Michael Hermele
Curriculum Vitae. February 2025.

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Field of research: Theoretical Condensed Matter Physics

Positions Held

2022 – present	Waldo E. Rennie Professor of Theoretical Physics, CU Boulder (three year term appointment)
2020 – present	Professor, University of Colorado Boulder
2014 — present	Fellow, Center for Theory of Quantum Matter, CU Boulder
2014 – 2020	Associate Professor (with tenure), University of Colorado Boulder
2007 – 2014	Assistant Professor, University of Colorado Boulder
2005 – 2007	Postdoctoral Associate, Massachusetts Institute of Technology (with Profs. P. A. Lee, T. Senthil and X.-G. Wen)
2001 – 05	Graduate work with Prof. M. P. A. Fisher (UC Santa Barbara)
2000 – 01	Undergraduate research assistant (condensed matter theory) with Prof. B. I. Halperin and Luca Marinelli (Harvard)
1999	Undergraduate research assistant (experimental atomic physics) with Prof. J. M. Doyle (Harvard)

Education

2005	Ph.D. in Physics, UC Santa Barbara (Advisor: Matthew P.A. Fisher) *Spin Liquid Quantum Critical Phases in Two and Three Dimensions*
2003	M. A. in Physics, UC Santa Barbara.
2001	A. B., Harvard University, *magna cum laude* with highest honors in Physics

Honors and Awards

2022-25	Inaugural Waldo E. Rennie Professor of Theoretical Physics at CU Boulder
2022	Boulder Faculty Assembly Award for Excellence in Research, Scholarly and Creative Work
2017	Fellow of the American Physical Society
2015	Visiting Professor, University of Cergy-Pontoise, France (May/June 2015)
2014	Simons Fellowship in Theoretical Physics
2010	Packard Fellowship in Science and Engineering
2010	Department of Energy Early Career Award
2009	Air Force Office of Scientific Research Young Investigator Research Program Award[1]
2008	Junior Faculty Development Award, CU Boulder
2005	Robert H. Dicke Fellowship, Princeton University (declined)
2001-04	National Defense Science and Engineering Graduate Fellow
2000-01	Barry M. Goldwater Scholar

Selected Publications

- "Pyrochlore Photons: The U(1) Spin Liquid in a S = 1/2 Three-Dimensional Frustrated Magnet," M. Hermele, M. P. A. Fisher and L. Balents, *Phys. Rev. B* **69**, 064404 (2004).
- "Stability of U(1) Spin Liquids in Two Dimensions," M. Hermele, T. Senthil, M. P. A. Fisher, P. A. Lee, N. Nagaosa and X.-G. Wen, *Phys. Rev. B* **70**, 214437 (2004).
- "Projected-wave-function study of Spin-1/2 Heisenberg model on the Kagomé lattice," Y. Ran, M. Hermele, P. A. Lee and X.-G. Wen, *Phys. Rev. Lett.* **98**, 117205 (2007).
- "Mott Insulators of Ultracold Fermionic Alkaline Earth Atoms: Underconstrained Magnetism and Chiral Spin Liquid," M. Hermele, V. Gurarie and A. M. Rey. *Phys. Rev. Lett.* **103**, 135301 (2009).
- "Classifying fractionalization: symmetry classification of gapped Z_2 spin liquids in two dimensions," A. M. Essin and M. Hermele. *Phys. Rev. B* **87**, 104406 (2013).
- "Topological phases protected by point group symmetry." Hao Song, Sheng-Jie Huang, Liang Fu and M. Hermele. *Phys. Rev. X* **7**, 011020 (2017).
- "Fracton topological orders via coupled layers." Han Ma, Ethan Lake, Xie Chen and M. Hermele, *Phys. Rev. B* **95**, 245126 (2017).

[1] Hermele declined funding in order to accept the DOE Early Career Award for the same project.

Selected Publications (continued)

- "Building crystalline topological phases from lower-dimensional states." S.-J. Huang, H. Song, Y.-P. Huang and M. Hermele, *Phys. Rev. B* **96**, 205106 (2017). [Editors' Suggestion]
- "Cage-Net Fracton Models." A. Prem, S.-J. Huang, H. Song and M. Hermele, *Phys. Rev. X* **9**, 021010 (2019).
- "Fracton Self-Statistics." H. Song, N. Tantivasadakarn, W. Shirley and M. Hermele, *Phys. Rev Lett.* **132**, 016604 (2024).

Mentorship

- Undergraduate students (alumni): Ethan Lake (REU summer student 2016; now Miller Fellow at UC Berkeley), Pavao Santak (honors thesis advisee, graduated *summa cum laude* 2016; Cambridge PhD student), Luisa Boateng (REU summer student 2023; currently undergraduate student at Stanford)
- PhD students (alumni):
  - Hao Song (PhD 2015; Associate Professor, Institute of Theoretical Physics, Chinese Academy of Sciences)
  - Yi-Ping Huang (PhD 2017; Assistant Professor of Physics, National Tsing Hua University, Taiwan)
  - Sheng-Jie Huang (PhD 2019; Postdoc at Max Planck Institute for the Physics of Complex Systems, Dresden, Germany)
  - Han Ma (PhD 2019; Assistant Professor of Physics, Stony Brook University)
  - Shriya Pai (PhD 2022; AAAS/Optica/MRS Congressional Science and Engineering Fellow)
  - Marvin Qi (PhD 2024, co-advised with Prof. Andrew Lucas; Kadanoff Center Posdoctoral Fellow at University of Chicago)
- PhD students (current): Noah Welikson, Evan Wickenden

Mentorship (continued)

The condensed matter theory faculty at CU Boulder hire postdoctoral researchers jointly. Postdocs listed below are those supported partly or fully from Hermele's research funds, and/or Hermele's collaborators during their time in Boulder.

