IPC - Dec 07, 2020 - Ashvin Vishwanath

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Prof. Ashvin Vishwanath

Harvard University, USA

Monday | December 07, 2020 | 16:00

Emergent Gauge Fields and Topology in Quantum Matter

For decades, condensed matter systems have been studied within the framework of classical order parameters - i.e. the Landau-Wilson paradigm. This has been recently extended with the rather complete understanding of topological states of noninteracting electrons. In this talk I will focus instead on new physics that arises from the interplay of topology and strong interactions. A unifying theme will be the emergence of gauge fields rather than the classical order parameters of Landau theory. I will illustrate these general themes with two recent works. The first proposes a route to realizing a long sought after phase - the Z2 quantum spin liquid - in a synthetic platform, an array of highly excited (Rydberg) atoms [1]. A potential application to the engineering of naturally fault tolerant quantum bits will also be described. The second example describes a topological route to strong coupling superconductivity [2], which was inspired by recent experimental observations in magic angle bilayer graphene and related devices.

[1] arXiv:2011.12310. Prediction of Toric Code Topological Order from Rydberg Blockade.
Authors: R. Verresen, M. Lukin and A. Vishwanath.
[2]arXiv:2004.00638. Charged Skyrmions and Topological Origin of Superconductivity in Magic Angle Graphene.
Authors: E. Khalaf, S. Chatterjee, N. Bultinck, M. Zaletel, A. Vishwanath.

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