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Physikalisches Kolloquium — Physics Colloquium

Einladung — **Invitation**

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Collective phenomena in 2D quantum materials: Probing and imaging the effects of dimensionality, pressure and disorder at the atomic scale

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PERSONAL

Two dimensional (2D) quantum materials often show remarkable properties arising as a result of a complex interplay of charge, lattice, spin, orbital, and topological degrees of freedom. This interplay gives rise to numerous collective phenomena including superconductivity, anti/ferromagnetism, spin and charge density waves, among others. Understanding the interplay between these orders is currently one of the most challenging areas in materials research.

Some of the approaches being used to understand the nature of this interplay include using dimensionality, pressure, or introduction of controlled disorder as tuning knobs. In cases where materials show co-existing and/or competing orders, use of these tuning knobs can either promote or suppress one of the existing electronic phases. This may also lead to atomic-scale spatial distribution of different electronic phases. This has prompted interest in using these tuning knobs to design atomic-scale landscapes to tune electronic phases at the atomic scale. However a better atomic-scale understanding of the effects these parameters have on the structure of the materials is necessary.

In this presentation, I will report on the use of transmission electron microscope (TEM) as a tool to probe effects of low dimensionality, and pressure on the structure and properties of collective electron phenomena in real and energy-momentum space. The application of the TEM to engineer controlled disorder on an ordered electronic phase, while studying its evolution, will be discussed. In particular I will focus on collective electronic phenomena in form of plasmons and charge density waves (CDW).This presentation will emphasize the use of the TEM to (1) Visualize (2) Quantify and (3) Modify ordered phases at the atomic scale.

Host: Prof. Dr. Ute Kaiser, Electron Microscopy Group of Materials Science

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