- Postdoctoral researchers (former): Daniel Bulmash (Assistant Professor, US Naval Academy), Gang Chen (Professor, Peking University), Andrew Essin (Visiting Assistant Professor, UC Davis), Jason Iaconis, Itamar Kimchi (Assistant Professor, Georgia Institute of Technology), Sergej Moroz (Associate Professor, Karlstad University), Michael Pretko (AAAS Science and Technology Policy Fellow, US Department of Defense), Sergey Syzranov (Assistant Professor, UC Santa Cruz), Xueda Wen (Assistant Professor, Georgia Institute of Technology)
- Postdoctoral researchers (current): Dachuan Lu (jointly affiliated with Harvard, Fall 2024-present), Lukas Homeier (Fall 2024-present)

Past, Current and Pending Grants

- Past: Department of Energy Early Career Program. "New states of matter and quantum simulation with ultracold alkaline earth fermions." Principal investigator, $750,000, 2010 - 2015.
- Past: Simons Foundation (Simons Fellowship in Theoretical Physics). "Symmetry enriched topological phases of matter." Principal investigator, $94,808, 2014-2015.
- Past: Packard Fellowship for Science and Engineering. $875,000, 2010-2021.
- Past: CU Boulder Research & Innovation Office Seed Grant. "Mathematical Physics of Quantum Matter." Principal investigator, with co-PIs Agnès Beaudry and Markus Pflaum, $45,000, 2020-21.
- Current: Department of Energy Office of Science, Basic Energy Sciences. "Symmetry in Correlated Quantum Matter." Principal investigator, $1,215,000, 2015-2025.
- Current: Simons Foundation. "Simons Collaboration on Ultra-Quantum Matter." Deputy Director and one of 17 Collaboration PIs, $14,000,000, 2019-2026. Share to CU Boulder is $1,663,000. PI on the CU Boulder award, Victor Gurarie and Ana Maria Rey are co-PIs.
- Current: National Science Foundation, Division of Mathematical Sciences. "Topological and C*-algebraic Quantum Matter." co-PI, with PI Markus Pflaum and co-PI Agnès Beaudry, $385,878, 2021-25.
- Current: National Science Foundation, Division of Mathematical Sciences. "Conference: C*-Algebraic Quantum Mechanics and Topological Phases of Matter." co-PI, with PI Markus Pflaum and co-PIs Agnès Beaudry and Daniel Spiegel (UC Davis), $42,236, 2024-25.
- Pending: Department of Energy Office of Science, Basic Energy Sciences. "Symmetry in Correlated Quantum Matter." Principal investigator, supplemental award for $33,678 during 2025.

Courses Taught

Courses with numbers 5000 and above are graduate courses.

- Fall 2007: Physics 1120 Recitations (General Physics 2)
- Spring 2008: Physics 7440 (Theory of the Solid State)
- Fall 2008: Physics 4230 (Thermodynamics and Statistical Mechanics)
- Fall 2009: Physics 7440 (Theory of the Solid State)
- Spring 2010: Physics 7450 (Theory of Solid State 2)
- Fall 2010: Physics 1120 Support Instructor & Recitations (General Physics 2)
- Fall 2011: Physics 1120 Primary Lecturer (General Physics 2)
- Spring 2012: Physics 7450 (Theory of Solid State 2)
- Fall 2012: Physics 7440 (Theory of the Solid State)
- Spring 2013: Physics 4340 (Solid State Physics)
- Fall 2013: Physics 5030 (Intermediate Mathematical Physics I)
- Spring 2014: Physics 4340 (Solid State Physics)
- Fall 2015: Physics 4230 (Thermodynamics and Statistical Mechanics)
- Spring 2016: Physics 3320 (Electrodynamics II)
- Fall 2017: Physics 5250 (Introduction to Quantum Mechanics I)
- Spring 2018: Physics 5260 (Introduction to Quantum Mechanics II)
- Fall 2018: Physics 5250 (Introduction to Quantum Mechanics I)
- Spring 2018: Physics 5260 (Introduction to Quantum Mechanics II)
- Fall 2019: Physics 5030 (Intermediate Mathematical Physics I)
- Spring 2020: Physics 5040 (Intermediate Mathematical Physics II)
- Fall 2021: Physics 5030 (Intermediate Mathematical Physics I)
- Spring 2022: Physics 5040 (Intermediate Mathematical Physics II)
- Fall 2022: Physics 7450 (Theory of Solid State 2)
- Spring 2023: Physics 3320 (Electrodynamics II)
- Spring 2024: Physics 7250 (Quantum Many Body Theory)
- Spring 2025: Physics 7450 (Theory of Solid State 2)

Departmental Service

- Conceived and led the creation in 2014 of the Center for Theory of Quantum Matter (CTQM) in the CU Boulder Department of Physics.
- Organizer of CTQM Seminar (2015-2017)
- Director of CTQM (two-year term), 2017-18

Selected departmental committees

- Chair of departmental Rules, Policies and Procedures committee (2023-25)
- Chair of graduate student mentoring committee (2022-24); committee provides mentoring to first and second year Physics graduate students
- Chair of departmental hiring plan committee (2021-22); committee was charged with constituting a five-year hiring plan for tenured/tenure-track faculty in the Department of Physics
- Departmental executive committee (two-year term: 2019-21); committee advises the Chair on various matters of importance within the Department of Physics
- Teaching evaluation committee (2017-19); committee members visit colleagues' lectures and provide written evaluations
- Strategic planning committee (2017-18); this committee wrote a strategic plan for the Department of Physics
- Research strategic planning committee (2016-17); this committee took initial steps in a strategic planning process for the Department of Physics
- Evaluation panel (Fall 2016); this committee makes written recommendations to the department in promotion and tenure cases
- Theoretical high energy physics faculty search committee (2012-13)

University Service

- Campus selection committee for Packard Fellowship nominees (2013-14, 2015-20, 2022-23)
- Research & Innovation Office Advisory Board (2018-21)
- Reviewer for Research & Innovation Office seed grants (2022)

Professional Service

- Peer review of manuscripts for *Physical Review Letters*, *Physical Review B, Physical Review X, Science, Nature Communications, Nature Physics*, *EPL*, *Modern Physics Letters B,* and *SciPost Physics*.
- Proposal review for NSF, DOE and ARO.
- Deputy Director of the Simons Collaboration on Ultra-Quantum Matter (UQM). The UQM collaboration is a $14M, seven-year grant involving 17 PIs at 11 institutions. Together with the Director (Ashvin Vishwanath, Harvard), Hermele is responsible for managing all aspects of the collaboration and steering its scientific agenda.

Conferences and Workshops Organized

1. "Strongly Correlated Systems and Gauge/Gravity Duality," Aspen Center for Physics, January/February 2011.

2. "Symmetry and Topology in Quantum Matter," held at the NSF Institute for Pure and Applied Mathematics in January 2015.

