JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

Friday, September 14, 2018
3:00 PM, 132 Gilman Hall

"*Differential Inertial Microfluidics for Biomedical Research*"

Presented by Prof. Soojung Claire Hur

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Rapid advances in clinical medicine have revealed formidable obstacles associated with individual variations in treatment responses. The heterogeneity leads to the development of personalized medicine for better therapeutic outcomes, but systematic and quantitative single-cell level analyses are imperative to identify factors contributing to the heterogeneity. My research group develops microfluidic systems that observe and modulate single cell behaviors to yield new insights into these clinical questions.

Particularly, we are interested in the understanding relationship between physical properties and cellular phenotypes because not only biophysical properties impact cellular functions but also cellular functions can be regulated and manipulated by physical environmental cues. Differential inertial microfluidic devices are great candidates to study these relationships since one can (i) precisely and distinctively positions cells in flow based on their intrinsic physical properties, and (ii) isolate and maintain identical populations of cells in the designated regions in the channel during the courses of cellular function modulating steps. Using softness-dependent distinctive cellular positions inflow, we adapted the system to conduct passive, label-free and continuous cell enrichment based on their physical properties. Moreover, we developed a simple molecular probe delivery system with improved single-cell transfection capability using vortex-generating inertial microfluidics' ability to contain cells in pre-determined locations and to release on-demand. Collectively, my research group endeavors to develop innovative techniques that have the potential for high-throughput target cell detection, cost-effective cell separation, and sequential multimolecular delivery, useful for oncology, immunology, gene therapy and regenerative medicine.