotten all about it, but this is how science is. Sometimes you help somebody out in a very minor way, and your name gets on a new publication. These opportunities do arise from time to time, and I like to involve students when they do; keep your ears open and remember this example the next time I ask you if you would like to be involved in an extra project!