ZOOM-Kolloquium - Habilitationsvortrag

physikalisches Kolloquium

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Spin Relaxation in Nanowires and Transport under Periodic Driving

Mo. 10.5.21
16:00 Uhr
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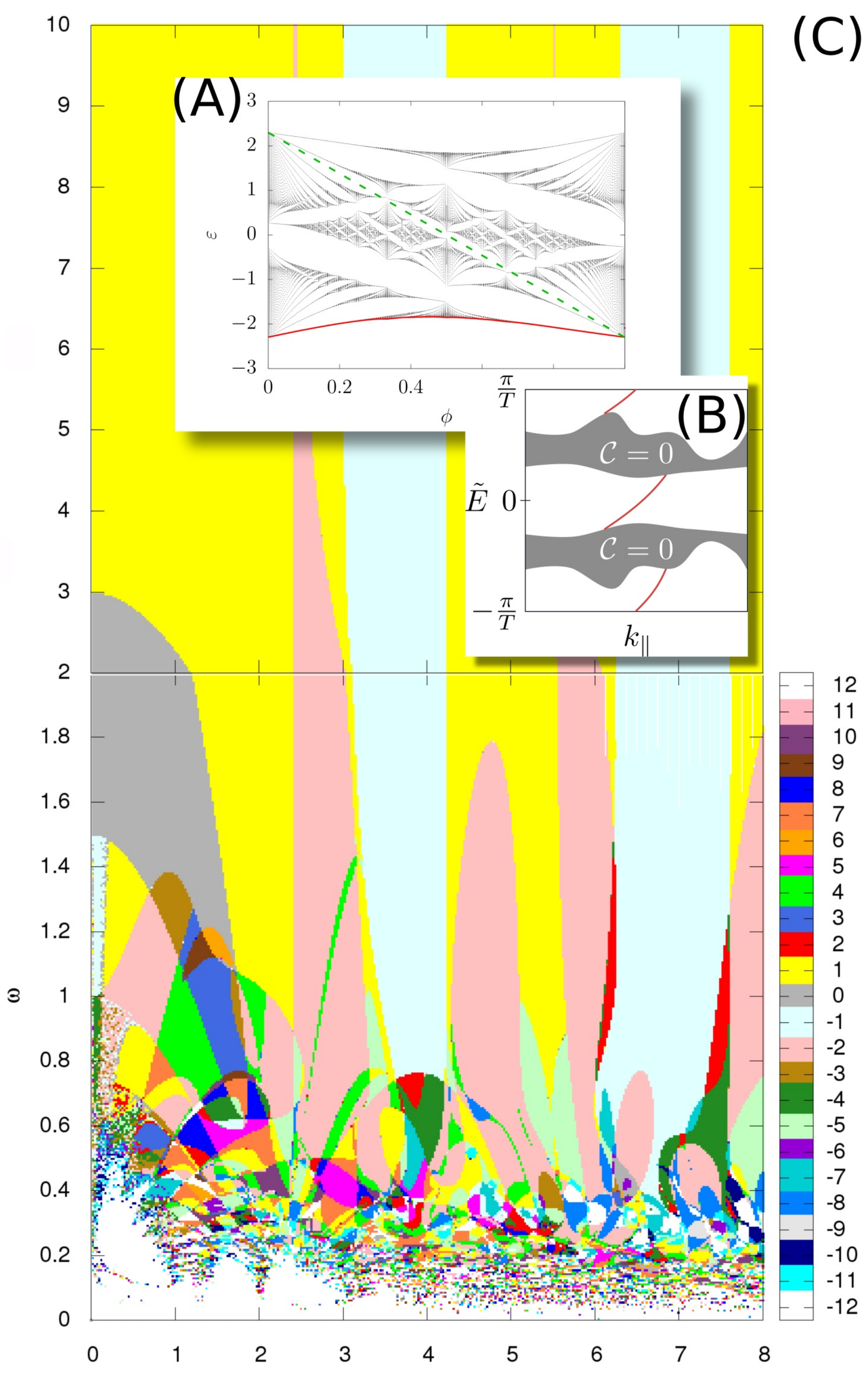
Nowadays sometimes called old fashioned, spintronics is often a fundamental ingredient in today's hunt for materials which either already host topologically non-trivial states or can be modified via a non-perturbative drive towards such interesting conditions.

In this colloquium, we first present an overview of our study on the spin relaxation due to spin-orbit coupling in nanorods and nanowires: we show how spin states in diffusive systems can be tailored to become persistent by modifying the boundary geometry, crystal growth direction[1], external fields and even the crystal structure. Moreover, we show how to find these states with the help of transport experiments.

In the second part we leave the static case and focus on the effect of non-perturbative time-periodic driving on 2D systems. Unexpected results show up already on the level of the Drude conductivity[2] and invariants beyond the Chern numbers are needed to count topologically protected boundary modes as will be presented for the driven Hofstadter Butterfly[3].

[1] PRL 117, 236801 (2016)
[2] PRB 101, 184204 (2020)
[3] PRB 100, 165411 (2019)



Driven Hofstadter butterfly for the honeycomb lattice. Quasi-energy spectrum (A), which can have topologically non-trivial bands even if all Chern numbers C are zero (B). The proper topological invariant W_3 for a driven honeycomb lattice is shown in (C) for different frequencies ω and amplitudes A of the driving.

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