



京都大学
KYOTO UNIVERSITY



SEMINAR

November 22nd, 2023

16:00 – 17:00 @ Bldg. C3 Room b4 (b1N06) & ZOOM

Exploring the Interactions Between Cells and Nanomaterials Across Scales: From Single Molecules to Whole Animal Studies

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Abstract:

Studying cellular interactions with nanostructures is critical as biomedical devices approach nanoscale dimensions. These interactions significantly affect device performance. Cells form focal adhesions at contact points with such devices, anchoring themselves and exerting mechanical force. However, at the nanoscale, the cellular response is less clear due to the limitations of conventional optical microscopy. To address this, we utilized far-field optical microscopy with sub-wavelength resolution. This enabled us to observe molecular responses at cellular adhesion sites and cytoskeleton regulation on artificial extracellular matrix surfaces in detail. We investigated cell adhesion forces using polymeric nanopillar arrays fabricated using various lithography techniques. The deflection of the nanopillars' tips under cellular traction forces—quantified by considering the polymer's Young's modulus—allowed us to monitor the evolution of traction forces during cell adhesion precisely. The traction forces they exert on the extracellular matrix vary with cellular processes such as division, migration, and apoptosis, providing insights into the cell's state. We have developed a label-free drug screening system that measures cellular traction forces, offering high sensitivity, and single-cell resolution. If time permits, I will also discuss our group's advancements in real-time intravital imaging applications, which include observing cell-cell interactions in vital organs and tracking nanoparticle distributions in living animals.

Brief Biosketch:

Prof. Peilin Chen obtained his Ph.D. degree in Chemistry from the University of California, Irvine in 1998. Prof. Chen joined the Research Center for Applied Sciences, Academia Sinica, Taiwan in 2001. He is now the Chief Executive officer of the Thematic Center for Intelligence Bioengineering.

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