3. 2016 Boulder Summer School in Condensed Matter and Materials Physics, "Topological Phases of Quantum Matter," held in Boulder in July/August 2016.

4. Simons Conference on Ultra-Quantum Matter I, held at the Simons Foundation in New York City in February 2018

5. Simons Conference on Ultra-Quantum Matter II, held at the Simons Foundation in New York City in August 2018.

6. Aspen Center for Physics summer workshop "Topological Phases and Excitations of Quantum Matter," held at the Aspen Center for Physics in June/July 2018.

7. "Workshop on Topological Aspects of Condensed Matter," held at the Harvard Center of Mathematical Sciences and Applications, September 10-11, 2019.

8. Kick-off meeting of the Simons Collaboration on Ultra-Quantum Matter, held at Harvard University, September 12-13, 2019.

9. First annual meeting of the Simons Collaboration on Ultra-Quantum Matter, held at the Simons Foundation, New York City, January 23-24, 2020.

10. Virtual meeting of the Simons Collaboration on Ultra-Quantum Matter, June 2-4, 2020.

11. Online Summer School on Ultra-Quantum Matter, virtually hosted by Perimeter Institute, August 10-14, 2020.

12. Meeting of the Simons Collaboration on Ultra-Quantum Matter (in person), held at the Institute for Advanced Study, Princeton, NJ, October 25-26, 2021.

13. Annual meeting of the Simons Collaboration on Ultra-Quantum Matter (hybrid in-person/virtual), held at the Simons Foundation, New York City, January 20-21, 2022.

14. Aspen Center for Physics summer workshop (in person), "Physics and information capabilities of highly entangled quantum matter," held at the Aspen Center for Physics, Aspen, CO, July 10-31, 2022.

Conferences and Workshops Organized (continued)

15. Meeting of the Simons Collaboration on Ultra-Quantum Matter (in person), held at California Institute of Technology, Pasadena, CA, September 19-21, 2022.

16. Annual meeting of the Simons Collaboration on Ultra-Quantum Matter (in-person), held at the Simons Foundation, New York City, January 19-20, 2023.

17. Meeting of the Simons Collaboration on Ultra-Quantum Matter (in person), held at CU Boulder, Boulder, CO, May 4-5, 2023.

18. Conference in honor of Matthew P.A. Fisher's 60th birthday (in person), held at University of California Santa Barbara, Santa Barbara, CA, May 19-21, 2023.

19. Meeting of the Simons Collaboration on Ultra-Quantum Matter (in person), held at Harvard University, Cambridge, MA, September 14-15, 2023.

20. Annual meeting of the Simons Collaboration on Ultra-Quantum Matter (in-person), held at the Simons Foundation, New York City, January 18-19, 2024.

21. Prospects in Theoretical Physics Summer School on "Quantum Matter," held in person at the Institute for Advanced Study, July 8-19, 2024.

22. Summer school "C*-algebraic Quantum Mechanics and Topological Phases of Matter," held in person at CU Boulder, July 29 - August 2, 2024.

23. Meeting of the Simons Collaboration on Ultra-Quantum Matter (in-person), held at Lake Arrowhead, CA, November 20-21, 2024.

24. Annual meeting of the Simons Collaboration on Ultra-Quantum Matter (in-person), held at the Simons Foundation, New York City, January 23-24, 2025.

Selected other activities (including outreach)

- Public lecture: CU Boulder Saturday Physics Series for adults and high school students, "Cool Physics: the Surprising Story of Ice." February 14, 2009.

- Public lecture: CU Boulder Saturday Physics Series for adults and high school students, "Quantum Matter." April 26, 2014.

- Panelist in a "Physics Cafe" event for the general public, hosted by the Aspen Center for Physics, February 2015.

- Panelist in discussion on careers in academia, presented as part of the *Beyond Boulder* series for undergraduates in physics and astronomy. January 2010 and February 2013.

- Participant in Kavli Institute for Theoretical Physics programs, "Strongly Correlated Phases in Condensed Matter and Degenerate Atomic Systems" (2007), "Quantum Criticality and the AdS/CFT Correspondence" (2009), "Frustrated Magnetism and Quantum Spin Liquids: From Theory and Models to Experiments" (2012), "Symmetry, Topology, and Quantum Phases of Matter" (2016).

- Participant in Aspen Center for Physics summer workshops (2004, 2005, 2008, 2012, 2014, 2018, 2019).

- Lecturer at advanced schools for Ph.D. students and postdoctoral researchers: *Topological Aspects in Correlated Systems*, held at International Center for Quantum Materials at Peking University, Beijing, China (June 2012). *Spin liquids, matrix product states and entanglement*, Princeton Summer School on Condensed Matter Physics, Princeton University (August 2013). *Quantum Spin Liquids: from Theory to Numerical Simulations*, SISSA, Trieste, Italy (September 2013). *New Trends in Frustrated Magnetism*, 4th Theory Winter School, National High Magnetic Field Laboratory, Tallahassee, Florida (January 2015).

Publications and preprints

Publications in peer-reviewed journals

1."d-wave Quasiparticles in the Tilted Vortex Lattice," M. A. Hermele and L. Marinelli, *Phys. Rev. B* **66**, 132512 (2002).

2."Pyrochlore Photons: The U(1) Spin Liquid in a S = 1/2 Three-Dimensional Frustrated Magnet," M. Hermele, M. P. A. Fisher and L. Balents, *Phys. Rev. B* **69**, 064404 (2004).

3."Stability of U(1) Spin Liquids in Two Dimensions," M. Hermele, T. Senthil, M. P. A. Fisher, P. A. Lee, N. Nagaosa and X.-G. Wen, *Phys. Rev. B* **70**, 214437 (2004).

4."Atomic quantum simulator for lattice gauge theories and ring exchange models," H. P. Büchler, M. Hermele, S. D. Huber, M. P. A. Fisher and P. Zoller, *Phys. Rev. Lett.* **95**, 040402 (2005).

5."Criticality in quantum triangular antiferromagnets via fermionized vortices," J. Alicea, O. I. Motrunich, M. Hermele and M. P. A. Fisher, *Phys. Rev. B* **72**, 064407 (2005).

6."Algebraic spin liquid as the mother of many competing orders," M. Hermele, T. Senthil and M. P. A. Fisher, *Phys. Rev. B* **72**, 104404 (2005).

