世纪物理情·系列讲座

Topology, Spin and Orbital in DNA-type Chiral Quantum Materials

【报告人】

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【 地点 】

清华大学高等研究院

科学馆104报告厅

【摘要】

In physics, chirality usually refers to the locking of spin and momentum, such as in Weyl fermions, neutrinos and photons. In chemistry and biochemistry, however, chirality represents the geometric asymmetry of non-superposable mirror images. While seemingly unrelated characters in different fields, the chiral geometry can lead to topological electronic properties in chiral molecules or solids, as we recently discovered. This electronic topology is encoded in the intrinsic orbital nature of the wave function, with an orbital-momentum locking occurring. The chirality information is transferred from the chiral atomic geometry to electron orbital, and to the light or electron spin, which may have broad impacts in fundamental science and technology application, for example, in quantum molecular devices and optoelectronic devices.

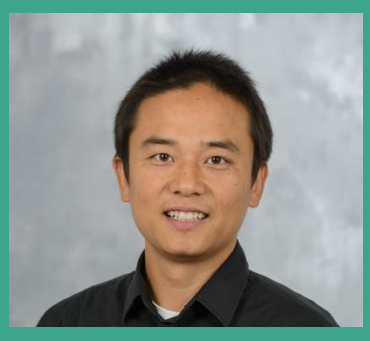
References:

[1] Y Liu, J Xiao, J Koo, B Yan, Chirality-driven topological electronic structure of DNA-like materials, Nature Materials 20 (5), 638 (2021).

[2] Y. Adhikari, et al, Interplay of Structure Chirality, Electron Spin and Topological Orbital in Chiral Molecular Spin Valves, Nature Comm, in press (2023), arXiv:2209.08117 (2022).

[3] L. Wan, Y. Liu, M.J. Fuchter, B. Yan, Anomalous circularly polarized light emission in organic light-emitting diodes caused by orbital–momentum locking, Nature Photonics 17, 193 (2023).

【报告人简介】



Binghai Yan is an associate professor in the department of condensed matter physics at the Weizmann Institute of Science, Israel. He is a theoretical physicist and currently interested in topological materials and topology-induced phenomena in transport and optics. After completing his PhD at Tsinghua University in 2008, he worked as a postdoc at Bremen University and later at Stanford University. He was a group leader in the Max Planck Institute in Dresden during 2012-2016 and started his current position at Weizmann Institute in 2017. He was awarded the ARCHES Prize in Germany in 2013, the Israel Physical Society Prize for Young Scientist in 2017 and recognized as a Highly Cited Researcher every year since 2019.

主办单位:清华大学高等研究院