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Nanochannel Device with Embedded Nanopore: a New Approach for Single-Molecule DNA Analysis and Manipulation YUNING ZHANG, WALTER REISNER, 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 nanpore 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 nanopore inside a nanochannel, we can in principle gain independent control over both DNA translocation speed and sensing signal, solving the key drawback of the standard nanopore configuration. We will discuss our recent progress on device fabrication and characterization. In particular, we demonstrate that we can detect - using fluorescent microscopy - 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 embedded pore could be used as a nanoscale window through which to interrogate a nanochannel extended DNA molecule.

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