Supplementary Material (ESI) for Lab on a Chip

Electronic Supplementary Information (ESI) for:

Dynamic Remodeling of Subcellular Chemical Gradients using a Multi-Directional Flow Device

Samira Moorjani,[1] Rex Nielson,[2] Xinming A. Chang,[1] and Jason B. Shear[2]

[1] Department of Biomedical Engineering, 1 University Station C0800, University of Texas, Austin, TX 78712

[2] Department of Chemistry & Biochemistry and the Institute for Cellular & Molecular Biology, 1 University Station A5300, University of Texas, Austin, TX 78712

This file includes:

Figure S1
Still images and captions for Movies S1 - S4

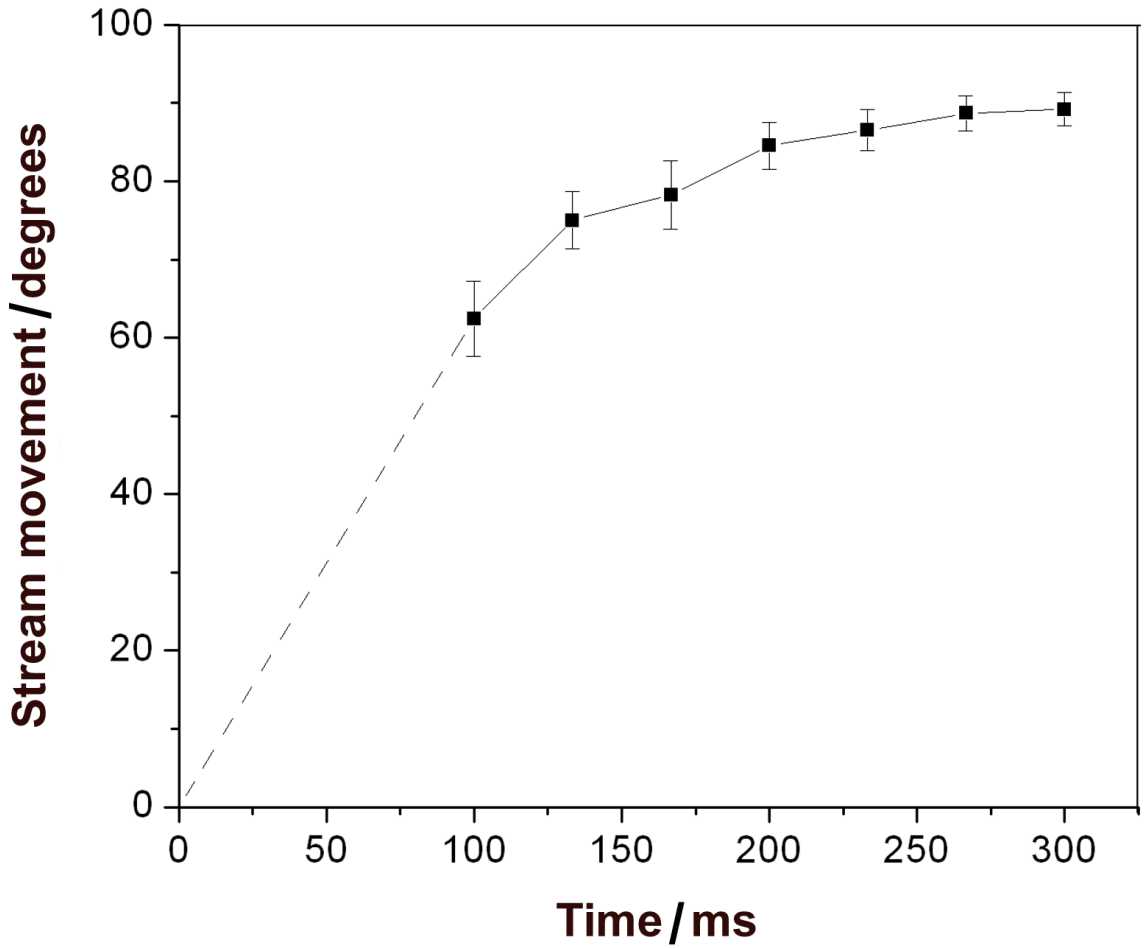
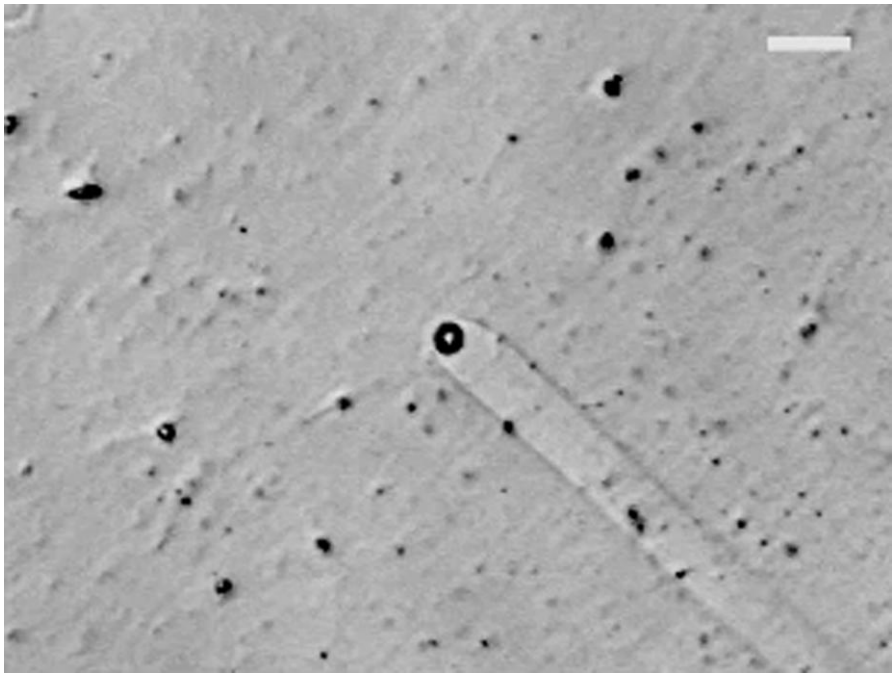
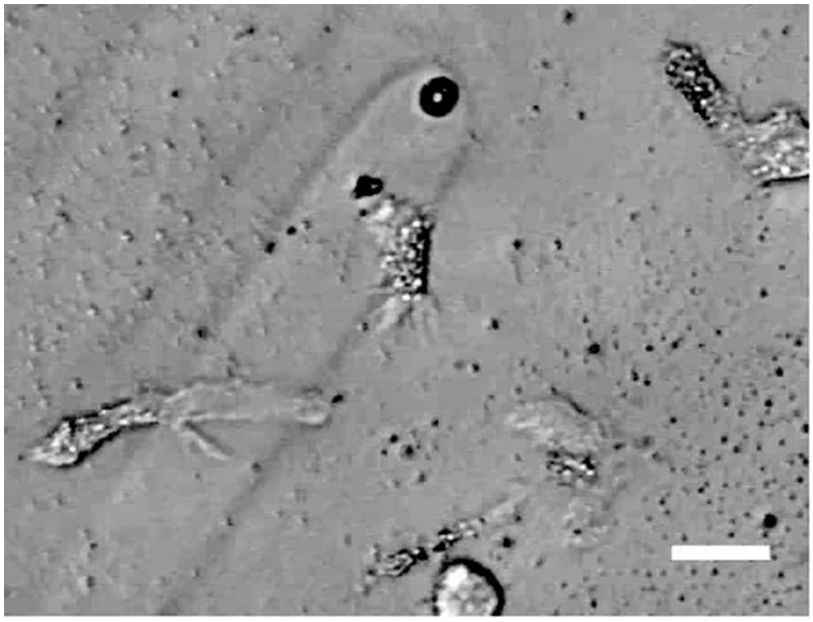


