



Forschergruppe 877

**Universität Leipzig**  
Fakultät für Physik und  
Geowissenschaften  
Institut für Theoretische Physik

## **FOR 877-Seminar**

Am Montag, dem 18.03.2013 um 11:30 Uhr spricht

**Prof. Dr. Lene Oddershede**  
(University of Copenhagen)

über

### **Optical heating and manipulation of a single metallic nanoparticle**

A precise control over individual nanoparticles has huge potential for nano-architectural purposes and for probing nano-scale interactions. However, the absorption and heating associated with resonant irradiation of an individual gold nanoparticle can be extreme. Moreover, the heating of a nanoparticle cannot be theoretically predicted as the precise focal intensity distribution on the nanoscale is unknown and typically highly aberrated [1]. Utilizing a novel assay based on partitioning of lipophilic dyes between membrane phases we quantify the heating of an individual irradiated gold nanoparticle [2,3]. The heating of the particle is dependent on laser power, and for a nanorod, also on its orientation with respect to the laser polarization [4]. A dramatic and irreversible change in plasmonic behavior of a nanorod occurs at high illumination intensities as the nanorod restructures into a more spherical shape. Nanoparticles can be used inside living cells for precise force measurements [5], and the photo-thermal effect of metallic nanoparticles can be used to create localized heat gradients inside living cells thus investigating cellular responses to heat shocks.

- [1] A. Kyrsting, P.M. Bendix, L.B. Oddershede, Mapping 3D focal intensity exposes the stable trapping positions of single nanoparticles, *Nano Letters* vol.13 p.31-35 (2013).
- [2] A. Kyrsting, P.M. Bendix, D.G. Stamou, and L.B. Oddershede. Heat Profiling of Three Dimensionally Optically Trapped Gold Nanoparticles using Vesicle Cargo Release. *Nano Letters*, vol 11 p.888-892 (2011).
- [3] P.M. Bendix, S.N.S. Reihani and L.B. Oddershede. Direct measurements of heating by electromagnetically trapped gold nanoparticles on supported lipid bilayers. *ACS Nano*, vol. 4 p.2256-2262 (2010).
- [4] H. Ma, P.M. Bendix, L.B. Oddershede. Large-Scale Orientation Dependent Heating from a Single Irradiated Gold Nanorod. *Nano Letters* vol.12 p.3954-3960 (2012).
- [5] L.B. Oddershede. Force probing of individual molecules inside the living cell is now a reality. *Nature Chemical Biology* vol.8 p.879-886 (2012).

**Ort:** Linnéstraße 5, SR 224

*Interessenten sind herzlich eingeladen!*

gez. Prof. K. Kroy