Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Design of Optimal Microfluidic Components Using a Genetic Algorithm Search[1] DAVID MOTT, KEITH OBENSCHAIN, PETER HOWELL, JOEL GOLDEN, Naval Research Laboratory — Mott et al. [1] describe the automatic design of optimal microfluidic components based on performance criteria. The approach constructs a complex component by adding geometric features, such a grooves of various shapes, to a microchannel. The net transport produced by each of these features in isolation was pre-computed and stored as an "advection map" for that feature, and the complex flow through a composite geometry that combines these basic features was calculated rapidly by applying the corresponding maps in sequence. An exhaustive search of feature combinations produced optimized mixer designs of moderate size and complexity. In the current work, a genetic algorithm replaces the exhaustive search of Ref. [1], enabling the optimization of much more complex components with far more degrees of freedom. New metrics for characterizing surface delivery and sample dispersion (i.e., the spreading of a sample plug within the pressure-driven flow) are developed, and the software is applied to design new components that optimize surface delivery and that minimize sample dispersion.
[1]. Mott, D.R., Howell, P.B, Golden, J.P., Kaplan, C.R., Ligler, F.S., and Oran, E.S., Lab on a Chip, Vol. 6, No. 4, 2006, pp. 540-549.

[1]This work is funded by the Office of Naval Research.

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Date submitted: 06 Aug 2007 Electronic form version 1.4