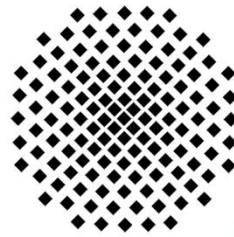


# Stuttgarter Physikalisches Kolloquium

Fachbereich Physik, Universität Stuttgart  
Max-Planck-Institut für Festkörperforschung  
Max-Planck-Institut für Intelligente Systeme

Ansprechpartner: Prof. Harald Giessen  
E-Mail: [giessen@physik.uni-stuttgart.de](mailto:giessen@physik.uni-stuttgart.de)  
Telefon: 0711 - 685-65111



Dienstag, 28. November 2023

16:15 Uhr

V57.02

Universität Stuttgart, Pfaffenwaldring 57, 70569 Stuttgart-Vaihingen

Gastgeber: Fakultät Physik, Universität Stuttgart, Telefon: 0711 - 685-64818

## Engineered superlattices as tunable platforms for novel two-dimensional quantum phases

**Mathias Scheurer**  
*Antrittsvorlesung*

### Abstract

Two spatial dimensions (2D) are at the sweet spot for exciting physics since the reduced dimensionality enhances interaction effects and allows for qualitatively new phenomena that are absent in three spatial dimensions. At the same time, many theoretical tricks that led to a detailed understanding of the physics in one dimension are not readily applicable, leaving a rich and constantly growing set of interesting open questions about quantum physics in 2D. What is more, current experiments have remarkable control over 2D systems: for instance, by stacking and twisting layers of materials or by placing adatoms on surfaces, superlattice structures with desired properties can be engineered; meanwhile their enhanced unit cells open up novel ways of in situ control and of probing their physics. In this talk, I will illustrate the potential and rich physics of engineered 2D systems using a few examples of our recent research, which involve analytical and numerical methods of quantum many-body physics, as well as machine learning and collaborations with experimentalists. More specifically, these examples will include engineering and controlling novel forms of spin-orbit coupling, exotic superconducting phases beyond the standard paradigm, and electronic nematic order – the spontaneous breaking of rotational symmetry in an electron liquid.