Tian Lan

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	Department of Physics
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Education

2013–2017 PhD in Theoretical Physics
Perimeter Institute for Theoretical Physics & University of Waterloo
Thesis: A Classification of (2+1)D Topological Phases with Symmetries
Supervisor: Xiao-Gang Wen

2012–2013 MSc in Theoretical Physics, Perimeter Scholars International (PSI)
Perimeter Institute for Theoretical Physics & University of Waterloo

2008–2012 BSc in Mathematics and Physics, Tsinghua University

Experience

2018–2020 Postdoctoral Fellow
Institute for Quantum Computing, University of Waterloo
Supervisors: Raymond Laflamme, Bei Zeng

2021.6–now Assistant Professor
The Chinese University of Hong Kong

Research Interests

My research focuses on the theory of topological phases of matter:

- intrinsic topological order,

- symmetry protected topological (SPT) phases, which include topological insulators as a special case,

- symmetry enriched topological (SET) phases,

- higher dimensional generalization of symmetry and topological phases,

- . . .

and their mathematical foundation:

- tensor category,

- higher category, higher algebra,

- group cohomology, algebraic topology,

- . . .

I am also interested in understanding the nature of phases of matter from a quantum information perspective, and possible applications of topological materials such as quantum computing.

Grants

Direct Grant No. 4053501, The Chinese University of Hong Kong
Early Career Scheme (ECS) No. 24304722, Hong Kong Research Grants Council

Teaching

2021-23 Fall	PHYS5410(M) Advanced Quantum Mechanics
2024 Spring	PHYS1111B University Physics I, Introduction to Mechanics, Fluids and Waves

Referee

Physical Review X, Physical Review X Quantum, Physical Review Letters, Physical Review Research, Physical Review B, Journal of High Energy Physics, Scipost, Quantum.

Editor

Advances in Theoretical and Mathematical Physics.

Awards and Honors

Early Career Award 2021/22, University Grants Committee
2017 Chinese Government Award for Outstanding Self-financed Students Abroad
Scholarship of Tsinghua Xuetang
Scholarship of Tsinghua-Zhenggeru
Scholarship of Shanghai Institute of Microsystem

Talks

- A "Periodic Table" of Topological Orders

  – SIAM Annual Meeting (AN16), Boston, Massachusetts, USA, July, 2016
    invited but was not able to attend due to visa delay

  – Department of Physics, Fudan University, May, 2018

- Department of Physics, Tsinghua University, July, 2018
- Graduate School of China Academy of Engineering Physics, July, 2018
- Department of Physics, Southern University of Science and Technology, July, 2019
- The Chinese University of Hong Kong, October, 2020

- Non-Abelian Family of Topological Order[LW1701.07820]

  - Croucher Summer Course "Quantum Entanglement and Topological Order", The Chinese University of Hong Kong, June, 2017
  - Department of Physics, Southern University of Science and Technology, July, 2019

- Matrix Formulation of Non-Abelian Family[Lan1908.02599]

  - Topological Quantum Computing (TQC2019), Shenzhen, China, December, 2019

- Higher Dimensional Topological Order, Higher Category and A Classification in 3+1D[LKW1704.04221, LW1801.08530]

  - Department of Physics, Tsinghua University, May, 2018
  - Séminaire de mathématiques supérieures (SMS) 2018, Fields Institute for Research in Mathematical Sciences, June, 2018
  - Quantum Information and Operator Algebras III, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, July, 2018
  - Department of Physics, Sun Yat-Sen University, July, 2019
  - QuIST V: The 5th International Conference on Quantum Information, Space-time, and Topological order, Kunming, China, August, 2019
  - Department of Physics, Southern University of Science and Technology, August, 2019
  - The Chinese University of Hong Kong, October, 2020
  - CMSA, Harvard University, June, 2021
  - BIMSA, March, 2022

- The Modular Extension Characterization of SPT/SET Phases[LKW1507.04673, LKW1602.05936, LKW160]

  - BIMSA, December, 2021

- Introduction to Categorical Approach to Topological Phases in Arbitrary Dimensions
  - Center of Mathematical Sciencies and Applications, Harvard University, April 15, 2020

- Higher symmetry entriched topological phases[KLW+2003.08898, KLW+2005.14178]

  - Topological Orders and Higher Structures, Erwin Schrödinger Institute for Mathematics and Physics, University of Vienna, August, 2020

- Quantum Current[LZ2305.12917]

  - Croucher Summer Course "Quantum Entanglement and Topological Order", CUHK, June, 2023
  - The first International Congress of Basic Science (ICBS), BIMSA, July, 2023
  - Entangled Quantum Matter Workshop, Tsinghua University, August, 2023

- Gauging of generalized symmetry[LYW2312.15958]

  - Mini-Workshop on Unconventional Superconductivity and Correlated Electron Systems, CUHK, Dec, 2023