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### Nanosensors and nanoprobes: From cell exploration to medical diagnostics

This lecture presents an overview of recent advances in the development of optical nanobiosensor and nanoprobe technology at the nexus of engineering, biology, medicine and nanotechnology. This presentation describes two areas of research related to the development of nanoprobes and nanosensors for single-cell analysis and imaging: (1) plasmonics “molecular sentinel” nanoprobes using surface-enhanced Raman scattering (SERS) detection, and (2) nanobiosensors for in vivo analysis of a single cell for molecular diagnostics and imaging, and ultra-high throughput screening. A new generation of nanobiosensors and nanoprobes combining bio-recognition and nanotechnology have been developed for in vivo monitoring of biochemical processes in a single living cell. These studies demonstrate applications of plasmonics “molecular sentinel” nanoprobes for diagnostics of diseases such as HIV, and cancer; and the use of nano-biosensors for measurements of molecular signaling pathways inside a single cell. These nanodevices could also be used to develop advanced biosensing and bioimaging systems in order to study in situ intracellular signaling processes and to study gene expression and molecular processes inside individual living cells. Such nanoprobes open new horizons to a host of applications in medical diagnostics at the point of care, global health, molecular imaging, biology research, ultra-high throughput screening, and investigations of the therapeutic action of pharmaceutical agents.

#### Biography

Tuan Vo-Dinh is the Director of the Fitzpatrick Institute for Photonics, R. Eugene and Susie E. Goodson Distinguished Professor of Biomedical Engineering, and Professor of Chemistry at Duke University. His research involves nanobiotechnology, bio-nanophotonics, biosensors, and biochips for medical diagnostics and therapy. He has authored over 300 publications and has received numerous awards including seven RD-100 Awards, Gold Medal Award, Society for Applied Spectroscopy, Languedoc-Roussillon Award, Scientist-of-the-Year Award, ORNL, Thomas Jefferson Award, Martin Marietta, and the Distinguished Inventors Award, Battelle Institute, and the Exceptional Services Award, Department of Energy, and the Award on Spectrochemical Analysis, American Chemical Society.

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