

# Salvatore D. Pace

## Curriculum Vitae

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### Education

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|---|----------------------------|
| Massachusetts Institute of Technology                     | September 2021 - Present   |
| • Ph.D. in Physics  | GPA: 5.00/5.00             |
| • Advisor: <a href="#">Xiao-Gang Wen</a>                  |                            |
| University of Cambridge (Churchill Scholar)               | October 2020 - August 2021 |
| • MPhil in Physics  |                            |
| • Thesis: Emergent Axions in $U(1)$ Quantum Spin Liquids  |                            |
| • Advisor: <a href="#">Claudio Castelnovo</a>             |                            |
| Boston University   | September 2016 - May 2020  |
| • B.A. <i>with honors</i> in Physics & M.A. in Physics    | GPA: 4.00/4.00             |
| • Thesis: The Fine Structure Constant in Quantum Spin Ice |                            |
| • Advisor: <a href="#">Chris Laumann</a>                  |                            |

### Selected Awards and Honors

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| • KITP Graduate Fellowship                                 | October 2024 |
| • APS LeRoy Apker Award Finalist                           | June 2020    |
| • National Science Foundation Graduate Research Fellowship | March 2020   |
| • Churchill Scholarship                                    | January 2020 |
| • Learning Assistant of the Year                           | May 2019     |
| • Goldwater Scholarship                                    | April 2019   |

### Scientific Papers

- [16] [Salvatore D. Pace](#), Ömer M. Aksoy, and Ho Tat Lam, *Spacetime symmetry-enriched SymTFT*, arXiv:24xx.xxxxx (see corresponding [talk](#))
- [15] [Salvatore D. Pace](#), Arkya Chatterjee, and Shu-Heng Shao, *Lattice  $T$ -duality from non-invertible symmetries in quantum spin chains*, [arXiv:2412.18606](#)
- [14] [Salvatore D. Pace](#), Chenchang Zhu, Agnès Beaudry, and Xiao-Gang Wen *Generalized symmetries in singularity-free nonlinear  $\sigma$  models and their disordered phases*, [Phys. Rev. B \*\*110\*\*, 195149 \(2024\)](#)
- [13] [Salvatore D. Pace](#), Ho Tat Lam, and Ömer M. Aksoy, *(SPT-)LSM theorems from projective non-invertible symmetries*, [arXiv:2409.18113](#)
- [12] Arkya Chatterjee, [Salvatore D. Pace](#), and Shu-Heng Shao, *Quantized axial charge of staggered fermions and the chiral anomaly*, [arXiv:2409.12220](#)

- [11] [Salvatore D. Pace](#) *Emergent generalized symmetries in ordered phases and applications to quantum disordering*, [SciPost Phys.](#) **17**, 080 (2024)
- [10] [Salvatore D. Pace](#), Guilherme Delfino, Ho Tat Lam, and Ömer M. Aksoy *Gauging modulated symmetries: Kramers-Wannier dualities and non-invertible reflections*, [arXiv:2406.12962](#)
- [9] [Salvatore D. Pace](#) and Yu Leon Liu *Topological aspects of brane fields: Solitons and higher-form symmetries*, [SciPost Phys.](#) **16**, 128 (2024)
- [8] [Salvatore D. Pace](#) and Xiao-Gang Wen, *Exact emergent higher-form symmetries in bosonic lattice models*, [Phys. Rev. B](#) **108**, 195147 (2023)
- [7] Yun-Tak Oh, [Salvatore D. Pace](#), Jung Hoon Han, Yizhi You, and Hyun-Yong Lee, *Aspects of  $\mathbb{Z}_N$  rank-2 gauge theory in  $(2+1)$  dimensions: Construction schemes, holonomies, and sublattice one-form symmetries*, [Phys. Rev. B](#) **107**, 155151 (2023)
- [6] [Salvatore D. Pace](#), Claudio Castelnovo, and Chris R. Laumann, *Dynamical Axions in  $U(1)$  Quantum Spin Liquids*, [Phys. Rev. Lett.](#) **130**, 076701 (2023)
- [5] [Salvatore D. Pace](#) and Xiao-Gang Wen, *Emergent higher-symmetry protected topological orders in the confined phase of  $U(1)$  gauge theory*, [Phys. Rev. B](#) **107**, 075112 (2023)
- [4] [Salvatore D. Pace](#) and Xiao-Gang Wen, *Position-dependent excitations and UV/IR mixing in the  $\mathbb{Z}_N$  rank-2 toric code and its low-energy effective field theory*, [Phys. Rev. B](#) **106**, 045145 (2022)
- [3] [Salvatore D. Pace](#), Siddhardh C. Morampudi, Roderich Moessner, and Chris R. Laumann, *Emergent Fine Structure Constant of Quantum Spin Ice Is Large*, [Phys. Rev. Lett.](#) **127**, 117205 (2021) **[Editors' Suggestion and Featured in Physics]**
- [2] [Salvatore D. Pace](#), Kevin A. Reiss, and David K. Campbell, *The  $\beta$  Fermi-Pasta-Ulam-Tsingou Recurrence Problem*, [Chaos](#) **29**, 113107 (2019)
- [1] [Salvatore D. Pace](#) and David K. Campbell, *Behavior and breakdown of higher-order Fermi-Pasta-Ulam-Tsingou recurrences*, [Chaos](#) **29**, 023132 (2019) **[Selected as an Editor's Pick]**

