



# 复旦大学物理系 物质科学报告

Time: 2:00pm, Tuesday, 2017.9.19

Location: Physics Building, Room 221B

## Topological Semimetals: Where the Massless Fermions Are

Hongming Weng

Chinese Academy of Science

Topological semimetals (TSMs), characterized by Weyl/Dirac nodes in the bulk and Fermi arcs on their surfaces, are new states of three-dimensional quantum matters. They represent the extension of the topological classification of matters from insulator to metal. The low energy excitation in Dirac/Weyl semimetals (WSM) behaves in the similar way as the massless Dirac/Weyl fermions described by Dirac/Weyl equation. The Weyl fermions have certain chirality and have not been discovered since Hermann Weyl proposed them nearly 88 years ago. The recent discovery of their quasiparticles in solids has inspired broad and intensive studies in the field of TSMs. Notably, the Lorentz invariance assumed in high-energy field theory is broken in solids, which leads to more unconventional quasiparticles beyond the traditional classification of Dirac-Weyl-Majorana fermions. This greatly enriches the quantum states of TSM family, including Node-Line semimetal, type-II WSM, multiple-degenerate nodal point semimetal, etc. In this talk, I will introduce our theoretical predictions of realistic materials to host these intriguing quantum states, as well as their experimental progresses. The TSM family and their relationship with each other are discussed and summarized.



翁红明, 1977年9月生于江苏泰兴, 中科院物理所研究员, 博士生导师。2005年毕业于南京大学物理学系, 获博士学位, 导师董锦明教授。2005年~2007年, 日本东北大学金属材料研究所博士后, 获2007年日本学术振兴会(JSPS)博士后奖学金。2007年-2010年, 日本北陆先端大任助理教授。2010年7月获物理所“百人计划”回国工作, 2014年获基金委优秀青年基金资助, 2017年获日本仁科纪念财团“仁科芳雄亚洲奖”。从事计算凝聚态物理研究, 包括发展第一性原理计算方法及程序, 研究材料非线性光学, 磁光效应, 拓扑量子物态及拓扑材料等。迄今共发表SCI论文100余篇, 总共被引用5700余次。“理论预言并实验发现外尔半金属”的研究工作入选英国物理学会《物理世界》2015年十大突破之一、入选美国物理学会《物理》2015年度八大亮点工作之一、入选2015年中国科学十大进展之一和2015年中国十大科技新闻等。