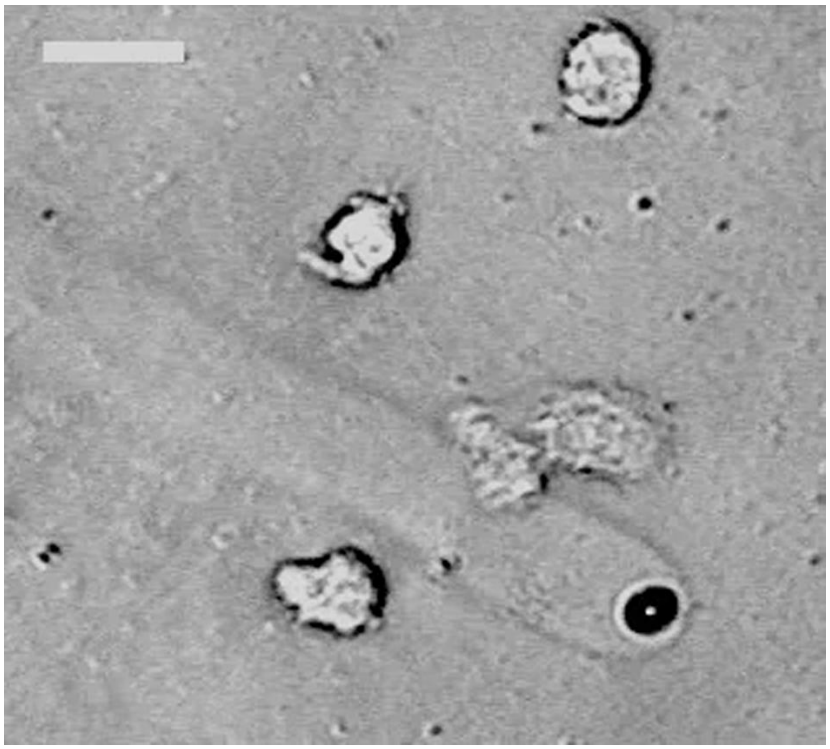
Figure S1. Rapid switching of stream directionality. Time plot showing the path traced by 3% BSA streams when switched between flow orientations that were 90º apart. The plot reveals a rapid initial phase followed by a decline in angular velocity as the stream approaches its final position. Data were acquired from 10 switching cycles using a video camera, and the error bars represent the standard error of the mean of the 10 trials. Because of rapid initial changes in stream orientation and the uncertainty in the start time of the valve switch relative to data acquisition (~1 frame), larger error bars were obtained during the initial portion of the switching cycle. Also, this rapid initial angular velocity made it difficult to image streams immediately after a switch was initiated ($t < 100$ ms). As a result, data for 33.3 ms and 66.7 ms could not be included in the plot. The $t = 0$ point was arbitrarily assigned an angle of 0º.



