Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Droplet Microfluidics for Compartmentalized Cell Lysis and Extension of DNA from Single-Cells PHILIP ZIMNY, DAVID JUNCKER, WALTER REISNER, McGill University — Current single cell DNA analysis methods suffer from (i) bias introduced by the need for molecular amplification and (ii) limited ability to sequence repetitive elements, resulting in (iii) an inability to obtain information regarding long range genomic features. Recent efforts to circumvent these limitations rely on techniques for sensing single molecules of DNA extracted from single-cells. Here we demonstrate a droplet microfluidic approach for encapsulation and biochemical processing of single-cells inside alginate microparticles. In our approach, single-cells are first packaged inside the alginate microparticles followed by cell lysis, DNA purification, and labeling steps performed off-chip inside this microparticle system. The alginate microparticles are then introduced inside a micro/nanofluidic system where the alginate is broken down via a chelating buffer, releasing long DNA molecules which are then extended inside nanofluidic channels for analysis via standard mapping protocols.

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Date submitted: 11 Nov 2016 Electronic form version 1.4