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Inertial Microfluidics and Viscoelastic Flows for Cell Separations

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ABSTRACT:

Complete lab-on-a chip or micro total analysis systems (mu-TAS) require a wide variety of microfluidic components for the completion of complex and challenging medical and biological assays. One of the approaches to microfluidic devices is use “inertial” microfluidics, which rely on both lift and wall repulsion forces of generate particle focusing. These forces can be used to separate a wide range of cells. This presentation will focus on using these forces to separate and process sperm from semen samples, blood cells of different kinds, and to separate blood cells by deformability level. The physics of these devices, their fabrication, and the general concept of the devices will be presented. These separations can be applied to challenges in infertility, malaria, and sample preparation in microfluidic devices.

BIOGRAPHY:

Professor Bruce K. Gale received his undergraduate degree in Mechanical Engineering from Brigham Young University in 1995 and his PhD in Bioengineering from the University of Utah in 2000. He was an assistant professor of Biomedical Engineering at Louisiana Tech University before returning to the University of Utah in 2001 where he is now Chair of the Department of Mechanical Engineering and the Merit Medical Systems Inc. Endowed Professor in the College of Engineering. He is the Director of the Utah State Center of Excellence for Biomedical Microfluidics, a center devoted to research and commercialization activities around microfluidic devices. He has published more than 175 journal papers, 300 conference papers and abstracts, and been recognized with multiple awards. He is a fellow of both the American Institute of Medical and Biological Engineering (AIMBE) and the National Academy of Inventors and holds more than 31 patents. His primary interests include solving medical, biology, and chemistry problems using a variety of microfluidic approaches to complex and challenging medical and biological assays. His ultimate goal is to develop platforms for personalized medicine, which should allow medical treatments to be customized to the needs of individual patients. As an outgrowth of his work, 6 companies have been formed and he maintains a role at each. The most prominent is Carterra, a multiplexed instrument development company focused on protein characterization in the pharmaceutical industry.