Microfluidics and Enabling Components

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Microfluidics is a field that promises to reach the holy grail of "lab-on-a-chip". In analogy to shrinking a computer from the size of a room in the 1950s to a laptop today, instruments for chemical and biological analyses may be miniaturized into microfluidic devices using modern microfabrication technology. Potential applications of the portable, miniaturized devices may include point-of-care testing, environmental monitoring, and detection of pathogens in the field. In this presentation, review will be given on the concept of microfluidics, device fabrication, and microflows. The focus of the presentation will then be on three enabling components: (1) microvalves for regulating flows, containing fluids, and isolating one region from the other in a device; (2) mixers for homogenization of reagents in biological reactions; and (3) sorters (or de-mixers) for the isolation and enrichment of cancer cells from peripheral blood.

Bio: Dr. Z. Hugh Fan is a professor of Department of Mechanical and Aerospace Engineering, Department of Biomedical Engineering, and Department of Chemistry at the University of Florida (UF), Gainesville, FL. Currently he holds UF Research Foundation Professorship. Prior to joining UF in 2003, Dr. Fan was a Principal Scientist at ACLARA BioSciences Inc. (Mountain View, CA) from 2000 to 2003 and a Member of the Technical Staff at Sarnoff Corp. (Princeton, NJ) from 1995 to 2000. He worked as a postdoctoral fellow at the Ames Laboratory of the US Department of Energy at Iowa State University in 1994. Dr. Fan received his B.Sc. from Yangzhou Teachers' College in China and his Ph.D. from the University of Alberta in Canada. Dr. Fan has authored over 70 journal articles that have been cited more than 4500 times. Dr. Fan is the recipient of Career Award from NIH in 2011, Fraunhofer-Bessel Award from Alexander von Humboldt Foundation (Germany) in 2010 and E. T. S. Walton Award from Science Foundation Ireland in 2009. He also received UF-HHMI (Howard Hughes Medical Institute) "Science for Life" Distinguished Mentor Award in 2013 and UF-Sigma Xi Junior Faculty Research Award in 2006. He is an editorial board member of "Scientific Reports" (Nature Publishing Group).