Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Single-Molecule Studies of the Temperature Dependence of Viral DNA Packaging Motors MICHAEL WHITE, DORIAN RAYMER, PETER RICKGAUER, DEREK FULLER, University of California, San Diego, SHELLEY GRIMES, PAUL JARDINE, DWIGHT ANDERSON, University of Minnesota, Minneapolis, DOUG SMITH, University of California, San Diego — A key step in the assembly of many viruses is the packaging of dsDNA into a preformed capsid by the action of a portal molecular motor complex. We have developed methods for directly measuring viral DNA translocation at the single molecule level using optical tweezers and applied these methods to study bacteriophages Φ29, lambda, and T4. Our previous measurements with Φ29 were performed at room temperature. Here we report that the rate of DNA translocation is strongly temperature dependent. Preliminary measurements indicate that the motor velocity increases ∼2-fold, to ∼250-300 bp/s when the temperature is increased from ∼20 to 30 degrees C. As the viral packaging motors are enzymes that catalyze ATP hydrolysis, such a trend with increasing temperature is to be expected, at least up to the point where the motor complex is thermally dissociated or denatured. However, the detailed form of the temperature dependence is difficult to quantify using standard bulk assay methods. We have installed a heating/cooling system in our optical tweezers instrument that allows us to precisely control the temperature in our sample chamber. This system allows us to systematically study the temperature dependence of the DNA translocation rate.

Michael White
University of California, San Diego

Date submitted: 17 Nov 2006 Electronic form version 1.4