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## Dissertation

**R. Schäfer**

*Magnetic frustration in three dimensions*

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## Publication list

- [13] E. M. Smith, **R. Schäfer**, et al.  
*Single Crystal Diffuse Neutron Scattering Study of the Dipole-Octupole Quantum Spin Ice Candidate  $\text{Ce}_2\text{Zr}_2\text{O}_7$ : No Apparent Octupolar Correlations Above  $T=0.05\text{K}$*   
[Phys. Rev. X 15, 021033 \(2025\)](#)
- [12] **R. Schäfer**, and D. J. Luitz  
*DanceQ: High-performance library for number conserving bases*  
[SciPost Phys. Codebases 48 \(2025\)](#)  
[DanceQ repository](#) and [DanceQ documentation](#)
- [11] Z. Lu, **R. Schäfer**, J. N. Hallén, C. R. Laumann  
*[111]-strained spin ice: Localization of thermodynamically deconfined monopoles*  
[Phys. Rev. B 110, 184421 \(2024\)](#)
- [10] D. Yahne, B. Placke, **R. Schäfer**, et al.  
*Dipolar spin ice regime proximate to an all-in-all-out Néel ground state in the dipolar-octupolar pyrochlore  $\text{Ce}_2\text{Sn}_2\text{O}_7$*   
[Phys. Rev. X 14, 011005 \(2024\)](#)
- [9] J. Beare, E. M. Smith, J. Dudemaine, **R. Schäfer**, et al.  
 *$\mu\text{SR}$  Study of the Dipole-Octupole Quantum Spin Ice Candidate  $\text{Ce}_2\text{Zr}_2\text{O}_7$*   
[Phys. Rev. B 108, 174411 \(2023\)](#)
- [8] E. M. Smith, J. Dudemaine, B. Placke, **R. Schäfer**, et al.  
*Quantum Spin Ice Response to a Magnetic Field in the Dipole-Octupole Pyrochlore  $\text{Ce}_2\text{Zr}_2\text{O}_7$*   
[Phys. Rev. B 108, 054438 \(2023\)](#)

- [7] **R. Schäfer**, B. Placke, O. Benton, and R. Moessner  
*Abundance of hard-hexagon crystals in the quantum pyrochlore antiferromagnet*  
[Phys. Rev. Lett. 131, 096702 \(2023\)](#)
- [6] **R. Schäfer**, J. C. Budich, and D. J. Luitz  
*Symmetry protected exceptional points of interacting fermions*  
[Phys. Rev. Research 4, 033181 \(2022\)](#)
- [5] I. Hagymási, **R. Schäfer**, R. Moessner, and D. J. Luitz  
*Magnetization process and ordering of the  $S = 1/2$  pyrochlore Heisenberg antiferromagnet in a magnetic field*  
[Phys. Rev. B 106, L060411 \(2022\)](#)
- [4] E. Smith, O. Benton, D. Yahne, B. Placke, **R. Schäfer**, *et al.*  
*The case for a  $U(1)\pi$  Quantum Spin Liquid Ground State in the Dipole-Octupole Pyrochlore  $Ce_2Zr_2O_7$*   
[Phys. Rev. X 12, 021015 \(2022\)](#)
- [3] I. Hagymási, **R. Schäfer**, R. Moessner, and D. J. Luitz  
*Possible Inversion Symmetry Breaking in the  $S = 1/2$  Pyrochlore Heisenberg Magnet*  
[Phys. Rev. Lett. 126, 117204 \(2021\)](#)
- [2] **R. Schäfer**, I. Hagymási, R. Moessner, and D. J. Luitz  
*Pyrochlore  $S = \frac{1}{2}$  Heisenberg antiferromagnet at finite temperature*  
[Phys. Rev. B 102, 054408 \(2020\)](#)
- [1] **R. Schäfer**, G. S. Uhrig, and J. Stolze  
*Time-crystalline behavior in an engineered spin chain*  
[Phys. Rev. B 100, 184301 \(2019\)](#)

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## Preprints

- [1] E. M. Smith, A. Fitterman, **R. Schäfer**, *et al.*  
*Two-Peak Heat Capacity Accounts for  $R \ln(2)$  Entropy and Ground State Access in the Dipole-Octupole Pyrochlore  $Ce_2Hf_2O_7$*   
[arXiv:2501.08327 \(2025\)](#)
- [2] D. Vuina, **R. Schäfer**, D. M. Long, A. Chandran  
*Probing Hilbert space fragmentation using controlled dephasing*  
[arXiv:2506.13856 \(2025\)](#)
- [3] **R. Schäfer**, C. Chamon, C. R. Laumann  
*Hall-on-Toric: Descendant Laughlin state in the chiral  $\mathbb{Z}_p$  toric code*  
[arXiv:2507.02035 \(2025\)](#)

- [4] H. Kim, **R. Schäfer**, D. M. Long, A. Polkovnikov, A. Chandran  
— **shared first authorship**  
*Confined and deconfined chaos in classical spin systems*  
[arXiv:2507.07168](#) (2025)