DEPARTMENT OF MECHANICAL ENGINEERING
WILLIAM MAXWELL REED SEMINAR SERIES

“Enabling Advanced Molecular Analyses via Miniaturization Phenomena”

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Abstract: The recent explosion of new molecular technologies (e.g., next-gen sequencing, transcriptional analysis, epigenetic profiling) has affected nearly every field within the life sciences, including medicine, agriculture, forensics, biosecurity, and drug discovery. While significant efforts have been made to advance the state-of-the-art, a number of inherent limitations hinder the impact of molecular technologies on our society. In particular, users must often chose between technologies that are simple yet imprecise versus those that are accurate but prohibitively complex/expensive. Fluid dynamics scaling laws offer one potential avenue for overcoming this tradeoff and obtaining the “best of both worlds”. For instance, miniaturization enables a physical regime where surface tension becomes the dominant factor affecting system behavior. Leveraging this transition, surface tension can be harnessed to serve as a simple yet highly efficient “filterless filter” that acts to purify, concentrate, and analyze target molecules. Similarly, scaling enables the generation of a diffusion-dominant environment, which can then be employed to study molecular signaling events with higher sensitivity than analogous macroscale technology. These phenomena have been successfully applied to a number of specific application areas where existing technology was deemed insufficient. A few examples: 1) Miniaturization has been used to make HIV viral load testing more accessible in developing world settings; 2) Related technology has been used to identify and quantify biomarkers that predict patient response to specific cancer therapies using only a blood sample; 3) Diffusion-dominant micro devices have been used to model micro environmental signaling in breast cancer in order to recapitulate a specific therapeutic resistance commonly seen in patients. In summary, engineering scaling principles are powerful tools that can facilitate the reimagining of molecular technologies in a manner that yields important new capabilities.

Bio: Dr. Scott Berry completed his PhD in Mechanical Engineering and his Masters of Business Administration (MBA) from the University of Louisville in 2009. His PhD research focused on leveraging fundamental physical principles to generate novel micro- and nanoscale components. Dr. Berry is currently an Associate Scientist in the Department of Biomedical Engineering at the University of Wisconsin-Madison, where he continues to apply the principles of miniaturization toward the development of new molecular assays targeting a myriad of diseases including cancer and HIV. In 2013, Dr. Berry also co-founded Salus Discovery, where he currently serves as Chief Scientific Officer, driving the commercialization of technologies derived from his academic research.

Date: Tuesday, Jan. 29th
Place: CB 118

Time: 3PM
Contact: Dr. Alexandre Martin 257-4462

Meet the speaker and have refreshments
Attendance open to all interested persons

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