

Abstract Submitted  
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**Tracking a Molecular Motor with a Nanoscale Optical Encoder**

EVERETT A. LIPMAN, CHARLES E. WICKERSHAM, DANIEL H. KERR, Department of Physics, UC Santa Barbara, Santa Barbara, CA 93106 — Optical encoders are commonly used in macroscopic machines, such as desktop printers and astronomical telescopes, to make precise measurements of distance and velocity by translating motion into a periodic signal. We have designed and synthesized self-assembling DNA segments incorporating Förster resonance energy transfer acceptor dyes at regular intervals. When one of these “FRET encoders” is unwound by a donor-labeled helicase molecule, a periodic fluorescence signal is produced, enabling us to monitor translation and rotation of the helicase. I will describe our methods for synthesizing FRET encoders, and show data indicating constant linear motion of a single *E. coli* DnaB helicase over a distance of hundreds of base pairs.

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