Nonlinear and Chiral Nanoplasmonics for Bioimaging and Biosensing:

Nanoplasmonics studies the nanoscale light-matter interaction and applies the enhanced electromagnetic response of metallic nanostructure resonators in a wide range of applications such as nanoscale optoelectronics and energy harvesting. Of our particular interest here is the recently emerged nonlinear and chiral plasmonics research because it provides tremendous opportunities for advancing the biophotonics research and for developing novel biochemical imaging and sensing platforms. In the first part of this talk, I will discuss how the nonlinear plasmonics concepts and nanostructures can be used for the development of ultrasensitive molecular nanorulers and highly efficient near-infrared multiphoton bioimaging probes. In the second part, I will show that the interaction between plasmonic nanostructures and chiral biomolecules enables switching and amplifying the molecular optical activity and, more importantly, probing the conformational evolution and structural rearrangement of the chemisorbed molecules. I believe that the synergistic combination of the nonlinear and chiroptical plasmonics research will open up a new paradigm for high-resolution, high-sensitivity molecular imaging, sensing and recognition.