

Micro/Nano Seminar Series
Sponsored by
Dr. Balaji Panchapakesan
Mechanical Engineering

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Single molecule and single particle tools in single cell analysis

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Abstract: Single molecule methods and nanoscale structures have provided both engineers and scientists with a plethora of opportunities to explore biology. These multidisciplinary efforts capitalize on the complementary expertise relating to technology development for single cell analysis to answers significant biological questions not possible before. In this presentation, examples on the use of nano-materials for multiplex detection of cell surface markers, quantification, and multifunctional targeting for photothermal ablation of tumor cells will be discussed. These detection modalities utilize the plasmon resonance effect of gold nanorods as single particle sensing agents. Complementary use of these nanostructures in Surface Enhanced Raman Spectroscopy (SERS) will be explored both for DNA (BRCA1 gene) detection and elucidation of intracellular features. Future directions in single cell technology development will be highlighted using both nonfluorescence and fluorescence techniques for probing cytoplasmic and nuclear protein interactions.



Biosketch: Dr. Irudayaraj has degrees in Biosystems Engineering and Computer Sciences from University of Hawaii and Purdue. He has held faculty positions at Penn State and Utah State prior to coming to Purdue in 2005 after a Sabbatical in Cornell University with Dr. Harold Craighead's group. Primary focus of their group at Purdue is on multiplex mechanistic sensing and quantification of molecular markers, genetic material, and drugs in single cells using nanomaterials and single molecule spectroscopies comprising of Surface enhanced Raman spectroscopy and Fluorescence Correlation Spectroscopy and Lifetime imaging.

He has published over 150 refereed journal articles in areas covering nanosensors and SERS-based approaches for cancer detection and diagnosis, Spectroscopic (Raman and FTIR) characterization of biomaterials, and thermodynamics and viscoelastic modeling of biological systems. He serves in the Nanotechnology for medicine and biology review panels for NIH, NSF, and DOD and participates in research review activities with funding agencies such as the NSERC (Canada) and the European Union. He is a member of American Chemical Society, Institute of Biological Engineering, Biophysical Society, and the American Society of Agricultural and Biological Engineers