THE UNIVERSITY OF TOKYO

Fluctuation & Structure

Seminar Series on Bio-Soft Matter Out-of-Equilibrium (3)

Date: 15:30-17:00, March 20, Thursday, 2014

Place: Room #414, 4th Floor, Science Building #1, The University of Tokyo
(東大、本郷キャンパス、理学部 1 号館 414 セミナー室)

15:30-16:15

Dr. Wasim Abuillan, (Institute of Physical Chemistry, University of Heidelberg)

"Surface Scattering Techniques to Quantify Soft, Biofunctional Interfaces"

Abstract: Cell membranes are crucial components to the life of cells and organelles. In some small organisms such as Trypanosoma brucei and gram negative bacteria, the outer surface of their cell membrane is coated with a dense layer of proteins or lipopolysaccharides (LPSs), respectively. These molecules are responsible for cell viability and defense against the host immune system. In the talk, I will present a model system of the cell membranes of such organisms at the air/water interface. The fine structures perpendicular to the membrane plane are characterized by specular X-ray reflectivity (XRR). A new surface scattering technique called grazing incidence small angle X-ray scattering (GISAXS) is used to probe the lateral structure and the inter-molecular correlation of membrane-anchored proteins. In addition, the element distributions across the interface are constructed by grazing incidence X-ray fluorescence (GIXF) with a high spatial resolution.

Reference:

[1] W. Abuillan, A. Vorobiev, A. Hartel, NG. Jones, M. Engstler, M. Tanaka, JCP 137, 2012 [2] W. Abuillan, E. Schneck, A. Koerner, K. Brandenburg, T. Gutsmann, T. Gill, A. Vorobiev, O. Konovalov and M. Tanaka, Phys. Rev. E 88, 2013 [3] A. Koerner, W. Abuillan, C. Deichmann, F. Rossetti, A. Koehler, O. Konovalov, D. Wedlich and M. Tanaka, J. Phys. Chem. B 117, 2013

16:15-17:00

Dr. Cornelia Monzel (Institute of Physical Chemistry, University of Heidelberg)

"Quantitative Studies on Hematopoietic Progenitor Cell Adhesion and Migration by Nanometric Presentation of Niche Ligand Molecules"

Abstract: The bone marrow niche that harbors hematopoietic stem and progenitor cells (HSPCs) is critical to explore for a better understanding of HSPC homing and mobilization during health and disease. Since little is known about the complex interplay of these cells and their environment, we design simplified models of the niche environment, which allow for quantitative studies of HSPC adhesion and migration mediated by niche relevant ligand-receptor pairs. The model consists of a supported lipid bilayer displaying either human SDF1α or recombinant N-cadherin at controlled intermolecular distances ranging from 5 nm to 100 nm. Label-free, live cell imaging of adhesion and motion was facilitated using micro-interferometry (Reflection Interference Contrast Microscopy, RICM) and time-lapse phase contrast imaging. Our results demonstrate a highly sensitive response of HSPCs towards small changes in the lateral spacing of SDF1α and N-cadherin. Moreover, time-lapse analysis of cellular motion resulted in characteristic distances of migration and distinct maps of HSPC modes of motion depending on the underlying substrate. Thus, our studies provide valuable information on the relative significance of niche ligand-receptor pairs, which may contribute to future adhesion regulation in leukemia therapy

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