7."Fate of the Josephson Effect in thin-film superconductors," M. Hermele, G. Refael, M. P. A. Fisher and P. M. Goldbart, *Nature Physics* **1**, 117-121 (2005). [See also News and Views article by Steven M. Girvin, Nature Physics 1, 83 (2005).]

8."Universal point contact resistance between thin-film superconductors," M. Hermele, G. Refael, M. P. A. Fisher and P. M. Goldbart, *Phys. Rev. B*. **73**, 134504 (2006).

9. "Projected-wave-function study of Spin-1/2 Heisenberg model on the Kagomé lattice," Y. Ran, M. Hermele, P. A. Lee and X.-G. Wen, *Phys. Rev. Lett*. **98**, 117205 (2007).

10. "SU(2) gauge theory of the Hubbard model and application to the honeycomb lattice," M. Hermele, *Phys. Rev. B* **76**, 035125 (2007).

11. "Properties of an algebraic spin liquid on the kagome lattice," M. Hermele, Y. Ran, P. A. Lee and X.-G. Wen, *Phys. Rev. B* **77**, 224413 (2008). [Physical Review B Editors' Suggestion.]

12. "Monopoles in CP^{N-1} model via the state-operator correspondence," M. A. Metlitski, M. Hermele, T. Senthil and M. P. A. Fisher. *Phys. Rev. B* **78**, 214418 (2008). [Physical Review B Editors' Suggestion.]

13. "Non-abelian descendant of abelian duality in a two-dimensional frustrated quantum magnet," M. Hermele. *Phys. Rev. B* **79**, 184429 (2009). [Physical Review B Editors' Suggestion; highlighted in *Physics*: http://physics.aps.org/synopsis-for/10.1103/PhysRevB.79.184429]

14. "Mott Insulators of Ultracold Fermionic Alkaline Earth Atoms: Underconstrained Magnetism and Chiral Spin Liquid," M. Hermele, V. Gurarie and A. M. Rey. *Phys. Rev. Lett.* **103**, 135301 (2009).

15. "Two-orbital SU(N) magnetism with alkaline-earth atoms," A. V. Gorshkov, M. Hermele, V. Gurarie, C. Xu, P. S. Julienne, J. Ye, P. Zoller, E. Demler, M. D. Lukin, and A. M. Rey. *Nature Physics* **6**, 289-295 (2010).

16. "Probing the Kondo lattice model with alkaline-earth-metal atoms," M. Foss-Feig, M. Hermele and A. M. Rey. *Phys. Rev. A* **81**, 051603(R) (2010).

17. "Heavy fermions in an optical lattice," M. Foss-Feig, M. Hermele, V. Gurarie and A. M. Rey. *Phys. Rev. A* **82**, 053624 (2010).

18. "Topological liquids and valence cluster states in two-dimensional SU(N) magnets," M. Hermele and V. Gurarie. *Phys. Rev. B* **84**, 174441 (2011).

19. "Majorana spin liquids and projective realization of SU(2) spin symmetry," G. Chen, A. Essin and M. Hermele. *Phys. Rev. B* **85**, 094418 (2012).

20. "High-temperature properties of fermionic alkaline-earth-metal atoms in optical lattices," K. R. A. Hazzard, V. Gurarie, M. Hermele and A. M. Rey. *Phys. Rev. A* **85**, 041604(R) (2012).

21. "Frustrated quantum critical theory of putative spin-liquid phenomenology in 6*H*-B-$Ba_3NiSb_2O_9$," G. Chen, M. Hermele and L. Radzihovsky. *Phys. Rev. Lett.* **109**, 016402 (2012).

22. "Magnetic orders and topological phases from *f-d* exchange in pyrochlore iridates," G. Chen and M. Hermele. *Phys. Rev. B* **86**, 235129 (2012).

23. "Classifying fractionalization: symmetry classification of gapped Z_2 spin liquids in two dimensions," A. M. Essin and M. Hermele. *Phys. Rev. B* **87**, 104406 (2013).

24. "Mott insulators of ultracold fermionic alkaline earth atoms in three dimensions," Hao Song and M. Hermele. *Phys. Rev. B* **87**, 144423 (2013). [Physical Review B Editors' Suggestion.]

25. "Quantum spin ices and topological phases from dipolar-octupolar doublets on the pyrochlore lattice," Yi-Ping Huang, G. Chen and M. Hermele. *Phys. Rev. Lett.* **112**, 167203 (2014).

26. "Spectroscopic signatures of crystal momentum fractionalization," A. M. Essin and M. Hermele. *Phys. Rev. B* **90**, 121102(R) (2014).

27. "String flux mechanism for fractionalization in topologically ordered phases," M. Hermele. *Phys. Rev. B* **90**, 184418 (2014).

28. "Space group symmetry fractionalization in a family of exactly solvable models with Z2 topological order." Hao Song and Michael Hermele. *Phys. Rev. B* **91**, 014405 (2015).

29. "Numerical detection of symmetry-enriched topological phases with space-group symmetry." Ling Wang, Andrew Essin, Michael Hermele, and Olexei Motrunich. *Phys. Rev. B* **91**, 121103(R) (2015).

30. “High-energy electronic excitations in Sr2IrO4 observed by Raman scattering.” J.-A. Yang, Y.-P. Huang, M. Hermele, T. Qi, G. Cao and D. Reznik. *Phys. Rev. B* **91**, 195140 (2015).

31. “Hallmarks of the Mott-metal crossover in the hole-doped pseudospin-1/2 Mott insulator Sr2IrO4.” Yue Cao, Qiang Wang, Justin A. Waugh, Theodore J. Reber, Haoxiang Li, Xiaoqing Zhou, Stephen Parham, Nicholas C. Plumb, Eli Rotenberg, Aaron Bostwick, Jonathan D. Denlinger, Tongfei Qi, M. A. Hermele, Gang Cao and Daniel S. Dessau. *Nature Communications* **7**, 11367 (2016).

32. “Synthetic gauge field stabilization of the chiral spin liquid phase.” Gang Chen, Kaden R. A. Hazzard, A. M. Rey and M. Hermele. *Phys. Rev. A* **93**, 061601(R) (2016).

33. “Fractionalizing glide reflections in two-dimensional Z2 topologically ordered phases.” SungBin Lee, M. Hermele and S. A. Parameswaran. *Phys. Rev. B* **94**, 125122 (2016).

