凝聚态物理前沿论坛

第七十七讲

题　　目：Universal linear scaling of Topological Phase Transition in Band Theory

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报告摘要： We develop a unified view of topological phase transitions (TPTs) in solids by revising the classical band theory with the inclusion of topology. Re-evaluating the band evolution from an "atomic crystal" [a normal insulator] to a solid crystal, such as a semiconductor, we demonstrate that there exists a ubiquitous intermediate phase of topological insulator, whose critical transition point is underlined by a universal linear scaling between the characteristic bond strength and average bond length. The validity of the scaling relation is not only verified in various two-dimensional crystals but also in quasicrystals and amorphous lattices based on a generic tight-binding model. Significantly, this universal linear scaling is shown to set an upper bound for the degree of structural disorder to destroy the topological order in a crystalline solid, as exemplified by formation of vacancies and thermal disorder. Our work formulates a simple framework for understanding the physical nature of TPTs with significant implications in practical applications of topological materials.

报告人简介： Feng Liu, Professor, Department of Materials Science and Engineering, Adjunct professor, Department of Physics, University of Utah. He received his PhD in Chemical Physics from Virginia Commonwealth University in 1990. Prof. Liu is a fellow of American Physical Society and recipient of Senior Humboldt Award. His research interest lies in theoretical and computational studies of low-dimensional nano and quantum materials, with a most recent focus on topological materials.