
Thursday, March 18, 2021 | 3:00 PM – 4:00 PM

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“Droplet Microfluidics Enables Rapid Diagnostics and Antimicrobial Susceptibility Testing”

Presented by [Professor Jeff Wang](#)

Department of Mechanical Engineering, Johns Hopkins University

*Additional Appointments include Biomedical Engineering, Materials Science and Engineering, Oncology, and Medicine, Institute for NanoBioTechnology Infectious Disease Division, Kimmel Comprehensive Cancer Center
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The talk describes droplet microfluidic-based platforms for pathogen detection and antimicrobial susceptibility testing (AST). I will first introduce droplet magnetofluidics, a technology that eliminates the need for large, complex instrumentation and fluidics typically associated with clinical laboratory nucleic acid amplification testing. Droplet magnetofluidics facilitates facile extraction and purification of nucleic acid targets from clinical samples and concentrates them into a small volume for amplification detection. The assay miniaturization helps maximize the thermocycling speed and minimize reagent consumption, thereby enabling a molecular test with a short turnaround time of 15 minutes and a low assay cost of ~\$2. The magnetofluidic diagnostic platforms have demonstrated clinically relevant sensitivity and specificity for Hepatitis C viral infections, sexually transmitted diseases, and, recently, COVID-19. Meanwhile, I will also present a microfluidic single-cell biosensing platform that employs droplet microfluidics to enable pathogen detection without performing nucleic acid amplification via hybridization detection of 16S rRNA from single bacterial cells captured in picolitre droplets. In-droplet quantitative measurements of genetic contents from single bacterial cells also provide a surrogate for accelerating AST. When applied to urinary tract infections, the droplet-based single-cell platform achieved both pathogen identification and AST from urine samples in 30 minutes, as opposed to 2-3 days by conventional culture-based methods.



Jeff Wang is a professor in Mechanical Engineering at JHU, where he has served on the faculty since 2002. He earned his doctorate in mechanical engineering from UCLA in 2002. His research focuses on the development of new technologies for molecular analysis and biomedical research via advances in micro- and nano-scale sciences. He has contributed to developments in single-molecule fluorescence spectroscopy, microfluidics, and nano-biosensors for genetic and epigenetic biomarker-based diagnostics of cancer, infectious disease, and an array of other diseases. Dr. Wang is an inventor of 20 patents and has authored 150 research articles and delivered 130 invited talks. He received the NSF CAREER Award in 2006, CSR Jorge Heller Award in 2007, ASGR Excellence in Research Award in 2007, the JALA Ten Award in 2011. He is a Fellow of the American Institute for Medical and Biological Engineering (AIMBE), American Society of Mechanical Engineering (ASME), Institute of Electrical and Electronics Engineers (IEEE), and Royal Society of Chemistry (ROC).

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