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Investigation of Gas and Fluid Flow through a Single Nanopore SERAH FRIEDMAN, ANGEL VELASCO, ZUZANNA SIWY, PETER TABOREK, University of California, Irvine — Mass flow through ion-track etched nanopores with diameters ranging in size from 100 to 300 nm was measured using mass spectrometry. The thickness of the membrane was 12 micron, so our system was modeled after flow through a long pipe. The mass flow was caused by a pressure difference across the membrane of order 1 atm, with the low pressure side at vacuum. At room temperature diffusive transport through the membrane was comparable to mass flow through the hole so the temperature was lowered to -50 C which stopped the diffusive transport. The flow rates for gaseous Helium, Argon, and Nitrogen were studied and agreed with theory at a variety of Knudsen numbers. In contrast, with liquid water or Nitrogen on the high pressure side of the membrane, preliminary results show higher flow rates than can be accounted for by classical viscous flow theory.

Serah Friedman
University of California, Irvine

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