

Special Condensed Matter Theory Seminar

Subject: **Chirality and Topology in DNA-type Chiral Materials**

Speaker: **Prof. Binghai Yan (Department of Condensed Matter Physics, Weizmann Institute of Science, Israel)**

Date & time: **Monday, 10th of July 2023 at 3:15 p.m.**

Venue: **Room 01.114**

Abstract:

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, it is 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, and leads to unexpected consequences, for example, in molecular spin valve devices and circularly polarized light emitting diodes. The chirality information is transferred from the chiral atomic geometry to electronic orbital/spin, and to the light, which may have broad impacts in fundamental science and technology application.



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, 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).