

Detecting Weyl Fermions in Condensed Matter

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Weyl semimetals are three-dimensional materials with topologically protected degeneracy points in the band structure. Even though this material class was envisioned several decades ago and anticipated in many theoretical studies, it took until the beginning of this year to find the first Weyl semimetal TaAs. In this talk, I will give an overview over the characteristic properties of Weyl semimetals, and more broadly three-dimensional topological semimetals. I will then discuss recent experiments that probe the physics of Weyl semimetals. For example, angle resolved photoemission spectroscopy and scanning tunneling microscopy measurements evidence the topological surface states, so-called Fermi arcs. Magnetotransport measurements detect a characteristic negative magnetoresistance associated with a nonconservation of the chiral charge of excitations near the Weyl points. This effect has a beautiful correspondence to the chiral anomaly studied in high-energy physics.