“Cancer Diagnosis, and Response to Treatment with Plasmonic Nanoprobes”

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2:45 – 3:45 PM
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Abstract
In the past two decades, plasmonic nanostructures have gained tremendous interest as both diagnostic and therapeutic agents for cancer detection and treatment. In this talk, I will show the utility of gold nanostar probes designed in my lab for rapid and noninvasive detection of multiple immunomarkers of cancer to enable patient selection for immunotherapies, as well as response to treatment after immunotherapy. We combined a clinical and pre-clinical imaging technique, positron emission tomography with surface-enhanced Raman spectroscopy (ImmunoPET-SERS) in vivo by labeling gold nanostars with radiolabels, Raman reporter molecules, and targeting antibodies. Multimodal ImmunoPET-SERS seamlessly integrates depth-resolved whole-body imaging and high sensitivity of PET with high spatiotemporal resolution and multiplexing of SERS providing dynamic immunomarker profiling in vivo. Further, ImmunoPET-SERS was used to determine the immunomarker status of mice treated with combinatorial immunotherapy; we demonstrated real-time feedback of CD8+ infiltration in tumors, which was confirmed with IHC ex vivo. High-resolution SERS maps of tumor sections provide quantitative measure of multiple receptor expression in the same tumor section which correlate well with histological analysis of tissue. I will also demonstrate how gold/liposomal hybrid nanostructures efficiently convert light to heat and enable highly specific drug delivery combining photothermal therapy with chemo and immunotherapy for enhanced treatment outcome in highly aggressive breast cancer.

Biography
Professor Rizia Bardhan joined Vanderbilt University Chemical and Biomolecular Engineering Department in Fall 2012. Rizia received a B.A. in Chemistry and Mathematics from Westminster College, Fulton, MO. She then moved to Houston, TX to pursue a Ph.D. at Rice University under the supervision of Prof. Naomi Halas. During her graduate work, her research focused on fundamental plasmonics and nanophotonics, and applications of plasmonic nanostructures in nanomedicine. Prior to coming to Vanderbilt, Rizia spent two years as a postdoctoral fellow in the Molecular Foundry at Lawrence Berkeley National Laboratory in designing nanomaterials for energy conversion and storage.

She has received the CDMRP Career Development Award, ORAU’s Ralph E. Powe Junior Faculty Enhancement Award, NSF BRIGE Award, and was also a recipient of Forbes “Top 30 Under 30 : Rising Stars of Science and Innovation” Award. Rizia has published 61 publications in high impact journals including Science, Nature Materials, Energy and Environmental Science among others with ~7000 citations.