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Inertial Microfluidics: High-throughput cell and particle manipulation

Dino Di Carlo¹

1. Department of Bioengineering, UCLA, Los Angeles, USA 90095

E-mail: dicarlo@seas.ucla.edu

The inertia or momentum of a fluid is usually not considered in microfluidic flows but has recently been shown to be of great practical use for continuous manipulation of particles and cells. I will demonstrate several unique phenomena that allow for sorting, focusing, and ordering of cells and particles in three dimensions under continuous flow. I will briefly discuss inertial migration theory and our recent results allowing improved control and assembly of microparticle lattices. I will discuss how we have used theory to design novel trapping systems in which larger cells and particles are highly enriched in microscale vortices from which they can be subsequently released. Controlled, inertially focused streams of cells and particles are poised to provide next-generation filter-less filters and simplified high-throughput cytometry instruments which ultimately may aid in cost-effective medical diagnostics and therapies.

Keywords: finite Reynolds number;inertial focusing;inertial lift;particle migration;

Preferred Presentation Type: lecture