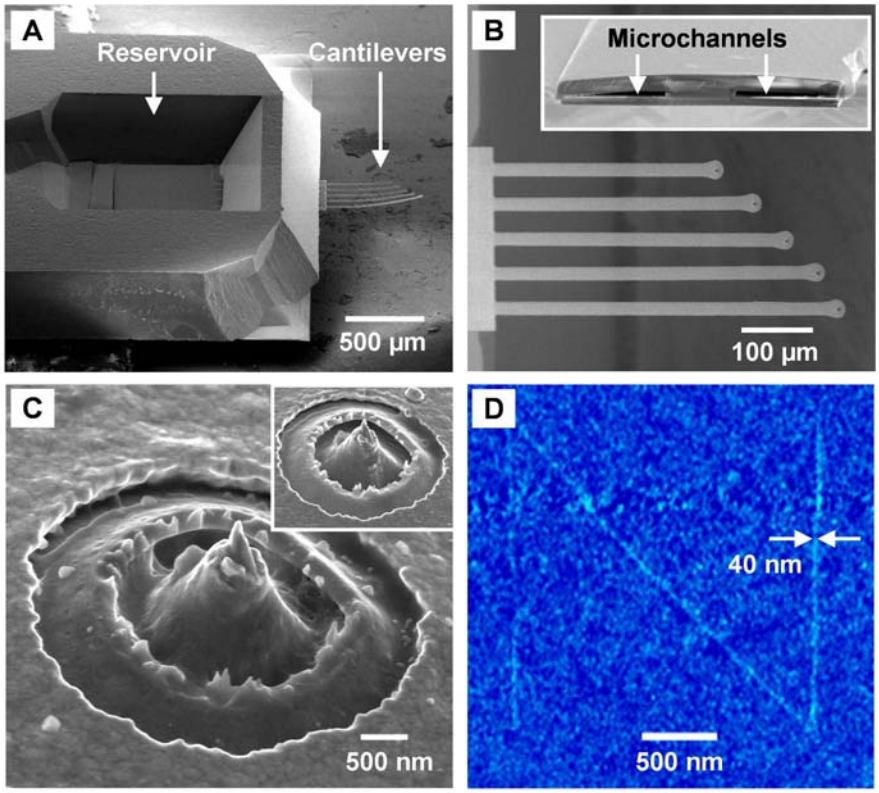
4.1.2 NANO FOUNTAIN PROBE WITH 40 NM WRITING RESOLUTION

K.-H. Kim, N. Moldovan, H. D. Espinosa; "A Novel Nano Fountain Probe with sub-100 nm Molecular Writing Resolution", *Small*, **2005**, ASAP.

Patent application "Nanotipped Device and Method," H. D. Espinosa, N. Moldovan, K.-H. Kim, U.S. application 10/801,928, filed March 2004 and claiming priority date of March 2003. NU 23014.

NU-NSEC researchers developed the first "nano-fountain pen" capable of depositing organic ink molecules in patterns as small as 40 nm. This novel probe is used in atomic force microscopes (AFMs) and contains an on-chip ink reservoir, cantilevers with embedded microchannels and fluid-dispensing volcano-like tips. The device enhances the capabilities of the dip-pen nanolithography (DPN) process previously developed at Northwestern University. The fabrication process is based on standard surface micromachining and allows easy integration into arrays for parallel writing and imaging. Applications include combinatorial biochemistry, nanolithography, and nano-electrochemistry.



(A) Scanning electron micrograph of the back side of the Nano Fountain Probe chip showing the reservoir cavity. (B) Scanning electron micrograph of the cantilevers with embedded microchannels; in the inset, cross-section of a cantilever with microchannels. (C) Scanning electron micrograph of a volcano tip used for writing with a solution of MHA in ethanol at a concentration of 1 mM; in the inset, volcano tip prior to ink feeding. (D) Lateral force image of MHA deposited onto a gold substrate by the volcano tip. Both writing and imaging were performed by the same tip.