

Chemistry Departmental Colloquium

Thursday, January 25, 2024
4:30 p.m. ~ WTHR 104

"Fluorescence-Free Super-Resolution Imaging and Nano-Environment Sensing Based on Time-Resolved Detection"



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Abstract:

Super-resolution imaging has revolutionized chemistry and life science by providing features beyond the optical diffraction limit. Nonetheless, the current methodology relies on specialized fluorophores, limiting labeling efficiency and specificity, and imposing photobleaching. Label-free super-resolution imaging techniques have thus attracted increasing attention. However, the requirement of either high peak laser power or unique chromophores limits the broader application of the technique. Here, we focus on the location-dependent temporal features of the photothermal effect, termed photothermal relaxation localization (PEARL) microscopy that breaks the diffraction limit of the probe beam. PEARL is widely applicable to general molecules or structures with optical absorption, including electronic absorption and vibrational absorption that provide molecular identity. The second half of the talk will feature vibrational dephasing, a temporal feature on a much shorter time scale, through time-resolved coherent anti-Stokes Raman scattering (T-CARS). Vibrational dephasing time is interestingly correlated with macroscale properties, showing new possibilities in nano-environment sensing. Overall, these time-resolved detection approaches open new dimensions for imaging with high sensitivity and resolution.

Bio:

Delong Zhang is an Assistant Professor of School of Physics and Advisor of Chu Kochen Honors College, Zhejiang University, and Senior Member of Optica (formerly OSA). He got Bachelor's degree from University of Science and Technology of China in 2009 and received Ph.D. degree from the Department of Chemistry at Purdue University in 2014, followed by postdoctoral appointments at Purdue University and Boston University, respectively, before joining Zhejiang University in 2019. Dr. Zhang has published 37 peer-reviewed articles with citations over 2600