

## V O R T R A G S E I N L A D U N G

im Rahmen des gemeinsamen Berufungsverfahrens  
der Freien Universität Berlin und des Helmholtz-Zentrums Berlin  
W1-Professur „Theoretical Physics for Matter under Non-Equilibrium Conditions (BerNEM)“

am Mittwoch, 20. November 2013, 9.00Uhr  
FU Berlin, Fachbereich Physik, Arnimallee 14, Hörsaal B

### **Spin-Orbit Coupling and Spin-Current Generation**

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During the last years the efficient generation of pure spin currents or spin polarized charge currents became a highly active field of research.

While at the beginning spin-polarized charge currents were typically generated by spin injection from ferromagnetic materials the rediscovery of the spin Hall effect opened a completely different route. This effect describes the pure spin-current generation in nonmagnetic materials caused by spin-dependent scattering from strong spin-orbit coupling.

Importantly, at the same time spin-orbit coupling tends to destroy the spin state of an electron and both effects need to be balanced.

In this talk I discuss the spin Hall and related effects in detail. I will introduce the different contributions and explain how they can be used to engineer the best material for different requirements in actual devices. I will show that the principle mechanisms are not restricted to nonmagnetic metals and semiconductors but can be transferred to superconductors. The gained insight can be used to shed light onto Kerr rotation measurements and time reversal symmetry breaking in unconventional superconductors.