College of Engineering
Department of
Mechanical & Industrial Engineering

The Robert W. Courter Seminar Series

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ZOOM: https://lsu.zoom.us/meeting/register/tJApd-mhqzssHNAtbx8xlujIXfCf28JLgcJB

The right tool for the right job: Bioanalytical methods to elucidate the personalized nature of cancer

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Cancer is a highly heterogeneous disease with significant differences between patients (intertumor heterogeneity) and among cells in the tumor microenvironment (intratumor heterogeneity) motivating the need for a more personalized approach to fundamental cancer research and diagnostics. The analysis of enzymatic activity and cellular behavior in single, intact cells yields more precise information than the bulk analysis of cell lysates and allows researchers to collect both endpoint and dynamic measurements. When examining cell lysates alone, the heterogeneity is averaged across the entire population and valuable information about distinct subpopulations is masked or lost entirely. Emerging technologies, such as microfluidic devices, coupled with novel biosensors have allowed for high-throughput, facile analysis and sorting of individual cells to provide new information on low occurring, rare phenotypes. Microscale systems offer a significant advantage over competing technologies due to reduced cost, ease-of-use, significant reproducibility, biological inertness, and a compatibility with light microscopy. This talk will focus on recent work in my lab utilizing a combination of microfluidic devices and peptide-based biosensors to develop novel bioanalytical tools for a more personalized approach to cancer research. It will highlight our efforts to identify drug resistant subpopulations of cancer cells by combining cell permeable, long-lived, enzyme-specific, fluorescent, peptide-based reporters with a microfluidic droplet trapping array and automated image analysis algorithm. I will also demonstrate our microfluidic co-culture approach to study the behavior of cancer cells within the tumor microenvironment in particular how stromal cells enhance cancer cell progression and drug resistance. Finally, I will summarize our recent efforts combining a thiol-acrylate hydrogel scaffold with a droplet microfluidic trapping array to generate, culture, and interrogate 3D spheroids.

* Adam Melvin obtained a BS in Chemical Engineering and a BA in Chemistry from the University of Arizona, a MS in Chemical Engineering (with a minor in Biotechnology) and a Ph.D. in Chemical Engineering from North Carolina State University. He was an NIH postdoctoral fellow at the University of North Carolina at Chapel Hill in the Departments of Chemistry and Biomedical Engineering. In August of 2013, he joined the faculty as an Assistant Professor in the Cain Department of Chemical Engineering at Louisiana State University. He has several ongoing research projects that are funded by the NSF and NIH and is an NSF CAREER awardee. He is also the co-director of an NSF-sponsored REU site at LSU combining entrepreneurship and energy research.