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The Physics of Nanoconfined DNA WALTER REISNER, Department of Physics, Princeton University, KEITH MORTON, Electrical Engineering, Princeton University, ROBERT RIEHN, YANG MEI WANG, Department of Physics, Princeton University, STEPHEN CHOU, Electrical Engineering, Princeton University, JONAS TEGENFELDT, Department of Physics, Lund University, ROBERT AUSTIN, Department of Physics, Princeton University — Top-down approaches to nanotechnology have the potential to revolutionize biology by making possible the construction of chip-based devices that can not only detect and separate single DNA molecules by size but also–it is hoped in the future–actually sequence at the single molecule level. While a number of top-down approaches have been proposed, all these approaches have in common the confinement of DNA to nanometer scales, typically 5-200nm. Nanoconfinement effects the equilibrium conformation of the DNA. Here we present measurements of the static and dynamic properties of single DNA molecules confined in nanochannels using fluorescence microscopy techniques. In particular, we investigate the dynamics of DNA in novel structures, including structures with defects (bulges and constrictions) and channels that funnel in depth and width. We also discuss observations of possible topological structures on the confined DNA (knots or loops observed on the extended molecules).

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