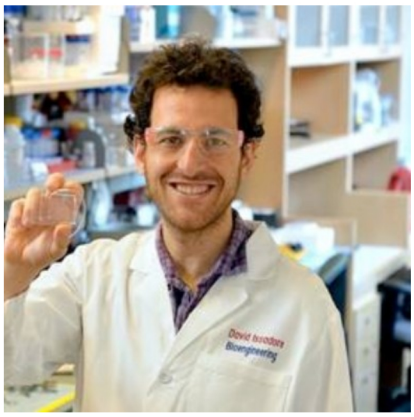
BIOENGINEERING & BIOMEDICAL ENGINEERING

RESEARCH SEMINAR

DIAGNOSING DISEASE ON A MICROCHIP: FINDING NANOSCALE NEEDLES IN A NANOSCALE HAYSTACK



David Issadore
Associate Professor of Bioengineering and Electrical & Systems Engineering
University of Pennsylvania

The Issadore lab combines microelectronics, microfluidics, nanomaterials, and machine learning to solve big problems in healthcare. We create miniaturized platforms for the diagnosis of disease, we develop new platforms to manufacture micro and nanomaterials, and we dip our toes into an assortment of other areas where we can leverage our engineering training to improve healthcare. This work requires an interdisciplinary approach in which engineers, scientists, and physicians work together in teams.

The transformative growth in microelectronics in the latter half of the 20th century was fueled fundamentally by the ability to miniaturize complex circuits onto chips. The impact of this has been profound– computing is pervasive and portable and communication is instant and global. My research aims to harness this same engineering approach to solve high impact problems in medical diagnostics. To accomplish this goal my lab develops hybrid microchips, where microfluidics are built directly on top of semiconductor chips. In this talk I will focus on recent work at Penn on 'digital asays.' Digital assays — in which ultra-sensitive molecular measurements are made by performing millions of parallel experiments in picoliter droplets — have generated enormous enthusiasm due to their single molecule resolution. These assays have incredible untapped potential for disease diagnostics but are currently confined to laboratory settings due to the instrumentation necessary to generate, control, and measure tens of millions of droplets. To overcome this challenge, we are developing a hybrid microelectronic / microfluidic chip to 'unlock' droplet-based assays for mobile use. Our microDroplet Megascale Detector (μMD) takes inspiration from cellular networks, in which phones are identified by their carrier frequency and not their particular location. In collaboration with physicians at The Abramson Cancer Center, we are demonstrating the power of this approach by developing a multiplexed extracellular vesicle-based diagnostic for the early detection of pancreatic cancer. I will also discuss ongoing projects on the early diagnosis of lung cancer, treatment guidance for traumatic brain injury, and the differential diagnosis of Alzheimer's versus Lewy body dementia.

Sept 8, 2023 at 1:30PM

Zoom Meeting ID: 830 7128 8396

McGill

Department of **Biomedical Engineering**
Department of **Bioengineering**

Dr. David Rudko (david.rudko@mcgill.ca)

Dr. Sara Mahshid (sara.mahshid@mcgill.ca)