Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Role of ions in thermal diffusion of DNA: Lattice Boltzmann based simulations AUDREY HAMMACK, DAHARSH RANA, KARL MAY, MATTHEW BLEDSOE, JENNIFER KREFT PEARCE, University of Texas at Tyler, Tyler, TX, YENG-LONG CHEN, Institute of Physics, Academia Sinica, Taipei, Taiwan — The Ludwig-Soret effect, the migrarion of a species as a consequence of a temperature gradient, has been a factor in the development of microfluidic laboratory instrumentation. In a system consisting of DNA in a buffered salt solution exposed to a temperature gradient in micro channels, it has previously been observed that DNA will migrate to the colder regions, yielding an irregular density profile. We present a computational model in order to quantify the motion of the particles and describe the causes of this migration. In this construct, the salt ions are modeled as charged point particles and DNA as charged beads connected by springs. The motions of particles is calculated by using a combination of Brownian dynamics and the lattice Boltzmann method. We observe that the salt are also affected by the temperature gradient, creating a density profile. By varying the number of ions, the charge of the ions and the length of the DNA chain, we observe that the accumulation of ions in the cold region enhances the migration of the DNA to those regions of the channel.

Jennifer Kreft Pearce
University of Texas at Tyler, Tyler, TX

Date submitted: 23 Jul 2008 Electronic form version 1.4