34. “Flux-Fusion Anomaly Test and Bosonic Topological Crystalline Insulators.” M. Hermele and Xie Chen. *Phys. Rev. X* **6**, 041006 (2016).

35. “Symmetry fractionalization and anomaly detection in three-dimensional topological phases.” Xie Chen and M. Hermele, *Phys. Rev. B* **94**, 195120 (2016).

36.“Topological phases protected by point group symmetry.” Hao Song, Sheng-Jie Huang, Liang Fu and M. Hermele. *Phys. Rev. X* **7**, 011020 (2017).

37. “Theory of quantum kagome ice and vison zero modes.” Yi-Ping Huang and M. Hermele, *Phys. Rev. B* **95**, 075130 (2017).

38. “Fracton topological orders via coupled layers.” Han Ma, Ethan Lake, Xie Chen and M. Hermele, *Phys. Rev. B* **95**, 245126 (2017).

39. “Building crystalline topological phases from lower-dimensional states.” Sheng-Jie Huang, Hao Song, Yi-Ping Huang, and M. Hermele, Phys. Rev. B 96, 205106 (2017). [Physical Review B Editors’ Suggestion.]

40. “Surface field theories of point group symmetry protected topological phases.” Sheng-Jie Huang and M. Hermele, *Phys. Rev. B* **97**, 075145 (2018).

41. “Topological Entanglement Entropy of Fracton Stabilizer Codes.” Han Ma, A.T. Schmitz, S. A. Parameswaran, M. Hermele, Rahul M. Nandkishore, *Phys. Rev. B* **97**, 125101 (2018).

42. “Fracton topological order from Higgs and partial confinement mechanisms of rank-two gauge theory.” Han Ma, M. Hermele and Xie Chen. *Phys. Rev. B* **98**, 035111 (2018).

43. “Fractons.” Rahul M. Nandkishore and M. Hermele. *Annual Reviews of Condensed Matter Physics* **10**, 295 (2019). Invited review article.

44. “Cage-Net Fracton Models.” Abhinav Prem, Sheng-Jie Huang, Hao Song and M. Hermele. *Phys. Rev. X* **9**, 021010 (2019).

45. “Fracton fusion and statistics.” Shriya Pai and M. Hermele. *Phys. Rev. B* **100**, 195136 (2019). [Physical Review B Editors’ Suggestion.]

46. “Topological states from topological crystals.” Zhida Song, Sheng-Jie Huang, Yang Qi, Chen Fang and M. Hermele. *Science Advances* **5**, eaax2007 (2019).

47. “Fractons from vector gauge theory.” Leo Radzihovsky and M. Hermele. *Phys. Rev. Lett.* **124**, 050402 (2020).

48. “Quantum liquid from strange frustration in the trimer magnet Ba4Ir3O10.” G. Cao, H. Zheng, H. Zhao, Y. Ni, C. A. Pocs, Y. Zhang, F. Ye, C. Hoffmann, X. Wang, M. Lee, M. Hermele and I. Kimchi. *npj Quantum Materials* **5**, 26 (2020).

49. “Localization from Hilbert space shattering: From theory to physical realizations.” Vedika Khemani, M. Hermele and Rahul M. Nandkishore. *Phys. Rev. B* **101**, 174204 (2020). [Physical Review B Editors’ Suggestion.]

50. “Odd Fracton Theories, Proximate Orders, and Parton Constructions.” Michael Pretko, S. A. Parameswaran and M. Hermele. *Phys. Rev. B* **102**, 205106 (2020).

51. “Fracton phases via exotic higher-form symmetry breaking.” Marvin Qi, Leo Radzihovsky and M. Hermele. *Annals of Physics* **424**, 168360 (2021).

52. “Subdimensional criticality: condensation of lineons and planons in the X-cube model.” Ethan Lake and M. Hermele. *Phys. Rev. B* **104**, 165121 (2021).

53. “Systematic extraction of crystal electric-field effects and quantum magnetic model parameters in triangular rare-earth magnets.” Christopher A. Pocs, Peter E. Siegfried, Jie Xing, Athena S. Sefat, M. Hermele, Bruce Normand and Minhyea Lee. *Phys. Rev. Research* **3**, 043202 (2021).

54. “Fractionalization of subsystem symmetries in two dimensions.” David T. Stephen, Arpit Dua, José Garre-Rubio, Dominic J. Williamson and M. Hermele. *Phys. Rev. B* **106**, 085104 (2022).

55. “Continuous dependence on the initial data in the Kadison transitivity theorem and GNS construction.” Daniel Spiegel, Juan Moreno, Marvin Qi, M. Hermele, Agnès Beaudry and Markus J. Pflaum. *Reviews in Mathematical Physics* **33**, 2250031 (2022).

56. “The dipolar Bose-Hubbard model.” Ethan Lake, M. Hermele and T. Senthil. *Phys. Rev. B* **106**, 064511 (2022).

57. “Renormalization of Ising cage-net model and generalized foliation.” Zongyuan Wang, Xiuqi Ma, David T. Stephen, M. Hermele and Xie Chen. *Phys. Rev. B* **108**, 035148 (2023).

58. “Flow of (higher) Berry curvature and bulk-boundary correspondence in parametrized quantum systems.” Xueda Wen, Marvin Qi, Agnès Beaudry, Juan Moreno, Markus J. Pflaum, Daniel Spiegel, Ashvin Vishwanath and M. Hermele. *Phys. Rev. B* **108**, 125147 (2023).

59. “Fracton Self-Statistics.” Hao Song, Nathanan Tantivasadakarn, Wilbur Shirley and Michael Hermele. *Phys. Rev. Lett.* **132**, 016604 (2024). [Editors’ Suggestion.]

60. “Sequential Quantum Circuits as Maps Between Gapped Phases.” Xie Chen, Arpit Dua, Michael Hermele, David T. Stephen, Nathanan Tantivasadakarn, Robijn Vanhove and Jing-Yu Zhao. *Phys. Rev. B* **109**, 075116 (2024).

61. “Homotopical Foundations of Parametrized Quantum Spin Systems.” Agnès Beaudry, Michael Hermele, Juan Moreno, Markus J. Pflaum, Marvin Qi and Daniel Spiegel. *Reviews in Mathematical Physics* **36**, 2460003 (2024).

