Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Dynamics of DNA strand exchange by Bxb1 integrase, a model serine site-specific recombinase HUA BAI, Dept. of Physics, University of Illinois at Chicago, PALLAVI GHOSH, Dept. of Biology, University of Pittsburgh, MINGXUAN SUN, Dept. of BMBCB, Northwestern University, NIGEL GRINDLEY, Dept. of Mol. Biology, Yale University, GRAHAM HATFULL, Dept. of Biology, University of Pittsburgh, JOHN F. MARKO, Dept. of BMBCB, Northwestern University — Site-specific recombination breaks and rejoins DNA at specific sequences within synaptic complexes assembled by specialized recombinase enzymes. Structural data suggest that serine recombinases exchange duplex DNAs via a "clutch plate" mechanism allowing the fully cleaved duplex DNA ends to be exchanged by a rigid body rotation. We have directly observed this rotational motion for a simple serine recombinase, the Bxb1 phage integrase, using a single-DNA supercoiling-release assay which allows us to follow cleavage, rotation, religation and product release in real time. The molecular friction associated with the bearing is much larger than that found for type I topoisomerases in a similar assay. Experiments with recombination-incompetent and recombination-competent substrates lead to expected outcomes. We confirm our results in two-DNA braiding-relaxation experiments where synapse rotation can be directly observed in reactions on two long molecules.

Hua Bai
Dept. of Physics, University of Illinois at Chicago

Date submitted: 20 Nov 2009 Electronic form version 1.4