MSB 2023 3-minute Research Showcase

Presentation Agenda

Tuesday, May 23, 2023, 4:25 – 5:40 pm

Turnbull Conference Center, Room 208

4:25 pm Welcome / opening statements

Introducing our volunteer judges:

Anderson R. M. de Oliveira, University of Sao Paulo
Janet Freshwater, Royal Society of Chemistry
Elain Fu, Oregon State University
Claude Dufresne, axiVEND

4:30 – 4:50 pm Session 1

Each talk is allocated 3 minutes for presentation, plus up to 2 min for judges to take notes and for speakers to transition.

Moving brain cancer: Studying cells in inexpensive ways

Abigail Kreznor, Kansas State University, Culbertson Laboratory

Glioblastoma multiforme is a deadly type of adult brain cancer that is highly mobile, making it incredibly hard to treat. By utilizing microfluidics to mimic the cancer environment, a better understanding of this disease can be gained, and a low-cost and simple fabrication method has been developed by employing 3D printing and validated to ensure comparable results to traditional devices. This work highlights an inexpensive way to study cells that can not only contribute to improved cancer therapies but increase the accessibility of this kind of research.

Brewing better beer faster: Using a magnet to sort yeast by age

Leonie Wittmann, Technical University of Munich, Schwaminger Laboratory

Magnetic separation allows the simple and fast age-dependent analysis of a heterogeneous yeast culture by using functionalized magnetic nanoparticles. We showed that daughter cells grow 52% faster compared to old mother cells in anaerobic conditions. These findings are the first step towards improving the efficiency of yeast-based processes.

Seeking justice: microfluidic approaches to improve forensic sample extraction and preparation

Larissa Cunha, University of Virginia, Landers Laboratory

The conventional technique used in forensic laboratories to obtain two separate genetic fractions (one from the victim and one from the perpetrator) from evidence collected from victims of sexual assault and rape is labor-intensive and often fails to generate adequate recovery of the forensically-relevant perpetrator fraction. We propose to address these shortcomings by outlining a microfluidic approach to this forensic sample preparation technique that provides timed-release of on-board reagents and temperature control for sequential, fully-enzymatic unit operations. The novel method will be critical in expediting the analysis of DNA-based sexual assault evidence, reducing processing times by 1-2 orders of magnitude and streamlining the identification and judicial prosecution of sexual predators from the population, ultimately helping victims of sexual assault and rape get justice.

Selective aptamer modification of Au surfaces in a microelectrode sensor array for simultaneous detection of multiple analytes

Debashis Sen, Florida State Univrsity, Lazenby Laboratory

Simultaneous detection of multiple different analytes requires the selective modification of multiple electrode surfaces with different aptamers. In this work, we selectively modified electrode surfaces with thiolated aptamers of different single stranded DNA sequences, by successive removal and addition of thiol monolayers. This was achieved by electrodesorption of thiol monolayers using controlled potential, to expose unmodified gold electrodes to be modified with a different thiolated aptamer, thus enabling multiple different aptamers to be used on the surfaces of closely spaced microelectrodes.

4:50-5:00 BREAK (may shift earlier)

5:00 – 5:20 pm Session 2

Capillary Electrophoresis-Mass Spectrometry based Metabolomics Approaches for Volume-restricted Applications

Marlien van Mever, Leiden University, Ramautar Laboratory

Metabolomics is a powerful tool that can provide a comprehensive insight into the complexity of human biology and the pathophysiology of diseases. However, one of the main challenges in (brain) metabolomics studies is the reliable and sensitive analysis of volume-limited biological samples. During my PhD project, innovative microscale analytical workflows based on capillary electrophoresis (CE) coupled to mass spectrometry (MS) were developed to showcase that the technical reproducibility, detection sensitivity, and metabolic coverage of CE-MS are sufficient to allow use for different material-limited matrices of interest for neuroscience research.

Understanding the Bio-nanointerface and Sensor Design Based on Au nanoparticle Conjugates

Narjes Dridi, Florida State University, Mattoussi Laboratory

The unique and tunable photophysical properties of nanomaterials have garnered significant attention for their potential applications in various fields, particularly in biomedicine. Addressing the challenge of detecting cancer at its early stages, we leverage the optical properties of nanoparticles to develop a highly sensitive device. By harnessing both the surface chemistry and optical attributes of nanocrystals, we have successfully engineered cancer biomarker sensors that hold significant potential for improving early detection of cancer.

What Does the Cell Say? 3D Printing Designer Tools to Uncover Immune Cell Conversations

Hannah Musgrove, University of Virginia, Pompano Laboratory

Our immune cells are constantly engaging in conversations regarding our well-being, but detecting these molecular dialogues poses a considerable challenge. As a solution, I established a 3D printing workflow to create tiny, transparent, non-toxic devices for observing live cell cultures. These methods enable rapid, high-throughput production of customizable cell-analysis environments, empowering accelerated discovery into what our immune cells are saying.

Scanning ion conductance microscopy for pH studies in single cells

Yusuf Muhammd, Florida State University, Lazenby Laboratory

Driven by the need of techniques for single cell studies, we are working on developing scanning ion conductance microscopy probes for application in pH studies in single cells.

5:20 – 5:30 pm BREAK while judges confer

5:30 – 5:40 pm Celebration and announcement of the winners!