北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Seminar

Topological Phases of Non-Hermitian Systems

Zongping Gong

University of Tokyo

Time: 2: 30 pm, June. 10, 2019 (Monday)

时间：2019年6月10日 （周一）下午2:30

Venue: Room W563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

Recent experimental advances in controlling dissipation have brought about unprecedented flexibility in engineering non-Hermitian Hamiltonians in open classical and quantum systems [1]. A particular interest centers on the topological properties of non-Hermitian systems [2]. However, no systematic understanding in analogy with Hermitian topological insulators and superconductors [3] has been achieved. In this seminar, we introduce a coherent framework for classifying free-fermion-like non-Hermitian topological phases [4], within which we work out the periodic table for all the non-Hermitian systems with Altland-Zirnbauer symmetries in all dimensions. In particular, we find that a one-dimensional non-Hermitian lattice can be topologically nontrivial even without symmetry protection (class A), reminiscent of the quantum Hall insulator in Hermitian systems. The primary example is the Hatano-Nelson model [5], in which the Anderson transition can be understood from a topological viewpoint. We will also discuss a remarkable observation that the time-reversal and particle-hole symmetries are unified [6], as well as some examples in other symmetry classes in zero and one dimensions.

References:

[1] R. El-Ganainy *et al*., Nat. Phys. **14**, 11 (2018).

[2] M. A. Bandres and M. Segev, Physics **11**, 96 (2018).

[3] A. P. Schnyder *et al*., Phys. Rev. B **78**, 195125 (2008).

[4] Z. Gong *et al*., Phys. Rev. X **8**, 031079 (2018).

[5] N. Hatano and D. R. Nelson, Phys. Rev. Lett. **77**, 570 (1996).

About the speaker

Zongping Gong graduated from Peking University with a B.S. degree in 2015. He is now a fourth-year PhD student at the University of Tokyo, supervised by Prof. Masahito Ueda. He is working on various topics on nonequilibrium physics, including quantum and stochastic thermodynamics, nonequilibrium phases of matter, and dynamical topological phenomena.