Chirality and Topology in DNA-type Chiral Materials

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Abstract

In physics, chirality usually refers to the locking of spin and momentum, such as in Weyl fermions and photons. In chemistry and biochemistry, however, it is the geometric asymmetry of non-superposable mirror images that constitutes chirality. While seemingly unrelated characters in different fields, the chiral geometry can lead to topological electronic properties in chiral materials including molecules, polymers, and solids, as we recently discovered. This electronic topology is encoded in the intrinsic orbital nature of the wave function and leads to unexpected consequences, for example, in molecular spin valve devices and light emitting diodes. The chirality information is transferred from the atomic geometry to electronic orbital, and further to the electronic spin and light, which promises broad impacts in fundamental science and technology application.

Figures

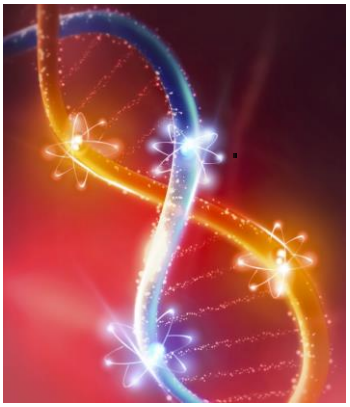

Figure 1: Chirality-driven electronic orbital texture in DNA-type chiral materials

References

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