Works accepted for publication

62. “Heat conduction in magnetic insulators via hybridization of acoustic phonons and spin-flip excitations.” Christopher A. Pocs, Ian A. Leahy, Jie Xing, Eun Sang Choi, Athena S. Sefat, Michael Hermele and Minhyea Lee. arXiv:2401.01407. Accepted to *Physical Review Research*.

Works posted on arXiv.org and submitted (or to be submitted)

63. “Charting the space of ground states with tensor networks.” Marvin Qi, David T. Stephen, Xueda Wen, Daniel Spiegel, Markus J. Pflaum, Agnès Beaudry, Michael Hermele. arXiv:2305.07700. Submitted to *SciPost Physics*.
64. “Sequential Adiabatic Generation of Chiral Topological States.” Xie Chen, Michael Hermele and David T. Stephen. arXiv:2402.03433. Submitted to *SciPost Physics*.
65. “Planon-modular fracton orders.” Evan Wickenden, Marvin Qi, Arpit Dua and Michael Hermele. arXiv:2412.14320. Submitted to *Phys. Rev. B*.
66. “A Classifying Space for Phases of Matrix Product States.” Agnes Beaudry, Michael Hermele, Markus J. Pflaum, Marvin Qi, Daniel D. Spiegel and David T. Stephen. arXiv:2501.14241. To be submitted.

Invited Presentations

* Denotes invited talk at a professional conference/workshop
** Denotes departmental colloquium or similar
***Denotes lectures at an advanced school for Ph.D. students and postdoctoral researchers

2024

1. “Fracton Quantum Matter.” Department of Physics Colloquium, University of Washington, Seattle, WA, January 8, 2024.**
2. “Fracton Self-Statistics.” Department of Energy Theoretical Condensed Matter Physics Principal Investigators’ Meeting, Rockville, MD. April 10-12, 2024.*

2023

1. "Coarse translation symmetry and exotic renormalization groups in fracton phases." Presented in person as part of Kavli Institute for Theoretical Physics Conference “Topology, Symmetry and Interactions in Crystals: Emerging Concepts and Unifying Themes,” Santa Barbara, CA, April 3-6, 2023.*

2. “What is a gapped (fracton) phase of matter?” Presented at an in-person meeting of the Simons Collaboration on Ultra-Quantum Matter, held at Harvard University, Cambridge, MA, September 14-15, 2023.* *[Note: Hermele was also a co-organizer of this conference.]*

2022

1. “Subsystem symmetry fractionalization in two dimensions.” Presented at an in-person meeting of the Simons Collaboration on Ultra-Quantum Matter, held at Harvard and MIT, Cambridge, MA, April 25-26, 2022.*

2. “Subsystem symmetry fractionalization in two dimensions.” Presented as part of program “Geometrical aspects of topological phases of matter: spatial symmetries, fractons and beyond” held at the Simons Center for Physics and Geometry, Stony Brook, NY (remote), April 29, 2022.*

3. “Subsystem symmetry fractionalization in two dimensions.” Presented in the Quantum Matter Frontier Seminar Series, hosted by Perimeter Institute, Waterloo, Ontario, Canada (remote), May 2, 2022.

4. “Generalized foliated fracton phases.” Presented at an in-person meeting of the Simons Collaboration on Ultra-Quantum Matter, held at California Institute of Technology, Pasadena, CA, September 19-21, 2022.* *[Note: Hermele was also a co-organizer of this conference.]*

2021

1. "Families of gapped systems and quantum pumps." Harvard University Center of Mathematical Sciences and Applications, Quantum Matter in Mathematics and Physics Seminar (remote), February 11, 2021.

2. "Fracton phases of matter and quantum field theory." Rice University condensed matter seminar (remote), April 19, 2021.

3. "Subsystem symmetry fractionalization on point-like excitations." Presented at virtual workshop *New directions in topological phases: from fractons to spatial symmetries*, at the Simons Center for Physics and Geometry. May 24-28, 2021.*

4. "Parametrized quantum systems." Presented at an in-person meeting of the Simons Collaboration on Ultra-Quantum Matter, held at the Institute for Advanced Study, Princeton, NJ, October 25-26, 2021.* *[Note: Hermele was also a co-organizer of this conference.]*

2020

1. "Gapped phases of matter and topological quantum field theories." Presented at the 2020 Joint Mathematics Meetings, Denver. January 15-18, 2020.*

2. "Symmetries in fracton phases." Presented at the annual meeting of the Simons Collaboration on Ultra-Quantum Matter, Simons Foundation, New York City. January 23-24, 2020.* *[Note: Hermele was also a co-organizer of this conference.]*

3. "Symmetries in fracton phases." Presented at conference *Fractons and Beyond,* at the Banff International Research Station, Banff, Alberta, Canada. January 26-31, 2020.*

4. "Fracton phases of matter and quantum field theory." University of California Riverside Condensed Matter Seminar (remote), November 18, 2020.

2019

1. "Abelian and non-Abelian excitations in fracton phases of matter." Presented at Aspen Center for Physics conference *New Approaches to Strongly Correlated Quantum Systems*. February 3-9, 2019.*

2. "Abelian and non-Abelian excitations in fracton phases of matter." University of Maryland Condensed Matter Theory Center seminar, April 23, 2019.

3. "Fractons, p-string condensation and higher symmetries." Presented at the Aspen Center for Physics as part of the summer program *Generalized symmetries, anomalies and observables*. August 9, 2019.*

4. “From phases of quantum matter to quantum field theory…and beyond?” Aspen Center for Physics Colloquium. August 15, 2019.**

5. “Higher symmetries, p-string condensation and fractons.” Presented at the kick-off meeting of the Simons Collaboration on Ultra-Quantum Matter, Harvard University. September 12-13, 2019.* *[Note: Hermele was also a co-organizer of this conference.]*

6. “Fracton phases: a new class of quantum spin liquids.” Condensed matter colloquium of the Paul Scherrer Institute, Villigen, Switzerland. September 27, 2019.

