清华大学高等研究院

Institute for Advanced Study, Tsinghua University

学术报告

Speaker: **Yong-Shi Wu 吴咏时**

Distinguished Professor

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Venue: **Conference Hall 322, Science Building, Tsinghua University**

Talk I: Category Theory: A conceptual framework that unites Yang-Mills and Yang-Baxter

Time: 3:30pm, Monday, Oct 16, 2017

Abstract: Yang-Mills theory and Yang-Baxter equations are two very influential concepts in theoretical particle physics and many-body physics. At the first sight, they seemed to be unrelated to each other. However, recent progress in understanding topological phases and many-body entanglement reveal that there is a deep connection between them. In this talk, I will try to explain, from physicists' point of view, how a universal mathematical structure, called category theory, constitutes a conceptual framework that naturally unites both Yang-Mills and Yang-Baxter. It is expected that category theory will also provide powerful algebraic techniques for theoretical physics in the future.

Talk II: Boundary Hamiltonian Approach to Gapped Topological Phases on Open Surfaces

Time: 2:00pm, Friday, Oct 20, 2017

Abstract: To study gapped topological phases on open surfaces with boundary, we propose to add appropriately constructed boundary terms in the Hamiltonian. Our setting is exactly solvable discrete models, such as string-net models (andWitten-Dijkgraaf models). The full Hamiltonian in our approach yields a topologically protected, gapped energy spectrum, with the corresponding wave functions robust under topology-preserving transformations of the lattice.We explicitly present the wavefunctions of the ground states and boundary elementary excitations, as well as creation and hopping operators of boundary quasi-particles. We find that given a bulk topological order, the gapped boundary conditions are described by Frobenius algebras in its input data. Emergent topological properties of the ground states and boundary excitations are described by (bi-) modules over Frobenius algebras.