Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Diffusion of Isolated DNA molecules: dependence on length and topology RAE M. ROBERTSON, STEPHAN LAIB, DOUGLAS E. SMITH, University of California at San Diego — Diffusion coefficients (D) for relaxed circular and linear DNA molecules ranging in length (L) from 5.9 to 287.1 kilobasepairs were measured by tracking the Brownian motion of single molecules. A topology independent scaling law, $D \sim L^{-0.58+/-0.016}$, was observed, in good agreement with the –0.588 exponent predicted by renormalization group theory. The measured ratio $D_{Circular}/D_{Linear}$ = 1.32+/-0.014 fell between predictions of 1.18 for Kirkwood hydrodynamic theory and 1.45 for renormalization group theory and agreed best with a value 1.31 predicted using the Zimm model and an expression for the radius of gyration proposed by Bensafi, Maschke, and Benmouna. Measurements on supercoiled DNA molecules were also made and qualitatively compared to theoretical predictions.

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Date submitted: 26 Nov 2005 Electronic form version 1.4