Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

A Landau-Squire Nanojet[1] SANDIP GHOSAL, Dept. of Mech. Eng. & (by courtesy) Eng. Sci. Appl. Math., Northwestern University, USA, NADANAI LAOHAKUNAKORN, Dept. of Physics, Cambridge University, UK, BENJAMIN GOLLNICK, FERNANDO MORENO-HERRERO, Centro Nacional de Biotecnologia, Spain, DIRK G.A.L. AARTS, ROEL P.A. DULLENS, Dept. of Chemistry, Oxford University, UK, ULRICH F. KEYSER, Dept. of Physics, Cambridge University, UK — Fluid jets are found in nature at all length scales – microscopic to cosmological. Here we report on what may be the smallest liquid jet ever observed: an electroosmotically driven flow from a single glass nanopore about 75 nm in radius with a maximum flow rate of about 30 pL/s. A novel anemometry technique allows us to map out the vorticity and velocity fields which show excellent agreement with the classical Landau-Squire solution of the Navier Stokes equations for a point jet. We observe a phenomenon that we call flow rectification: an asymmetry in the flow rate with respect to voltage reversal. Such a nanojet could potentially find applications in gene delivery, nano patterning, and as a diode in microfluidic circuits.

[1]NIH (R01HG004842) & Leverhulme Trust (SG), George & Lillian Schiff Foundation & Trinity College (NL), Ministry of Education, Spain (BG), Deutsche Froschungsgemeinschaft & European Research Council (UFK)

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Date submitted: 30 Jul 2013 Electronic form version 1.4