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(I) Microfluidic devices for handling small organisms

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Microfluidic technology has been used in many application areas including diagnostics, drug delivery and drug discovery. In drug discovery, microfluidic devices have been used to perform combinatorial experiments where several drug candidates can be exposed to biological materials such as protein drug targets, cells or small organisms simultaneously at various concentrations in order to determine a suitable drug candidate for further investigations. Small organisms such as *C.elegans* worms or *Drosophila* flies are ideal model organisms that are used in the drug discovery process understand biological processes and studying human diseases at the molecular-genetic level. Nevertheless, these organisms are small and are difficult to handle. Microfluidic devices provide the capability to handle these organisms one at a time but in a parallelized manner allowing unprecedented capability to perform combinatorial analysis.

In this talk, I will present some of the unique microfluidic devices that we have developed in my laboratory to study and perform assays on these model organisms. First, I will describe the work that we have done to characterize the phenomenon of electrotaxis of *C.elegans* worms. I will demonstrate the use of it to immobilize the worm and sort it as well as measure its neuromuscular response. I will also describe devices to immobilize and image the neurons in *Drosophila* larva. Finally, I will describe microinjection devices that are capable of immobilization of *C.elegans* and *Drosophila* and inject precise regions in them to deliver biomolecules. The versatility of these devices provide new capabilities to biophysicists, medical researchers and drug discovery scientists to study these organisms in great detail.

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