

May 2018

Opening:
PhD-project in Biophysics/Biochemistry



Dynamics of Proteins with Single-Molecule Methods

Cellular processes are highly dynamic and rely on extended interaction networks. The investigation of such complex systems is challenging and is often reduced to pairwise interactions. However, the simultaneous observation of multiple interactions is essential in the understanding of the underlying mechanism.

Therefore we have developed several single-molecule methods over the last years. With our **multi-color Förster-resonance-energy-transfer (FRET)** microscopy approach it is possible to analyse simultaneously the interaction of multiple components in real-time (Fig. a). At the same time, they might be manipulated by force (Fig. b).

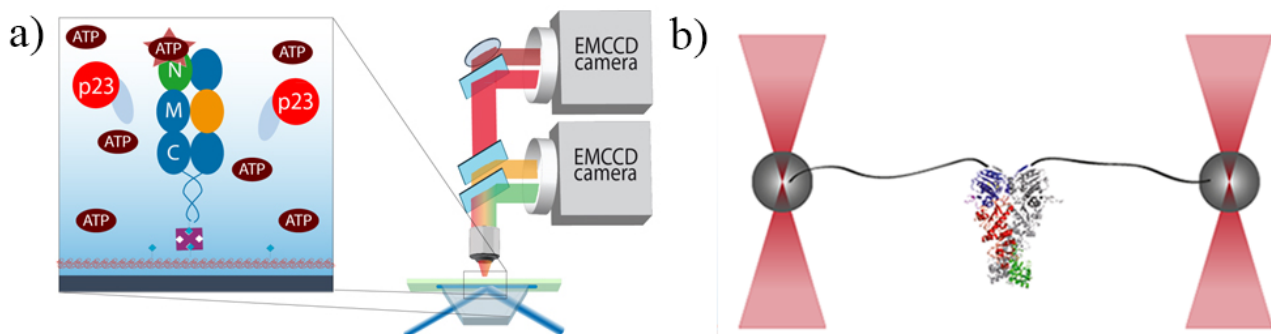


Figure:

a) Schematic of a four color FRET measurement. Here two dyes (green and orange) were used to monitor the conformation of Hsp90. A third dye reported on the binding of ATP and the fourth dye on the binding of the cochaperone p23. b) With an optical (or magnetic) tweezer forces can be applied at specific positions.

Our 'working horse' is the **heat-shock protein Hsp90**, the most abundant soluble protein in eukaryotes. With a multitude of interacting **cochaperones and clients** it is involved in most essential cellular processes. In recent years it has become a promising **drug-target** in e.g. cancer research.

The aim of this work is to combine **multi-color FRET** measurements with force measurements on the **Hsp90-system** to gain a deeper insight into the dynamic interaction network. This is e.g. relevant to understand fundamental signalling pathways on the molecular level.

In the project you will apply a wide range of methods from **protein biochemistry**, measurements on **home-build single molecule setups** and complex **data analysis**. Basic knowledge about protein handling and optical setups is highly appreciated.

Applicants should have a master's degree in **Biochemistry/ Chemistry/ Physics/ Biophysics** etc and the motivation to work independently in an interdisciplinary team.

If you are interested, please contact Thorsten Hugel at Thorsten.hugel@pc.uni-freiburg.de