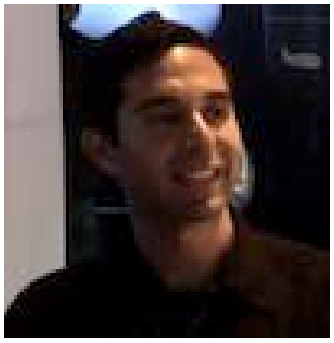
北京大学量子材料科学中心

Seminar



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Time: 4:00pm, Oct. 28, 2013 (Monday)
时间：2013年10月28日 （周一）下午4:00
Venue: Room 607, Conference Room A , Science Building 5
地点：理科五号楼607会议室

Abstract

The drive to continue Moore's Law by shrinking electrical components down to the ultimate limit has led to a great deal of interest in atomic and molecular-scale electronics, in which individual atoms and molecules can be used as circuit elements. More recent proposals also seek to exploit the magnetic properties of these nanoscale objects in new applications in information technology and spintronics. In typical device geometries, the magnetic element is coupled to electrical leads, and these interactions can strongly affect the properties of the quantum system.

Using scanning tunneling microscopy and spectroscopy, we study the effects of interactions between individual magnetic atoms and molecules that are separated from an underlying metallic surface by a thin-insulating layer of copper nitride (Cu2N). For Co atoms on large Cu2N islands, we find that exchange coupling of the spin to the metallic bath can result in Kondo screening as well as dramatically shifting the energy levels of the spin and modifying its effective magnetic anisotropy, the property that determines the stability of its spin orientation. By controlling the exchange coupling, we can tune both the Kondo screening of the systems as well as the anisotropy energy over a broad range of values. Furthermore, this system constitutes one of the few cases in which an open quantum system's energy levels, rather than just its excited-state lifetimes, can be controllably and observably renormalized. We also study the electronic transport through individual metal-doped phthalocyanine molecules on Cu2N and explore how it can be influenced through the magnetic properties of the molecules. These results have profound implications for controlling the properties of nanoscale spintronic devices.

About the Speaker

Cyrus F. Hirjibehedin is a Reader, the UK equivalent of an Associate Professor, in the Departments of Physics & Astronomy and Chemistry at University College London (UCL) and is a Principal Investigator at the London Centre for Nanotechnology. His group's research is focused on understanding the electronic and magnetic properties of nanometer-scale structures and exploring their potential applications in future paradigms of information processing, data storage, and sensing. The primary tools that he uses for his research are low-temperature scanning tunneling microscopes, some of which operate in high magnetic fields. These systems are able to image, manipulate, and probe structures on surfaces at the scale of individual atoms.