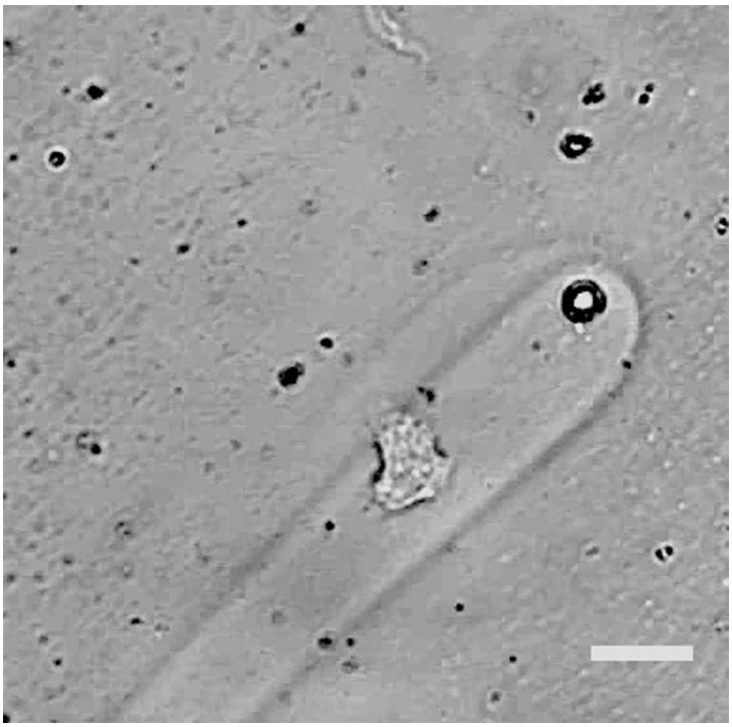
Movie S1. Real-time movie of data shown in Figure 2a. The orientation of a 6% (w/v) BSA stream emerging from the central pore is switched by successive activation of eight solenoid pinch valves for 1 s each. The entire cycle was repeated twice. Data was acquired at 2 Hz. Scale bar, 20 μm.



Movie S2. Movie (50x real time) of the data shown in Figure 4. An HL-60 cell redirects its migration path in response to repeated changes in the orientation of a 100 nM fMLP stream. Data was acquired at 0.5 Hz. Scale bar, 20 μm.



Movie S3. Movie (50x real time) showing an HL-60 cell reversing its polarity in response to the change in the orientation of a 100 nM fMLP stream. The movie acquisition rate was 0.5 Hz. Gey's medium was flowed in the cell-dosing chamber at 0.20 mL min^{-1}, and fMLP was flowed in the reagent chamber at 0.15 mL min^{-1}. 3% BSA was added for visualization of the fMLP streams. Scale bar, 20 μm.



Movie S4. Movie (50x real time) of the data shown in Figure 5. An HL-60 cell is guided in a clockwise arc by stepping the orientation of a 100 nM fMLP stream. The movie acquisition rate was 0.5 Hz. Scale bar, 20 μm.