PHYSIKALISCHES KOLLOQUIUM

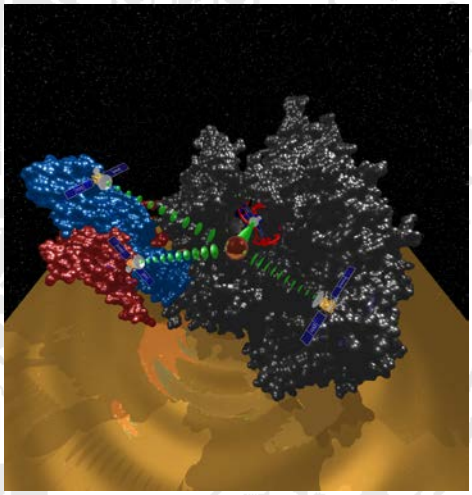
AM 20. JULI 2015 UM 17 UHR C.T.

IM GROßEN HÖRSAAL

THE INNER LIFE OF CELLS – HOW PHYSICS BRINGS LIGHT INTO BIOLOGY

PROF. DR. JENS MICHAELIS

INSTITUTE FOR BIOPHYSICS, UNIVERSITY ULM



Structural biology has in the last decades revolutionised our understanding of biological processes. We now have blueprints of many of the important biological machines with close to atomic resolution. However, these blueprints are static snapshots of living system. For a complete understanding dynamic information as can be obtained e.g. by using light microscopy is required. Unfortunately, diffraction of light limits the achievable resolution in light microscopy, with the resolution limit being roughly 100x larger than the sizes of proteins.

Recently, novel fluorescence methods have been developed to overcome this limit. In my talk I will present an overview of several techniques and their application to open question in the field of gene expression. I will show how using single molecule experiments we are able to obtain dynamic mechanistic information about gene expression, such as the role of transcription factors [1] the structure of transcription complexes [2] as well as nucleosome structure and dynamics [3]. Of particular interest for structural models of transient complexes is the so called Nano-Positioning system [1], [4], which combines the data from smFRET experiments and existing structural models with bayesian parameter estimation in order to obtain quantitative structural information.

[1] A. Muschielok, J.Andrecka, F. Brückner, A. Jawhari, P. Cramer and J. Michaelis, Nature Methods **5**, 965-971 (2008).
[2] B. Treutlein, A. Muschielok, J. Andrecka, A. Jawhari, C. Buchen, D. Kostrewa, P. Cramer and J. Michaelis, Molecular Cell **46**, 136-146 (2012).
[3] C. Bönisch, K. Schneider, S. Pünzeler, S. Wiedemann, C. Bielmeier, M. Bocola, C. Eberl, W. Kuegel, J. Neumann, E. Kremmer, H. Leonhardt, M. Mann, J. Michaelis, L. Schermelleh and S. Hake, Nucleic Acids Research **40**, 5951-5964 (2012).
[4] A. Muschielok and J. Michaelis, Journal of Physical Chemistry B **115**, 11927-11937 (2011).