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## NANOSCIENCE COLLOQUIUM

Thursday  
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at 15:15,  
K-space, Fysicum

### Single Molecule Research: When Biology Meets Physics

Nonequilibrium pervades nature. From living cells to the expanding universe virtually all energy processes in nature occur in nonequilibrium conditions [1]. The possibility of using electromagnetic fields to exert forces in the range of the piconewton has spurred the development of new experimental techniques such as optical tweezers that are capable of manipulating single molecules with unprecedented accuracy [2]. In this talk I will review a few selected examples of investigations carried out in my lab that combine the finest tools from statistical physics with single molecule data to characterize energy and information fluctuations in nucleic acids and proteins [3]. These experiments lay the ground to explore new concepts and tools [4] essential for our understanding of nonequilibrium phenomena in physics and beyond [5].

[1] F. Ritort, *Nonequilibrium fluctuations in small systems: from physics to biology*, *Advances in Chemical Physics*, **137**, 31-123 (2008). Ed. Stuart. A. Rice, Wiley publications

[2] F. Ritort, *Single molecule experiments in biological physics: methods and applications*, *Journal of Physics C (Condensed Matter)*, **18** (2006) R531-R583

[3] A. Alemany *et al.* *From free energy measurements to thermodynamic inference in nonequilibrium small systems*. *New Journal of Physics*, **17** (2015) 075009

[4] M. Ribezzi-Crivellari and F. Ritort, *Free-energy inference from partial work measurements in small systems*, *Proceedings of the National Academy of Sciences*, **111** (2014) E3386-E3394

[5] E. Dieterich *et al.* *Single-molecule measurement of the effective temperature in non-equilibrium steady states*. *Nature Physics*, **11** (2015) 971---977

**Host: Andreas Wacker (Mathematical Physics)**