Geometrical and Topological Ideas in Condensed Matter Physics

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Topological ideas have come to the forefront of condensed matter physics in recent decades, since the discovery and subsequent explanation of the integer quantum Hall effect. Today, these ideas are showing up in various subfields, and play important roles in guiding future theoretical and experimental research.

A more recent direction in this field is to couple topological ideas with geometrical ideas, where the geometry of quantum states (distance in Hilbert space) is constrained by the underlying topological structure.

This talk aims at giving an introduction to both topological and geometrical ideas in free-fermion condensed matter systems, and subsequently show the interplay of geometry and topology, and how it can lead to new and interesting physical responses in real materials.

Author:LANGE, Gunnar Felix (University of Oslo)Presenter:LANGE, Gunnar Felix (University of Oslo)

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