

CONDENSED MATTER SEMINAR

Thursday 8 November at 2.15pm

“Spin and Charge Ordering in the Quantum Hall Regime”

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The spontaneous ordering of electrons in spatial patterns is currently under study in a number of different material systems, most notably in the high-temperature superconductors. Here the charge ordering stands in strong competition to the superconducting phase which opens up a complex and partly unexplored phase diagram. Similar physics is at play in high-quality two-dimensional electron systems upon entering the quantum Hall regime, where electrons arrange in bubble and stripe phases due to a competition of the repulsive (direct) Coulomb interaction and the attractive exchange interaction (Fig. 1). The controlled environment of the semiconductor heterostructure combined with the discrete, narrow-band energy levels of the quantum Hall effect creates an ideal platform to study the origin of these interaction-driven phenomena.

Theoretically predicted in the 90s [1-3], first clues on the existence of bubble and stripe phases in the quantum Hall regime were found in resistance measurements only few years after. Here the bubble phase manifests itself by the reappearance of the integer quantum Hall effect outside of the main series of plateaus and the stripe phase induces a strong transport anisotropy [4-7]. These characteristic signatures proved to be very helpful in establishing a basic understanding of the bubble and stripe phases. More in-depth information were gained in recent years using alternative techniques such as surface acoustic waves and nuclear magnetic resonance spectroscopy [8-11]. In this talk, we will review the basic physics underlying the formation of the bubble and stripe phases in the quantum Hall regime and highlight the latest advances in unraveling the nature of these exotic electron phases.

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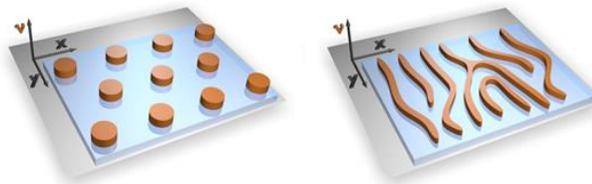


Fig. 1: Schematic representation of the filling factor modulation in the bubble (left) and stripe phases (right)

Host: Prof Robert Taylor

Audrey Wood Seminar Room, Clarendon Laboratory