Universität Regensburg

FAKULTÄT FÜR PHYSIK
Graduiertenkolleg
Elektronische Eigenschaften von
Nanostrukturen auf Kohlenstoffbasis

Einladung

zum

Seminartag

Freitag, 08. Juni 2018, 14:30 Uhr

Raum PHY 5.0.21

PD Dr. Sam Shallcross

Friedrich-Alexander-Universität Erlangen

"*Deformations in two dimensional systems*"

Deformations in materials can be either perturbative or non-perturbative departures from the high symmetry crystal. Perturbative deformations include strain in semiconductors or long wavelength ripples in a two dimensional membrane such as graphene. As these represent only small local changes from the high symmetry crystal, they can be calculated efficiently by perturbative effective mass methods. To the class of non-perturbative deformations belong extended defects such as dislocations, partial dislocations, twin boundaries, and twist faults. These occur in both two and three dimensional materials, and typically involve dramatic changes in crystal structure for which perturbative methods fail. In contrast to 3d materials, for which such defects are generically important only for mechanical properties, a growing body of work indicates that extended defects can fundamentally change electronic properties in 2d systems. For example, a single partial dislocation in bilayer graphene destroys the metallic state exhibited by the defect free system [1]. In this talk I will present a theoretical approach capable of treating both perturbative and non-perturbative deformations on an equal footing, and describe examples of both including partial dislocations in bilayer graphene, optical deformations in graphene, and twist faults [2] in a range of 2d systems.

[1] Sam Shallcross, Sangeeta Sharma, Heiko Weber. *Anomalous Dirac point transport due to extended defects in bilayer graphene*. Nature Communications **8**, 342, (2017).
[2] M Vogl, O Pankratov, S Shallcross. *Semiclassics for matrix Hamiltonians: The Gutzwiller trace formula with applications to graphene-type systems*. Physical Review B **96,** 035442 (2016).

Gastgeber: Dr. Jonathan Eroms