

# CONDENSED MATTER SCIENCES SEMINAR

## Dr Sheng-Jie Huang

Oxford University

### Host

Dr Kun Yang

### Title

**Quantum matter through the lens of topological holography**

Friday, December 6<sup>th</sup>, 2024

1<sup>st</sup> Floor – B101

15:00-16:00

### Abstract

It is well known that symmetry offers valuable insights for organizing quantum phases of matter and leads to important physical consequences, such as conservation laws and constraints on the low-energy dynamics. Recently, significant progress has been made in generalizing the concept of symmetry and exploring its connection to topological defects. In this talk, I will introduce a holographic principle for generalized symmetries, referred to as topological holography, which describes the generalized symmetry of a quantum matter in terms of a topological order in one higher dimension. This framework decouples the topological data from the local dynamics of the theory and provides a unified description of symmetries and dualities in both gapped and gapless phases of matter. Specifically, I will focus on various exotic quantum critical points and gapless phases in (1+1)d, including phase transitions between symmetry-protected topological (SPT) phases, symmetry-enriched quantum critical points, deconfined quantum critical points, and intrinsically gapless SPT phases.

### Bio

Sheng-Jie Huang obtained his PhD in physics from the University of Colorado Boulder in 2019.

He was a Joint Quantum Institute postdoctoral fellow at the University of Maryland and a postdoctoral researcher with a Guest Scientist Scholarship at the Max Planck Institute for the Physics of Complex Systems in Dresden, Germany. He is currently a postdoctoral research associate at the University of Oxford. His research interests include condensed matter theory and its connections to quantum information science, focusing on topological phases of matter, generalized symmetries, quantum error correction and computation.