



# JOHNS HOPKINS BIOMEDICAL ENGINEERING



Wednesday February 20, 1:00PM, Traylor 709

## Optical Imaging for Point of Care Diagnostics



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**Abstract:** Recent advances in MEMS technologies, miniature microscopy, nanotechnology, molecular recognition, and low power sensors and microprocessors now offer the ability to design low-cost, reusable platforms for point-of-care (POC) diagnostics. This talk will describe research efforts to integrate molecular imaging technologies based on novel nanoparticles together with miniature microscopes to detect cancer and infectious disease at the point of care. Our approach is built on the concept of modular design to yield a flexible platform of technologies that can be integrated and interchanged for multiplex detection of a variety of targets. To stain samples for optical analysis, we have developed a modular approach to synthesize contrast agents, wherein components such as the optical label and the probe molecule can be interchanged to realize a variety of optically active agents suitable for multiplex detection. To interrogate stained specimens, we have also developed a modular approach to build miniature optical sensors, in which microlenses, detectors and other optical elements can be interchanged on a common micro-optical table to yield a versatile array of tiny microscopes and spectrometers for quantitative biological sensing. We will illustrate that these methods yield a powerful and versatile approach to cost-effective, multiplexed POC diagnosis.

In parallel, we have developed multidisciplinary educational programs to train students to participate in interdisciplinary research efforts. With support from the Howard Hughes Medical Institute, we formed a new undergraduate concentration called Beyond Traditional Borders (BTB). The BTB program brings together science, engineering, policy, social science and humanities undergraduates to address POC design problems in developing countries. In creating solutions to real world challenges, students are challenged to think beyond traditional disciplinary and geographic boundaries. The program spans the freshman to senior level, and students have the opportunity to travel to the international site to test their solution in collaboration with partner scientists and clinicians.

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