Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Nanochannel Device with Embedded Nanopore: a New Approach for Single-Molecule DNA Analysis and Manipulation YUNING ZHANG, WALTER REISNER, Department of Physics, McGill University — Nanopore and nanochannel based devices are robust methods for biomolecular sensing and single DNA manipulation. Nanopore-based DNA sensing has attractive features that make it a leading candidate as a single-molecule DNA sequencing technology. Nanochannel based extension of DNA, combined with enzymatic or denaturation-based barcoding schemes, is already a powerful approach for genome analysis. We believe that there is revolutionary potential in devices that combine nanochannels with embedded pore detectors. In particular, due to the fast translocation of a DNA molecule through a standard nanopore configuration, there is an unfavorable trade-off between signal and sequence resolution. With a combined nanochannel-nanopore device, based on embedding a pore inside a nanochannel, we can in principle gain independent control over both DNA translocation speed and sensing signal, solving the key draw-back of the standard nanopore configuration. We demonstrate that we can optically detect successful translocation of DNA from the nanochannel out through the nanopore, a possible method to 'select' a given barcode for further analysis. In particular, we show that in equilibrium DNA will not escape through an embedded sub-persistence length nanopore, suggesting that the pore could be used as a nanoscale window through which to interrogate a nanochannel extended DNA molecule. Furthermore, electrical measurements through the nanopore are performed, indicating that DNA sensing is feasible using the nanochannel-nanopore device.

Yuning Zhang
Department of Physics, McGill University

Date submitted: 17 Nov 2012 Electronic form version 1.4