Microfluidic Large-Scale Integration

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Abstract

Miniaturization is a driving force for technology in fields ranging from consumer electronics to medicine. In addition to increasing transistor density in microprocessors or decreasing the detection limits of bio-sensors, miniaturization has also revealed fascinating fundamental science. Fluidic systems exhibit non-trivial behavior at small length scales as elegantly described in the lecture "Life at Low Reynolds Number" given by Edward Purcell. Large scale microfluidic integration takes advantage of both the technological benefits of miniaturization and the physical properties of fluids at the nanoliter scale, enabling new approaches to experimentation in physics, chemistry and particularly biology. This talk provides an introduction to the fabrication and application of integrated microfluidics. Specifically we explore microfluidic approaches to structural biology with high throughput screening of parameter space for protein crystallization and automated exploration of the conformational landscape of single-stranded DNA molecules.