Washington University in St. Louis

SCHOOL OF ENGINEERING & APPLIED SCIENCE

Preston M. Green Department of Electrical & Systems Engineering

Seminar Announcement

Amos Danielli
Faculty of Engineering
Bar-Ilan University

Friday, April 13, 2018
Green Hall, Room 0120
10:00 A.M.

Rapid and highly sensitive detection of fluorescently-labeled biosensors

Abstract: Sensitive and rapid detection of fluorescently-labeled biosensors at low concentrations is crucial in many biological and medical applications. Fluorescently-labeled biosensors are widely used in detection of specific DNA sequences or proteins, as well as in investigation of protein-protein interactions. In particular, detection of sequence-specific nucleic acids is important in pathogen detection and gene expression analysis, and the detection of proteins that serve as biomarkers is useful in diagnosis of diseases. For example, when a patient suffers a heart attack, increasing amounts of a cardiac protein (troponin) are slowly released to the patient's blood. Rapid detection of troponin levels early after the onset of symptoms significantly reduces the time required to diagnose or rule out heart attack. Today, most high sensitivity laboratory devices cannot provide results in a clinically relevant time frame, and, unfortunately, present point-of-care (POC) devices are substantially less sensitive than laboratory assays. To reap the benefits of improved patient care and reduced costs through prompt diagnostics, new platforms must be developed.

Recently, we discovered that by combining magnetic and fluorescent labeling of target analytes and then applying an alternating external magnetic field gradient, we can significantly increase the sensitivity of fluorescence detection. The external alternating magnetic field condenses the targets to a small volume and imposes on them a periodic motion, which enables separation of the background signal from the oscillating target signal without complex sample preparation. Here, I will demonstrate the use of this technology, named Magnetic Modulation Biosensing (MMB), in detecting proteins, antibodies, specific DNA sequences, and protein-protein interactions. I will also present the MMB advantages and limitations compared to state-of-the-art technologies, such as Luminex-200 and Euroimmun ELISA.

Bio: Dr. Danielli is a senior lecturer at the Faculty of Engineering in Bar Ilan University, Israel. In 1997, Dr. Danielli received his B.Sc. degree in Electrical Engineering from Tel-Aviv University, Magna cum Laude. In 2002 and 2010, he received his M.Sc. (Magna cum Laude) and Ph.D. degrees in Electrical Engineering from Tel Aviv University. In 2009-2014, Dr. Danielli worked as a post-doctoral researcher in the optical imaging laboratory at Washington University in St. Louis under the supervision of Prof. Lihong Wang. Dr. Danielli published multiple papers and patents in the field of biophotonics and biodetection. His research includes development of highly sensitive detection tools for biomarkers. Currently, he focuses on rapid and highly sensitive detection of flaviviruses, such as Zika, dengue, and West-Nile. Dr. Danielli is also a three-time entrepreneur with 15 years of experience in executive R&D positions and in the development of multidisciplinary systems in the medical device, communications, and solar energy industries.

Host: Lan Yang