7. “Frontiers of topological quantum matter and beyond.” CU Boulder Department of Physics colloquium. October 23, 2019.**

2018

1. “Crystalline symmetry protected topological phases.” Two lectures presented at Croucher Advanced Study Institute conference *Topology in Condensed Matter and High Energy Physics*, at the Chinese University of Hong Kong, January 3-5, 2018.*

2. “Overview: Topological Quantum Matter.” Presented at Simons Conference on *Ultra-Quantum Matter*, at the Simons Foundation, New York City, February 5-6, 2018.* *[Note: Hermele was also a co-organizer of this conference.]*

3. “Mechanisms for fracton topological order.” Presented at Aspen Center for Physics conference *Field Theory Dualities and Strongly Correlated Matter*. March 19-23, 2018.*

4. “Topology meets geometry in crystalline topological phases.” Institute for condensed matter theory seminar, University of Illinois Urbana-Champaign. April 23, 2018.

5. “Classifications and Constructions of Crystalline Topological Phases.” Department of Energy Theoretical Condensed Matter Physics Principal Investigators’ Meeting, Gaithersburg, MD. August 14-16, 2018.*

6. “Fracton fusion and statistics.” Presented at Princeton Center for Theoretical Science conference *Fracton Phases of Matter and Topological Crystalline Order*, at Princeton University. December 3-5, 2018.*

2017

1. “Crystalline topological phases with strong interactions.” Condensed matter seminar, University of Utah. March 21, 2017.

2. “Crystalline topological phases.” Presented at conference *Simons Symposium on Quantum Entanglement*, at Schloss Elmau, Krun, German, April 30-May 6 2017.*

3. “Topology meets geometry in crystalline topological phases.” Condensed matter theory seminar, Ohio State University. September 18, 2017.

2016

1. “Topological phases protected by point group symmetry.” Presented at conference *Geometrical Degrees of Freedom in Topological Phases,* at the Banff International Research Station, Banff, Alberta, Canada. August 22-26, 2016.*

2. “Topological phases protected by point group symmetry.” Condensed matter seminar, University of Minnesota. September 14, 2016.

3. “Topological phases protected by point group symmetry.” Presented at conference *Topological Quantum Matter*, at the Kavli Institute for Theoretical Physics, Santa Barbara, CA. October 17-21, 2016.*

2015

1. Two lectures presented at the 4th Theory Winter School of the National High Magnetic Field Laboratory, *New Trends in Frustrated Magnetism*, held in Tallahassee, Florida, January 5-9, 2015. Lecture title: “Theory of Quantum Spin Liquids.”***
2. “Bosonic topological crystalline insulators and anomalous symmetry fractionalization.” Presented at Aspen Center for Physics Conference *Progress and Applications of Modern Quantum Field Theory*. February 16-21, 2015.*
3. “Crystal symmetry fractionalization.” LASSP and A&EP Seminar, Cornell University. April 21, 2015.
4. “Possible and Impossible Phases of Matter.” *27th annual Packard Fellows Meeting*. Monterey, CA. September 9-12, 2015.*
5. “The flux-fusion anomaly test and bosonic topological crystalline insulators.” Presented at Banff International Research Station conference *Strongly Interacting Topological Phases*. September 20-25, 2015.*
6. “Phases of matter as emergent phenomena.” Keynote address, presented at 31st Boulder Conference on the History and Philosophy of Science. October 16-18, 2015.*
7. “Quantum phases of matter.” Physics colloquium, Colorado State University. October 19, 2015.**

2014

1. "Fractionalization of crystal momentum and other quantum numbers." Theory seminar, Washington University in St. Louis Department of Physics. February 13, 2014.
2. "Fractionalization of crystal momentum and other quantum numbers." Department of Physics seminar, Boston College. September 23, 2014.
3. "Fractionalization of crystal momentum and other quantum numbers." Informal condensed matter theory seminar, Massachusetts Institute of Technology. September 30, 2014.
4. "Fractionalization of crystal momentum and other quantum numbers." Condensed matter physics seminar, Harvard University. October 2, 2014.
5. "Fractionalization of crystal momentum and other quantum numbers." Condensed matter physics seminar, California Institute of Technology. December 1, 2014.
6. "Fractionalization of crystal momentum and other quantum numbers." Condensed matter seminar, University of California Irvine. December 3, 2014.

2013

1. "Classifying fractionalization: symmetry classification of gapped Z_2 spin liquids in two dimensions." Condensed matter seminar, Perimeter Institute for Theoretical Physics. March 26, 2013.
2. "Classifying fractionalization: symmetry classification of gapped Z_2 spin liquids in two dimensions." Condensed matter theory seminar, University of Maryland. April 15, 2013.
3. Three lectures presented at Princeton Summer School on Condensed Matter Physics, *Spin liquids, matrix product states and entanglement*, held at Princeton University, August 5-6, 2013. Lecture title: "Effective theories of quantum spin liquids."***
4. Four lectures presented at advanced school *Quantum spin liquids: from theory to numerical simulations*, held at SISSA, Trieste, Italy, September 9-13, 2013. Lecture title: "Symmetry in quantum spin liquids."***
5. "Quantum spin ice from dipolar-octupolar doublets on the pyrochlore lattice." Presented at conference *Mott Physics Beyond the Heisenberg Model*, Ascona, Switzerland, October 27-31, 2013.*

2012

1. "Exotic Phases of Matter." JILA Colloquium. January 24, 2012.**
2. Three lectures presented at summer school *Topological Aspects in Correlated Systems*, held at International Center for Quantum Materials at Peking University, Beijing, China. June 18-22, 2012. Lecture titles: 1. "Exotic phases of matter and quantum spin liquids." 2. "Parton approach to spin liquids and projective symmetry group classification." 3. "Symmetry classes for Z2 topological spin liquids."***
3. "Symmetry classification of gapped Z_2 spin liquids." Seminar presented at Kavli Institute for Theoretical Physics program *Frustrated Magnetism and Quantum Spin Liquids: From Theory and Models to Experiments*, Santa Barbara, CA. August 22, 2012.*
4. "Symmetry Classification of Gapped Z_2 Spin Liquids." Presented at conference *Exotic Phases of Frustrated Magnets*, Kavli Institute for Theoretical Physics, Santa Barbara, CA. October 12, 2012.*
5. "Mott insulators of ultracold alkaline earth fermions: A new class of quantum magnets." Condensed matter seminar, University of Kentucky, Lexington, KY. October 23, 2012.
6. "Classifying fractionalization: symmetry classification of gapped Z_2 spin liquids in two dimensions." Condensed matter theory seminar, University of Kentucky, Lexington, KY. October 24, 2012.

