



## Weekly Seminar

### A Current-Based Construction of Generalized Symmetry and Mixed Anomalies in (3+1)D Twisted BF Topological Field Theory

Peng Ye

*Sun Yat-sen University*

**Time: 3:00 pm, April 1, 2026 (Wednesday)**

时间: 2026年4月1日 (周三) 下午3:00

**Venue: Room w563, Physics building, Peking University**

地点: 北京大学物理楼, 西563会议室

#### Abstract

Generalized symmetry has emerged as a powerful language for describing topological operators, extended excitations, and anomaly constraints in quantum field theory and topological phases of matter. In this talk, based primarily on arXiv:2601.01523, I will discuss a current-based construction of generalized symmetries in (3+1)-dimensional twisted BF topological quantum field theories with  $(a \wedge b)$  twists (see also arXiv:1703.01926). Starting directly from the equations of motion, one can systematically identify conserved currents, construct the associated topological symmetry operators, and determine their fusion rules and mixed anomalies. A key message is that two distinct classes of conserved currents arise: Type-I currents generate invertible higher-form symmetries with group-like fusion, whereas Type-II currents obey additional consistency conditions and give rise to intrinsically non-invertible higher-form symmetries dressed by projector operators. This provides a concrete continuum-field-theory route to non-invertible symmetry in a class of non-Abelian (3+1)D TQFTs relevant to three-dimensional topological orders, including theories exhibiting Borromean-rings braiding. I will also explain how mixed anomalies can be diagnosed by coupling the theory to background fields, and how they separate into anomaly-inflow-cancelable cases and intrinsic gauging obstructions. If time permits, I will further comment on how the  $(a \wedge b)$  field theory can be realized in lattice models (arXiv:2512.21148).

#### About the speaker

Peng Ye is a Professor in the School of Physics at Sun Yat-sen University, Guangzhou, where he has been based since August 2018. His research focuses on quantum many-body theory. He received his B.Sc. in Physics from Sun Yat-sen University in 2007 and his Ph.D. from the Institute for Advanced Study, Tsinghua University, in 2012. He was then a postdoctoral researcher at the Perimeter Institute for Theoretical Physics in Canada from 2012 to 2015, followed by a position as postdoctoral research associate and Gordon & Betty Moore Fellow at the Anthony J. Leggett Institute for Condensed Matter Theory and the Department of Physics at the University of Illinois Urbana-Champaign from 2015 to 2018. He is currently a member of the Editorial Board of Physical Review Research of the American Physical Society.