HARVEY MUDD
COLLEGE

Department of Engineering
Seminar Program
Wednesday, October 26, 2011
Galileo McAlister, 4:10pm

Shannon L. Stott, Ph.D., Research Associate, The Center for Engineering in Medicine and the BioMEMS Resource Center, Harvard Medical School, Massachusetts General Hospital, Charlestown, MA

Raised in New England, Shannon Stott earned a B.S. degree in Mechanical Engineering from the University of New Hampshire in 1997 and subsequently enrolled in graduate school at the University of Illinois, Urbana-Champaign, where she conducted air-conditioning and refrigeration research. Shortly after arriving in the Midwest, Shannon discovered two things: (1) she loved the research environment and (2) that she was allergic to corn pollen. Thus, after receiving her master's degree, Shannon headed to Georgia Tech, to pursue a doctorate in the field of bioengineering with a focus on cryopreservation. Under the advisement of Dr. Jens Karlsson, she utilized theoretical and experimental methods to elucidate the mechanisms of damage during the freezing of cells and tissues, and in doing so, pioneered the use of high-speed video microscopy. For the past five years, Shannon has been working in Dr. Mehmet Toner's group at the Center for Engineering in Medicine (CEM) at Massachusetts General Hospital / Harvard Medical School. As a postdoctoral fellow at the CEM, Shannon co-invented the Herringbone-Chip, a microfluidic device used to isolate circulating tumor cells (CTCs) from patient blood. The Herringbone-Chip is currently being deployed to multiple non-profit research centers across the country, with the goal of rapidly translating research from the benchtop to the bedside. When she isn't trying to capture rare cells using small devices, Shannon enjoys photography, travel and gardening. Shannon lives in Stoneham, MA with her husband and son.

ISOLATION OF CIRCULATING TUMOR CELLS USING A MICROFLUIDIC VORTEX GENERATOR

Tumor-derived epithelial cells, referred to as circulating tumor cells (CTCs), have been identified in blood from patients with cancer, including lung, prostate, colon, breast, liver, and ovarian cancers. While extremely rare (1 in 10^9 cells), CTCs provide a potentially accessible source for detection, characterization and monitoring of non-hematological cancers that would otherwise require invasive serial biopsies. We have developed a high throughput microfluidic mixing device, or the 'Herringbone CTC-chip', that allows for the isolation and characterization of CTCs from the blood of cancer patients. The chip design was centered on the concept of passive mixing of blood through the generation of microvortices, ultimately increasing capture of these rare cells by dramatically increasing the number of interactions between the target cells (CTCs) and the antibody coated substrate. An initial proof of principle study has been conducted with metastatic lung and prostate cancer patient samples, demonstrating our ability to isolate, enumerate and molecularly characterize these cells with high sensitivity and specificity. Surprisingly, microclusters of CTCs have been captured in a rare number of patient samples using the Herringbone CTC-chip. The finding of these clusters of CTCs in the vasculature raises the possibility that such tumor emboli may also contribute to the metastatic process.