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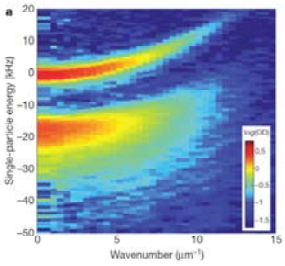
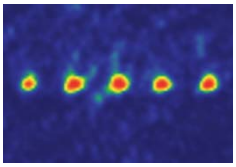
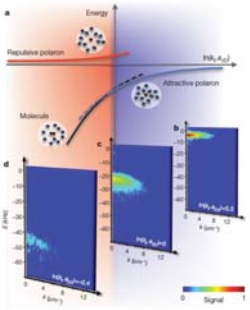
Alexander von Humboldt
Stiftung/Foundation

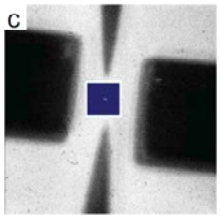
Our newly founded research group (starting April 2013) has openings for PhD/Master students

Ultracold atomic Fermi gases









Since the discovery of superconductivity a century ago, correlated quantum many-body systems have evolved from a scientific peculiarity to key components of commercially available devices. Yet, understanding collective states of strongly correlated matter remains a major scientific challenge. The unresolved puzzles, in particular in low-dimensions, include intriguing effects such as high-T_c superconductivity and the quantum Hall effect. In recent years, it has become possible to assemble strongly correlated quantum many-body systems in a bottom-up approach using ultracold atomic quantum gases. This novel approach has created the purest and most widely tunable "materials" in which quantum many-body physics can be studied. They are considered ideal candidates for unravelling mysteries known from the solid state as well as for realizing completely new quantum phases, very much in the sense of Feynman's concept of a "quantum simulator".

In this PhD project we plan to investigate low-dimensional atomic Fermi gases. The goal is to create correlated states in optical lattices and study the competition between quantum magnetism (e.g. antiferromagnetism) and superconductivity. This is one of the most intriguing properties of strongly correlated materials which has been pondered for decades. We plan to develop new preparation techniques, which will provide access to new quantum phases at ultra-low temperatures, and new detection techniques with single-atom sensitivity.

Literature:
M. Koschorreck et al. Nature 485, 619 (2012).
M. Feld et al., Nature 480, 75 (2011).

We are looking for an excellent candidate with a strong background in experimental physics and a passion for setting up and conducting challenging experiments. The research work offers training in both cutting edge technology (quantum optics, fiber optics, photonics) and fundamental concepts of modern quantum physics.

The PhD position is funded and the anticipated starting date is Spring/Summer 2013.

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