

Joint Department of

BIOMEDICAL ENGINEERING



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C o u l t e r S e m i n a r S e r i e s P r e s e n t s

“Droplet Microfluidics as a Platform for Biomedical Research, Rapid Diagnostics and Profits ”

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Richard B. Fair received his Ph.D. degree in electrical engineering from Duke University in 1969 and then joined Bell Laboratories, where he worked on semiconductor devices, integrated circuits, and semiconductor process technologies. In 1981 he joined MCNC as Vice President where he led the Center for Microelectronic Systems from 1981-1994. Concurrently he held a joint appointment at Duke as a professor of electrical engineering. In 1994 he returned to Duke full time. In 1999 his group produced the first electrowetting-on-dielectric chip, thus demonstrating digital microfluidics. His current research areas include digital microfluidic devices, applications, and technology. Dr. Fair is a Life Fellow of the IEEE, a Fellow of the Electrochemical Society, and past Editor-in-Chief of the Proceedings of the IEEE. He is a recipient of the IEEE Third Millennium Medal (2000) and the 2003 Solid State Science and Technology Prize and Medal from the Electrochemical Society.

ABSTRACT

Droplet-based microfluidic technology has been shown to enable competitive platforms for developing chips that impact molecular-based genomic research and patient care. Droplet technologies include transport of multiple droplets in channels under external pressure, (air pressure driven and co-flow of multiple droplets in oil emulsions), and digital microfluidics for individual droplet control. In most droplet applications, a key challenge has been the on-chip preparation of physiological samples and the extraction and purification of DNA/RNA for downstream amplification, sorting and/or analysis. In this talk we present a review of droplet technologies and discuss methods for selectively extracting target cells from physiological samples for the purpose of genomic analysis. We also present a true-life account of how the discovery of digital droplet microfluidics found its way on an unlikely path from academic discovery, to spin-off, to acquisition and finally to commercial success.

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