## Abstract Submitted for the MAR15 Meeting of The American Physical Society

Tunable Thermal Switching via DNA-Based Nano Devices MICHAEL ZWOLAK, Center for Nanoscale Science and Technology, National Institute of Standards and Technology, CHIH-CHUN CHIEN, School of Natural Sciences, University of California, Merced, KIRILL VELIZHANIN, Theoretical Division, Los Alamos National Laboratory, YONATAN DUBI, Department of Chemistry and the Ilse Katz Center for Nano-Science, Ben-Gurion University — DNA has a welldefined structural transition – the denaturation of its double-stranded form into two single strands – that strongly affects its thermal transport properties. We show that, according to a paradigmatic model of DNA denaturation, one can engineer DNA "heattronic" devices that have a rapidly increasing thermal conductance over a narrow temperature range across the denaturation transition ( $\sim 350$  K). The origin of this rapid increase of conductance, or "switching," is the softening of the lattice and suppression of nonlinear effects as the temperature crosses the transition temperature and DNA denatures. Most importantly, we demonstrate that DNA nanojunctions have a broad range of thermal tunability due to varying the sequence and length, and exploiting the underlying nonlinear behavior. We discuss the role of disorder in the base sequence, as well as the relation to genomic DNA. These results set the basis for developing thermal devices out of materials with nonlinear structural dynamics, as well as understanding the underlying mechanisms of DNA denaturation.

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