Ansi Bai （白岸斯）

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RESEARCH INTERESTS

• Condensed matter physics, in particular topological orders.

• Mathematics for quantum field theory and condensed matter physics, in particular higher category theory, Hopf algebras and operator algebras.

EDUCATION

Bachelor of Science. *Department of Physics, Peking University, China. July 2019.*

Master of Science. *Shenzhen Instistue for Quantum Science and Engineering, Southern University of Science and Technology, China. July 2024.*

Thesis: *Local Operator Algebras in Levin-Wen Models Form a Weak Hopf Cocategory*. Advisor: Liang Kong.

TALKS AND POSTERS

- Talk: 2-categorical interpretation of the reconstruction theorem for weak Hopf algebras. May 31, 2022. Online. *SUSTech-Nagoya Workshop on Quantum Science 2022* (`https://www.math.nagoya-u.ac.jp/~yanagida/SUSTech-Nagoya2022.html`). Slides and video available at `http://ansibai-prc.github.io/`.

  ▷ Abstract: Weak Hopf algebras (WHAs) have wide applications in the studies of quantum field theory, subfactor and topological order. One of the basic theorem of WHAs, the Reconstruction theorem (due to T. Hayashi), states that one can obtain a WHA from each pair (C,F:C->BiMod(R)), where C is a finite tensor category, F is a tensor functor and R is a separable algebra; Conversely, each WHA gives rise to such a pair. The appearance of R or BiMod(R) may seem ad hoc to many; In this talk I interpret this theorem as a special case of 2-categorical theorem, where R or BiMod(R) do not explicitly appear. This is based on a joint work with Zhi-Hao Zhang on understanding the algebraic structures in Kitaev-Kong (2012).
- Lecture: Basic category theory: adjoint functors and Yoneda lemma (4 hours, in Chinese); Lecture: Higher algebras in topological orders (11 hours, in Chinese). March 18-21, 2023. Shenzhen. *Shenzhen Category Theory and Topological Orders School* (`https://iqa-cat.github.io`).
- Poster: Bialgebras are algebras, and Drinfeld doubles are centers. July, 2023. Beijing. *The First International Congress of Basic Science (ICBS) Poster Session* (`https://www.icbs.cn/`). Poster available at `http://ansibai-prc.github.io/`.
- Talk: The center of a finite dimensional quantum group. September 8, 2023. Online. *Shenzhen–Nagoya Workshop on Quantum Science 2023* (`https://shenzhen-nagoya.github.io/2023/`). Slides and video available at `http://ansibai-prc.github.io/`.

  ▷ Abstract: The center of an algebra is the subalgebra consisting of elements commuting with every element of this algebra. It has a universal property identified by Lurie (2009) which can be easily generalized to various set-ups. In this talk we announce a verification that the Drinfeld double construction of a finite dimensional Hopf algebra gives rise to the 2-categorical center of this Hopf algebra.
- Expository Talk: Suspected En-algebras and their higher representations in topological orders. October 18, 2023. Beijing.

BIMSA-Tsinghua Quantum Symmetry Seminar (https://yilongwang11.github.io/seminar/BIMSA-THU-quan-sym/quan-sym.html).

▷ Abstract: Higher dimensional or categorical algebras and their higher representations are recently widely used in the study of topological orders. In this expository talk I introduce the geometric intuitions behind those applications, present a periodic table of those higher algebras, and introduce J. Lurie's notion of center of higher algebras which is fundamental for understanding their higher representations. If time permits, I will also talk about how to apply center to topological orders. The higher algebras appearing in this talk are conjecturally special cases of En-algebras whose definition is given by Lurie based on the work of May, Boardman-Vogt, Dunn and others.

- Talk: A Universal Property of the Drinfeld Double of Finite Dimensional Hopf Algebras. Janurary 26, 2024. Beijing. *Advances in Quantum Algebra* (https://qzc.tsinghua.edu.cn/en/info/1126/3183.htm). Slides available at http://ansibai-prc.github.io/.

  ▷ Abstract: The center of an algebra has a universal property identified by Lurie which can be easily generalized to any object in a category with a monoidal structure. Hopf algebras live naturally in a monoidal 2-category by the observation of Street and McCrudden, and we show that the center of a finite dimensional Hopf algebra coincides with the Drinfeld double construction.

ACADEMIC SERVICES

Co-Organizer | *Shenzhen Category Theory and Topological Orders School* March 18-24 2023

- I took full part in the organization of the 7-day offline school (https://iqa-cat.github.io, in Chinese) with 50 participants from across the country eventually, which has lecture hours summed up to 49 hours.
- More specifically, as an early-stage researcher, joint with other organizers, I have the honor to experience each step of the process of an organization of a meeting, including publicizing, securing the talks given, taking the quality control of the talks, arranging space and time for the meeting (moving the chairs), inviting guest talks, and making reimbursement.

Co-Organizer | *Shenzhen-Nagoya Workshop on Quantum Science 2023 (https://shenzhen-nagoya.github.io/2023/)* September 5-8, 2023

Co-Organizer | *BIMSA TQFT and Higher Symmetries Seminar (https://bimsa.net/activity/BIMTQFandHigSymSem/)* September 2024 - present

WORKS IN PROGRESS

Genearlized weak Hopf algebras in Levin-Wen models I: boundary algebras with no internal legs | *Joint with Zhi-Hao Zhang*

A universal property of the Drinfled double of a finite dimensional Hopf algebra

OTHER ACTIVITIES

Attending the school choir Sep 2022-June 2023

Giving three official performances.

Participating in the sports meeting of the school March 2023

Wining the second place in the postgraduate group in the "hard physique" project.