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Einladung
zum
Physikalischen Kolloquium

Montag, 04.05.2015
16:15 Uhr in N24/H13

Prof. Dr. Daniel J. Müller
ETH Zurich, Biosystems Science and
Engineering, CH-4057 Basel, Switzerland

Molecular Mechanics Guiding Cellular Processes

Microscopy at the sub-nanometer resolution (Nanoscopy) is an approach that allows the characterization of basic cellular processes, ranging from the cellular to molecular scale. I will introduce the use of atomic force microscopy (AFM)-based nanoscopic assays to characterize cellular mechanics underlying cell adhesion, cell migration, cell sorting and the dramatic shape change of mitotic cells [1-3]. Furthermore, AFM-based assays can be used to describe processes that control cellular mechanics and to identify cellular machines (proteins) that play commanding roles [4-6]. AFM-based single-molecule techniques allow the imaging of cellular machines at sub-nanometer scale in their functional state, while they work. Simultaneously to sub-nanometer imaging multiparametric AFM allows the interactions that functionally regulate the cellular machinery to be quantified and localized. Future developments of force nanoscopy [6,7], together with advances in light microscopy and cell biological and genetic tools, will provide further insight into how the molecular machinery of the cell contribute to basic cellular processes.

[1] Atomic force microscopy as a multifunctional molecular toolbox in nanobiotechnology. D.J. Müller & Y. Dufrene ***Nature Nanotechnology*** (2008) 3, 261-269.

[2] Force probing surfaces of living cells to molecular resolution. D.J. Muller, J. Helenius, D. Alsteens & Y.F. Dufrene ***Nature Chemical Biology*** (2009) 5, 383-390.

[3] Combined activities of hydrostatic pressure and the actomyosin cortex drive mitotic cell rounding. M.P. Stewart, J. Helenius, Y. Toyoda, S.P. Ramanathan, D.J. Muller & A.A. Hyman ***Nature*** (2011) 469, 226-230.

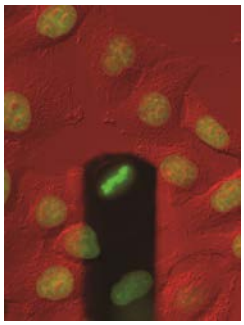
[4] Gating of the MlotiK1 potassium channel involves large rearrangements of the cyclic nucleotide-binding domains. S.A. Mari, J. Pessoa, S.L. Altieri, U. Hensen, L. Thomas, J.H. Morais-Cabral & D.J. Muller ***Proc. Natl. Acad. Sci. USA*** (2011) 108, 20802-20807.

[5] Locating an extracellular K^+-dependent interaction site that modulates betaine-binding of the Na^+-coupled betaine symporter BetP. L. Ge, C. Perez, I. Waclavska, C. Ziegler & D.J. Muller ***Proc. Natl. Acad. Sci. USA*** (2011) 108, E890-898.

[6] Cholesterol increases kinetic, energetic and mechanical stability of the human □2adrenergic receptor. M. Zocher, C. Zhang, G.F.S. Rassmussen, B.K. Kobilka & D.J. Muller ***Proc. Natl. Acad. Sci. USA*** (2012) 109, E3463-3473.

[7] Five challenges to bringing single-molecule force spectroscopy into the living cell. Y.F. Dufrene, E. Evans, A. Engel, J. Helenius, H.E. Gaub & D.J. Muller ***Nature Methods*** (2011) 8, 123-127.

[8] Multi-parametric force mapping of biological systems to molecular resolution. Y.F. Dufrene, D. Martinez-Martin, I. Medalsy, D. Alsteens & D.J. Muller ***Nature Methods*** (2013) 10, 847-854.



Ab 15.45 Kaffee, Tee und Kekse vor dem Hörsaal H13

Organisation: **Prof.Jelezko, Tel. 23750**

Host: **Prof. K. Gottschalk, Tel. 23012, off.: 23010**