An-Si Bai （白岸斯）

TEL: +86 13651346178 | E-mail: crippledbai@163.com

RESEARCH INTERESTS

Mathematics for quantum field theory, especially higher category theory and von Neumann algebras. Broadly, I am interested in the philosophy in human understanding.

EDUCATION

Bachelor of Science 						July 2019

Department of Physics, Peking University, China 			GPA: nice until I met Quantum Field Theory

(In Progress) Master of Science 					July 2024

Shenzhen Instistue for Quantum Science and Engineering, Southern University of Science and Technology, China *Thesis title: Weak Hopf Cocategories and their applications in Levin-Wen models. 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 available.

  ▷ 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/`.

- 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 available.

  ▷ 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://qzc.tsinghua.edu.cn/en/info/1122/2708.htm`.

▷ 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.

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

WORKS IN PROGRESS

An Equivalent Characterization of 1- and 2-Karoubi completions | *Joint with Zhi-Hao Zhang*

Weak Hopf Cocategories | *Joint with Zhi-Hao Zhang*