## Research Presentations

### Oral Presentations

- Perimeter Institute Seminar  
November 2024 [\[slides\]](#) [\[recording\]](#)  
“An SPT-LSM theorem for weak SPTs with non-invertible symmetry” (invited)
- Ohio State University Quantum Symmetries Seminar  
October 2024 [\[slides\]](#)  
“Generalized symmetries in ordered phases” (invited)
- Harvard CMT Kids Seminar  
October 2024 [\[slides\]](#)  
“An SPT-LSM theorem for weak SPTs with non-invertible symmetry” (invited)
- Applications of Generalized Symmetries and Topological Defects to Quantum Matter, SCGP

- September 2024 [\[slides\]](#) [\[recording\]](#)  
 “Interplays of generalized and crystalline symmetries in  $G$ -qudit models” (invited)
- Paths to Quantum Field Theory 2024  
 July 2024 [\[slides\]](#)  
 “Topological holography and spacetime symmetry”
  - IHES Summer School – Symmetries and Anomalies: a Modern Take, Seminar  
 July 2024 [\[slides\]](#)  
 “Non-invertible reflection symmetries in spin chains”
  - Boston University CMT Seminar,  
 May 2024 [\[notes\]](#)  
 “A classification of defect-free disordered phases” (invited)
  - American Physical Society March Meeting  
 March 2024 [\[slides\]](#)  
 “Generalized symmetries and quantum disordering”
  - Oxford’s Symmetry Seminar  
 September 2023 [\[slides\]](#) [\[recording\]](#)  
 “Emergent generalized symmetries in ordered phases” (invited)
  - American Physical Society March Meeting  
 March 2023 [\[slides\]](#)  
 “Exact emergent higher-form symmetries”
  - Caltech CMT Seminar  
 February 2023 [\[slides\]](#)  
 “Higher-form symmetries and topological phases”
  - Boston University CMT Seminar  
 June 2022 [\[slides\]](#)  
 “UV/IR Mixing in the  $\mathbb{Z}_N$  rank-2 toric code” (invited)
  - American Physical Society March Meeting  
 March 2021 [\[slides\]](#)  
 “The Emergent Fine Structure Constant of Quantum Spin Ice is Large”
  - Highly Frustrated Magnetism Conference (wHFM21),  
 January 2021 [\[slides\]](#)  
 “The Emergent Fine Structure Constant of Quantum Spin Ice is Large”
  - MIPPKS Condensed matter seminar,  
 November 2020 [\[slides\]](#)  
 “The fine structure constant of quantum spin ice” (invited)
  - American Physical Society March Meeting,  
 March 2020 [\[slides\]](#)  
 “The  $\beta$  Fermi-Pasta-Ulam-Tsingou Recurrence Problem”
  - Greater Boston Area Stat. Mech. Meeting, *Brandeis University*  
 October 2019 [\[slides\]](#)  
 “The  $\beta$  Fermi-Pasta-Ulam-Tsingou Recurrence Problem”
  - American Physical Society March Meeting,  
 March 2019 [\[slides\]](#)  
 “Behavior and Breakdown of Higher-Order FPUT Recurrences”
  - Dynamical Systems Seminar Series, *Boston University*  
 November 2018 [\[slides\]](#)  
 “Behavior and Breakdown of Higher-Order FPUT Recurrences” (invited)

- Greater Boston Undergraduate Physics Conference, *MIT*  
November 2018 [\[slides\]](#)  
“Behavior and Breakdown of Higher-Order FPUT Recurrences”

#### Poster Presentations

- Symmetries 2024,  
August 2024 [\[poster\]](#)  
“Non-invertible reflections in quantum spin chains”
- Prospects in Theoretical Physics 2024,  
July 2024 [\[poster\]](#)  
“Generalized symmetries and quantum disordering”
- UQM Winter 2024 meeting,  
January 2024 [\[poster\]](#)  
“Generalized symmetries and quantum disordering”
- Princeton Summer School on Condensed Matter Physics,  
July 2023 [\[poster\]](#)  
“Generalized symmetries in ordered phases: bridging the ordinary and the exotic”
- 22nd annual Undergraduate Research Symposium, *Boston University*  
October 2019 [\[poster\]](#)  
“Recurrences in the  $\beta$  FPUT Chain”
- Greater Boston Undergraduate Physics Conference, *MIT*  
November 2018 [\[poster\]](#)  
“Behavior and Breakdown of Higher-Order FPUT Recurrences”
- 21st annual Undergraduate Research Symposium, *Boston University*  
October 2018 [\[poster\]](#)  
“Behavior and Breakdown of Higher-Order FPUT Recurrences”

## Teaching Experience

### *Massachusetts Institute of Technology*

- Two-time guest lecturer of 8.513: Modern Quantum Many-Body Physics Fall 2023
- Two-time guest lecturer of 8.231: Physics of Solids I Fall 2022

### *Boston University*

- Undergraduate Teaching Assistant (Learning Assistant)
  - PY406: Electromagnetic Fields and Waves II Spring 2020
  - PY405: Electromagnetic Fields and Waves I Fall 2019
  - PY452: Quantum Physics II Fall 2019
  - PY451: Quantum Physics I Spring 2019
  - PY410: Statistical Physics & Thermodynamics Spring 2019
  - PY351: Modern Physics I Fall 2018
  - PY313: Waves and Modern Physics Fall 2018
- Guest lecturer of PY410: Statistical Physics & Thermodynamics Spring 2019

## Mentorship and Academic Services

- SciPost referee
- Physical Review referee
- Mentor for [Project SHORT](#) August 2020 - Present
- [MIT Physics Graduate Student Council](#) Officer June 2021 - September 2024
- MIT UROP Supervisor September 2022 - May 2023
- Mentor for [Boston University's PRISM](#) September 2018 - May 2020