LaSIE seminar
Speaker: Dr. Rosaria Piga (Human Stress Signal Research Center, Advanced Industrial Science and Technology (AIST), Osaka, Japan)
Title: "Nano-probing of the membrane dynamics of rat pheochromocytoma by near-field optics"
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Nano-probing of the membrane dynamics of rat pheochromocytoma by near-field optics

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Abstract

High-resolution analysis of activities of live cells is limited by the use of non-invasive methods. Apparatuses such as SEM, STM or AFM are not practicable because the necessary treatment or the harsh contact with system probe will disturb or destroy the cell. Optical methods are purely non-invasive, but they are usually diffraction limited and then their resolution is limited to approximately 1 µm. To overcome these restrictions, we introduce here the study of membrane activity of a live cell sample using a Scanning Near-field Optical Microscope (SNOM). A near field optical microscope is able to detect tiny vertical movement on the cell membrane in the range of only 1 nm or less, about 3 orders of magnitude better than conventional optical microscopes. It is a purely non-invasive, non-contact method, so the natural life activity of the sample is unperturbed. In this report, we demonstrated the nanometer-level resolving ability of our SNOM system analyzing cardiomyocytes samples of which membrane movement is known, and then we present new intriguing data of sharp 40 nm cell membrane sudden events on rat pheochromocytoma cell line PC12. All the measurements are carried out in culture medium with alive and unperturbed samples. We believe that this methodology will open a new approach to investigate live samples. The extreme sensitivity of SNOM allows measurements that are not possible with any other method on live biomaterial paving the way for a broad range of novel studies and applications.

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