Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Slowing down DNA translocation using magnetic and optical tweezers[1] HONGBO PENG, SHANSHAN WU, SANG RYUL PARK, ANDREW POTTER, X. S. LING, Brown University — Electric-field driven DNA translocation through nanopores can be exploited for DNA sequencing and other applications. However, the DNA translocation under normal patch-clamp-type measurement is too fast to allow detailed measurements of individual or few nucleotides. We propose a concept to slow down the DNA translocation through the nanopore by using magnetic (or optical) tweezers. The 3' end of a single-strand DNA can be attached to a streptavidin-coated magnetic bead through a single biotin molecule. During DNA translocation, the 5' end of DNA will be electrophoretically drawn through the nanopore to the *trans* side while the 3' end of DNA stays in the *cis* side with the magnetic bead. A set of permanent magnets or electric coils can be used to generate a magnetic field gradient large enough to pull the bead, hence the DNA out of the nanopore. The net force on the magnetic bead will determine this back-translocation speed. By carefully tuning the magnetic field gradient and the voltage bias on the nanopore, one can make the back-translocation much slower than the conventional forward-translocation in which case the DNA is driven only by the electric force. We will report our experimental design as well as the preliminary results.

[1]This work was supported by NSF-NIRT.

Xinsheng Ling
Brown University

Date submitted: 30 Nov 2005 Electronic form version 1.4