

IMCB & SBIC Invited Speaker



Speaker : **Prof. Ueli Aebi**
*Professor, M.E. Mueller Institute for Structural Biology,
Biozentrum, University of Basel, Switzerland*

Date : 6 August 2012, Monday

Time : 11am - 12pm

Venue : SBIC Seminar Room, Level 2, Helios Building, Biopolis
(please use Level 1 entrance)

Host : Prof. Wanjin Hong (IMCB) and Dr. Weiping Han (SBIC)

Seminar :

The Nanomechanical Signature of Cells and Tissues – Normal versus Pathological

We have established atomic force microscopy (AFM) as a powerful tool for imaging, measuring and manipulating soft biological matter at all relevant scales of cell and tissue architecture. For example, indentation-type AFM (IT-AFM) can spot early pathological changes of the articular cartilage in a collagen IX-deficient mouse model for osteoarthritis (OA), and it allows to detect early OA using articular cartilage biopsies from patients. Next, we probed the stiffness of normal versus tumorigenic Rat2 cells grown in monolayer culture as well as in 3D spheroids by IT-AFM. While low oxygen caused a softening of the tumor compared to the normal spheroids, no difference was monitored in monolayer cell cultures. Similarly, we explored the tissue plasticity of human breast biopsies. AFM stiffness maps complemented with histo-pathological examination revealed malignant lesions to be characterized by a radial stiffness gradient. Benign lesions typically exhibited a uniform stiffness, which is consistent with their fairly homogenous morphology. In contrast, a high ratio of soft versus stiff areas was indicative of more aggressive tumors. Hence, AFM stiffness testing might prove a valuable prognostic marker for cancer progression with significant implications for treatment.

About the Speaker :

Ueli Aebi holds master's degrees in physics and molecular biology. He earned his Ph.D. in biophysics in 1977 from the University of Basel. In 1977/78, he worked as a senior research associate in protein crystallography at the University of California in Los Angeles. In 1979 he joined the faculty at the Johns Hopkins University School of Medicine in Baltimore, holding appointments in the Departments of Cell Biology and Anatomy, and in Dermatology. In 1986 he moved to the Biozentrum, University of Basel, Switzerland, where he built a world-class structural biology division that integrates X-ray crystallography, NMR spectroscopy, and light, electron and scanning probe microscopies. Until the end of 2011, UA has been the Director of the M.E. Müller Institute for Structural Biology at the Biozentrum. From 2001 to 2009, he has also been a member of the Swiss Nanoscience Institute (SNI) and the National Center of Competence in Research (NCCR) "Nanoscale Science" where he co-directed the project module "Nanobiology/Nanomedicine".

Ueli Aebi's lab has a long-standing interest in a structure-based understanding of molecular machines and supramolecular assemblies by a hybrid methods experimental approach that includes light, electron and scanning probe microscopies, X-ray crystallography, molecular cell biology and protein design. Being problem-driven, he focuses on (1) cytoskeletal filament structure, assembly and turnover; (2) the nuclear pore complex and its involvement in nucleocytoplasmic transport; and (3) fibrillogenesis of amyloid forming peptides and how this relates to disease progression. Also, his group works on novel optical and mechanical nano-sensors/actuators for minimally invasive local interventions. UA has co-authored over 300 original research articles, reviews and book chapters, and he has received numerous honors and prestigious awards. In addition, UA has over 30 years of business experience. In 1981 he co-founded Protek, Inc. to develop, manufacture, and sell endoprostheses in the USA. Since 1996 he has been chairing the Board of Directors of Gehring Cut that develops and manufactures surgical instruments and other precision mechanical components. In 2003 he co-founded Therapeutic, Inc. that focuses on protein drug formulation and growth factor enhanced tissue repair. In 2005 he joined the Board of Directors of Alpha-O Peptides, a biotech start-up company that designs and customizes self-assembling polypeptide nanoparticles for synthetic vaccine design, bio-imaging and drug targeting/ delivery.



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