



Lehrstuhl für
Experimentalphysik E20

**Advanced Lab
Course
(FOPRA)
83**

Technische
Universität
München



Scanning Tunnelling Microscopy & Molecular Imaging (Rastertunnelmikroskopie & Abbildung von Molekülen)

The scanning tunnelling microscope (STM) is a versatile and ubiquitous tool for nanoscale science and technology. With this technique, recognized by a *Physics Nobel Prize* in 1986, one is able to obtain real-space images of interfaces and adsorbed species resolving finest details down to the atomic level. The physical principle of tunnelling and its exponential characteristics are illustrated with tunnelling current *vs.* distance measurements. You will obtain and analyse atomic-resolution STM topography data of well-defined surfaces, notably the (0001)-plane of highly oriented pyrolytic graphite. The relationship between the geometric topography and the STM images, reflecting a convolution of geometric and electronic effects, will be addressed. Moreover, the electronic properties of surfaces are probed by tunnelling spectroscopy.

Subsequently phthalocyanine molecules with appropriate substituents for self-assembly will be investigated at the solid-liquid interface. By a careful sample preparation organized layers are generated. Based on STM observations you can identify the symmetry and organization of the pertaining supramolecular arrays. The interpretation of the molecular features in the recorded images will be correlated to the molecular electronic structure. Thus a comprehensive description of a two-dimensional nanoarchitecture built from functional molecular bricks can be achieved.