2011

1. "Exotic magnetism and new states of matter with alkaline earth atoms." *American Physical Society March Meeting* (Dallas, TX), March 24, 2011.*
2. "Majorana spin liquids and projective spin rotation symmetry." *Symposium on Theoretical and Mathematical Physics,* Euler International Mathematical Institute, St. Petersburg, Russia. July 10, 2011.*
3. "Exotic Phases of Matter." *23rd annual Packard Fellows Meeting*. Monterey, CA. September 8, 2011.*

2010

1. "Algebraic Spin Liquid on the Kagome Lattice." Presented at conference *Novel Physics on the Kagome Network*, Orsay, France, Jan. 18, 2010.*
2. "Mott insulators of ultracold alkaline earth fermions: A new class of quantum magnets," seminar, LPTMC, Université Pierre et Marie Curie, Paris, France, Jan. 21, 2010.

3. "Mott insulators of ultracold alkaline earth fermions: A new class of quantum magnets," Complex Quantum Systems Seminar, University of Texas Austin, Feb. 18, 2010.
4. "Quantum Spin Liquids in Frustrated Magnets and Near the Mott Transition." *CIFAR Quantum Materials Program Meeting*, Montreal, May 8, 2010.*
5. "Mott insulators of ultracold alkaline earth fermions: A new class of quantum magnets." Condensed Matter Physics Seminar, California Institute of Technology, Nov. 29, 2010.

2009

1. "Collective behavior from top to bottom: stable phases without quasiparticles in quantum magnets," University of Michigan Physics Department Seminar, January 20, 2009.
2. "Quantum critical phases in two dimensions," Physics Department Colloquium, Boston College, March 3, 2009.**
3. "The Elusive Quantum Spin Liquid," Physics Department Colloquium, Colorado State University, April 13, 2009.**
4. "Quantum Criticality II and IV," tutorial lectures on quantum criticality presented at Kavli Institute for Theoretical Physics Miniprogram *Quantum Criticality and the AdS/CFT Correspondence*, July 1 & 3, 2009.*
5. "Monopoles and the Fermionic Dual of the O(4) Vector Model," seminar presented at Kavli Institute for Theoretical Physics Miniprogram *Quantum Criticality and the AdS/CFT Correspondence*, July 23, 2009.*
6. "Beyond Valence Bonds with Ultracold Atoms: Chiral Spin Liquids and Other Surprises in SU(N) Quantum Magnetism," Q Seminar, Microsoft Station Q, September 15, 2009.
7. "Beyond Valence Bonds with Ultracold Atoms: Chiral Spin Liquids and Other Surprises in SU(N) Quantum Magnetism," ICMT Seminar, University of Illinois at Urbana-Champaign, October 5, 2009.
8. "Quantum magnetism of ultracold alkaline earth fermions." Presented at conference *Control of quantum correlations in tailored matter: Common perspectives of mesoscopic systems and quantum gases*, Günzburg, Germany, November 17, 2009.*
9. "Exotic phases in condensed matter physics," condensed matter seminar, University of Stuttgart, Germany, November 19, 2009.
10. "Tutorial: Exotic phases and phase transitions in quantum magnetism." Presented at conference *Frontiers of Condensed Matter Physics*, Seoul, South Korea, Dec. 17, 2009.*

11. "Mott insulators of ultracold alkaline earth fermions: A new class of quantum magnets." Presented at conference *Frontiers of Condensed Matter Physics*, Seoul, South Korea, Dec. 19, 2009.*
12. "Beyond valence bonds with ultracold atoms: Chiral spin liquid and other surprises," seminar, Asia Pacific Center for Theoretical Physics, Pohang, South Korea, Dec. 22, 2009.

2008

1. "Critical spin liquids in two dimensions: New insights from new dualities," *Quantum Magnetism Conference*, University of Minnesota Fine Theoretical Physics Institute, May 2-4, 2008.

2007

1. "Exotic Quantum Liquids with Gapless Excitations," Kavli Institute for Theoretical Physics Program on *Strongly Correlated Phases in Condensed Matter and Degenerate Atomic Systems*, April 5, 2007.*
2. "Exotic quantum matter on the kagome lattice of $ZnCu_3(OH)_6Cl_2$," Physics Department Seminar, University of Massachusetts at Boston, May 16, 2007.

2006

1. "Emergent photons (and beyond) in quantum magnets and optical lattices," Condensed Matter Physics Seminar, Yale University, January 12, 2006.
2. "New light on strongly correlated systems: Emergent photons in exotic liquids," Physics Department Colloquium, University of Colorado at Boulder, January 25, 2006.**
3. "Fate of the Josephson effect in thin-film superconductors," Condensed Matter Seminar, University of Colorado at Boulder, January 26, 2006.
4. "Fate of the Josephson effect in thin-film superconductors," Condensed Matter Seminar, Berkeley, February 2, 2006.
5. "Fate of the Josephson effect in thin-film superconductors," Condensed Matter Seminar, Princeton, February 6, 2006.
6. "Quantum critical phases: Algebraic spin liquids in two dimensions," *American Physical Society March Meeting* (Baltimore, MD), March 2006.*
7. "Spin liquids near the Mott transition," Condensed Matter Seminar, Brown University, November 2, 2006.

2005

1. "The Algebraic Spin Liquid as the Mother of Many Competing Orders." Berkeley Condensed Matter Theory Seminar, February 3, 2005.
2. "Basics of exotic quantum states of matter," informal seminar, Institute for Quantum Optics and Quantum Information, Innsbruck, November 11, 2005.
3. "Fate of the Josephson effect in thin-film superconductors," Theory Seminar, University of Illinois at Urbana-Champaign, December 5, 2005.

2004

1. "Monopoles and their Quantum Numbers in π-flux (and other) U(1) Spin Liquids." Kavli Institute for Theoretical Physics Program on *Exotic Order and Criticality in Quantum Matter*, June 1, 2004.*
2. "The Algebraic Spin Liquid as the Mother of Many Competing Orders." Princeton Condensed Matter Theory Seminar, October 29, 2004.
3. "The Algebraic Spin Liquid as the Mother of Many Competing Orders." University of Toronto Condensed Matter Seminar, December 6, 2004.
4. "The Algebraic Spin Liquid as the Mother of Many Competing Orders." Harvard University Special Condensed Matter Theory Seminar, December 9, 2004.