

# SFB 608

## Einladung zum Sonderkolloquium

- Ort:** Universität zu Köln  
Seminarraum Theorie
- Zeit:** Montag, 9. Mai 2005, 13:30 Uhr
- Sprecher:** Prof. Dirk Morr  
University of Illinois Chicago, USA
- Thema:** Quantum Photography and Quantum Sound  
or  
How to take pictures and make music in the  
quantum world

The formation of optical images and sound is fundamentally related to the properties of waves. Experimental advances over the last few years have made it possible to use the wave-like nature of electrons in condensed matter systems to form quantum images in solids. For example, Manoharan et al. created the quantum image of a Kondo-resonance inside an elliptic quantum corral that resides on the surface of a metal. In this talk, I demonstrate that the interaction of quantum corrals with correlated electron systems gives rise to a series of exciting quantum phenomena. In particular, I will focus on superconducting host systems, which allow for the formation of novel “quantum candles” whose images can be projected. I will show that the interplay between the quantum corral and the superconducting correlations of the host system leads to (a) quantum phase transitions, (b) the formation of multiple quantum images or the complete suppression of the “quantum candle”, (c) new selection rules for quantum imaging, and (d) the screening of impurity resonances. Moreover, I will demonstrate that molecular nanostructures provide the intriguing possibility to manipulate and gain insight into the complex electronic structure of strongly correlated electron systems. Finally, I discuss the formation of magnetic droplets around nanostructures in the vicinity of magnetic quantum phase transitions.

Gez. Prof. A. Rosch