Seminar on June 25th

13h30 – 14h30

Cryogenic Optical Microscopy for High-Sensitivity and Quantitative Cellular Imaging

Prof. Katsumasa Fujita, University of Osaka, Japan

Cryogenic optical microscopy offers a powerful approach for overcoming fundamental limitations in biological imaging. By suppressing photobleaching, reducing molecular motion, and preserving transient biological states, cryogenic conditions enable significantly enhanced sensitivity, spatial resolution, and quantitative accuracy compared with conventional room-temperature observations. In this seminar, I will present our recent efforts to establish cryogenic optical microscopy as a versatile platform for quantitative biological imaging. A central component of this work is the development of rapid on-stage cryofixation techniques that enable dynamic cellular events to be captured at precisely defined time points and subsequently analyzed under cryogenic conditions. By combining microscopic cryofixation with advanced optical imaging modalities, including fluorescence microscopy, super-resolution imaging, and Raman microscopy, we aim to bridge the gap between live-cell dynamics and high-sensitivity molecular analysis.

Biomedical Raman spectroscopy and imaging: Throughput and sensitivity

Prof. Yasuaki Kumamoto, University of Osaka, Japan

Raman spectroscopy provides comprehensive molecular information from biological samples without invasive or destructive pretreatment. However, the acquisition speed of spontaneous Raman imaging remains a limitation for many biomedical applications. In this talk, I will present two approaches for accelerating spontaneous Raman spectroscopy and imaging. Multiline illumination Raman microscopy employs multiple line-shaped laser foci and a multislit array to scan a sample, improving the imaging speed by four orders of magnitude compared with conventional confocal Raman microscopy. A multiplexed selective-sampling approach using a custom fiber bundle and a spatial light modulator enables single-exposure acquisition of Raman spectra from multiple regions of interest in a tissue sample. I will also discuss potential applications of these high-throughput Raman techniques in life sciences and biomedical applications.