SEVEN INFLUENTIAL PHYSICS TOOLS FOR BIOLOGISTS

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INITIAL MEETING (VORBESPRECHUNG):
March 5th 2012, 10:00, Seminar Room 6th floor, Max F. Perutz Laboratories, Dr. Bohr-Gasse 9 1030 Wien

TIME:
Blocked 10.04.2012 – 22.05.2012 – Tuesdays 2:00pm – 3:30pm,
Seminar Room 6th floor, Max F. Perutz Laboratories,
Dr. Bohr-Gasse 9, 1030 Wien

In this lecture series we will present and discuss seven influential physics methods that have had or are expected to have a significant impact on biology. Each lecture will cover one topic presented by a subject matter expert in the field. The topics will include amongst others such-super resolution microscopy, molecular dynamics simulation, FRET, molecular force measurements via optical tweezers and optogenetics. Each lecture will be structured to introduce students at the Masters or PhD level into the basics of the methods followed by case examples of their application in specific biological or biophysical questions.

LECTURES:

10.04. ***ALIPASHA VAZIRI***

In this lecture I will provide an overview of the recent advances in structural and functional imaging techniques and optogenetics that has led to significant advances in cell biology and circuit neuroscience.

17.04. ***GEHARD SCHUETZ***

In this lecture, I will show examples how to obtain insights into the organization of the cellular Nanocosm by single molecule experiments. Our primary goal is an understanding of the role of such structures for immune recognition. For this, we apply single molecule tracking to resolve the plasma membrane structure at sub-diffraction-limited length-scales.

24.04. ***MAXIM MOLODTSOV***

In this lecture I will talk about using optical tweezers for studying individual molecules of molecular motors and investigating mechanisms that drive chromosome movements during cell division.

01.05. ***HARALD JANOVAK***

In 1986, Binnig, Quate and Gerber introduced the AFM, a revolutionary microscope that measures interaction forces between an ultra-sharp tip and a sample surface to generate a topographical surface image. Most interestingly for biology, the AFM is capable of revealing the surface topography of biological systems ranging from single biological molecules (such as proteins, nucleic acids, polysaccharides) to molecular assemblies and cells with sub-nanometer resolution. Although the AFM was initially developed as an imaging technique, today it is increasingly used as a nanomanipulator to dynamically probe molecular and cellular mechanics.

08.05. ***CHRIS OOSTENBRINK***

In this lecture will present and critically discuss the most powerful computational techniques for evaluating free energy differences in biological systems and their application in molecular pharmacology and drug design.

15.05. ***BOJAN ZAGROVIC***

In this lecture, I will provide an overview of the basic principles of molecular dynamics simulations and their usage in studying fundamental biological processes such as protein folding, protein-protein interactions and enzyme activation at the atomistic level.

22.05. ***CHRISTOPH DELLAGO***

In this lecture I will discuss the importance of rare events in biological processes at the microscopic level with focus on transition path sampling, a powerful computational technique for sampling rare events.