

## Chemical Tools for Biological Discovery

Monika Raj

*Emory University, Department of Chemistry Atlanta GA USA, 30322*

In the Raj lab, we develop novel **chemical** probes and sensors for global profiling of undruggable proteome, selective detection of posttranslational modifications (PTMs), and biological metabolites. This research program leads to the discovery of novel protein biomarkers, affordable diagnostic tools for the early detection of cancer, and endogenous protein partners thus facilitating the synthesis of biotherapeutics. In the first part of the talk, I will focus on our efforts toward the identification of proteins and PTMs at a single molecule level in a cell or an organism to understand biological processes, disease analysis and biomarker discovery. We have developed multiple bioconjugation approaches for the selective labeling of methionine, asparagine, mono-methyl lysine,<sup>1-2</sup> di-methyl lysine and monomethyl-histidine posttranslational modifications (PTMs) to fill the present gap in the range of available techniques to sequence and identify proteins and PTMs at the single molecule and single cell level with high sensitivity and high accuracy. We showed the utility of our chemical methods in identifying methyl lysine PTMs at the single-molecule level by using fluorosequencing technology. In the 2<sup>nd</sup> part of the talk, I will focus on our efforts of developing turn-on and ratiometric chemical sensors for detecting and measuring the concentrations of aliphatic aldehydes inside the live cells. These sensors would aid in the identification of early disease warning signals.