

# Mathias S. Scheurer

## List of Publications

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In total **60 manuscripts**: 7 preprints online, 1 book chapter, 1 News & Views article (Nature), and 51 published in peer-reviewed journals: Science (1), Nature Materials (1), Nature Physics (5), Nature Communications (2), Physical Review X (2), Proceedings of the National Academy of Sciences (3), Physical Review Letters (2), 2D Materials (2), SciPost Physics (2), Nano Letters (1), npj Quantum Materials (1), Scientific Reports (1), Physical Review B Letter (2), Physical Review B (19), Physical Review Research (6), and Journal of Physical Chemistry C (1).

### Complete list of publications available online:

#### Submitted

1. *Classifying topological neural network quantum states via diffusion maps*, Y. Teng, S. Sachdev, M. S. Scheurer, [arXiv:2301.02683](https://arxiv.org/abs/2301.02683).
2. *Vestigial singlet pairing in a fluctuating magnetic triplet superconductor: Applications to graphene moiré systems*, Prathyush P. Poduval, M. S. Scheurer, [arXiv:2301.01344](https://arxiv.org/abs/2301.01344).
3. *Time-reversal symmetry breaking in superconducting low-carrier-density quasi-skutterudite  $\text{Lu}_3\text{Os}_4\text{Ge}_{13}$* , A. Kataria, J. A. T. Verezhak, O. Prakash, R. K. Kushwaha, A. Thamizhavel, S. Ramakrishnan, M. S. Scheurer, A. D. Hillier, R. P. Singh, [arXiv:2211.03084](https://arxiv.org/abs/2211.03084).
4. *Tunable superconductivity and Möbius Fermi surfaces in an inversion-symmetric twisted van der Waals heterostructure*, H. D. Scammell, M. S. Scheurer, [arXiv:2210.03125](https://arxiv.org/abs/2210.03125).
5. *Electron spin resonance and collective excitations in magic-angle twisted bilayer graphene*, E. Morissette, J.-X. Lin, S. Liu, D. Rhodes, K. Watanabe, T. Taniguchi, J. Hone, M. S. Scheurer, M. Lilly, A. Mounce, J.I.A. Li, [arXiv:2206.08354](https://arxiv.org/abs/2206.08354).
6. *Non-coplanar magnetism, topological density wave order and emergent symmetry at half-integer filling of moiré Chern bands*, P. Wilhelm, T. Lang, M. S. Scheurer, A. Läuchli, [arXiv:2204.05317](https://arxiv.org/abs/2204.05317).
7. *A new flavor of correlation and superconductivity in small twist-angle trilayer graphene*, P. Siriviboon, J.-X. Lin, H. D. Scammell, S. Liu, D. Rhodes, K. Watanabe, T. Taniguchi, J. Hone, M. S. Scheurer, J.I.A. Li, [arXiv:2112.07127](https://arxiv.org/abs/2112.07127).

#### Published

8. *Moiré phonons and impact of electronic symmetry breaking in twisted*

*trilayer graphene*, R. Samajdar, Y. Teng, M. S. Scheurer, *Phys. Rev. B* **106**, L201403 (Letter) [arXiv:2205.06816].

9. *Zero-field superconducting diode effect in small-twist-angle trilayer graphene*, J.-X. Lin, P. Siriviboon, H. D. Scammell, S. Liu, D. Rhodes, K. Watanabe, T. Taniguchi, J. Hone, M. S. Scheurer, J.I.A. Li, *Nature Physics* **2022** [arXiv:2112.07841].
10. *Time-reversal-symmetry Breaking in the Superconducting State of ScS*, Arushi, R. K. Kushwaha, D. Singh, A. D. Hillier, M. S. Scheurer, R. P. Singh, *Phys. Rev. B* **106**, L020504 (Letter) [arXiv:2203.16458].
11. *Correlated insulators, semimetals, and superconductivity in twisted trilayer graphene*, M. Christos, S. Sachdev, and M. S. Scheurer, *Phys. Rev. X* **12**, 021018 (2022) [arXiv:2106.02063].
12. *Orderly disorder in magic-angle twisted trilayer graphene*, S. Turkel, J. Swann, Z. Zhu, M. Christos, K. Watanabe, T. Taniguchi, S. Sachdev, M. S. Scheurer, E. Kaxiras, C. R. Dean, A. N. Pasupathy, *Science* **376**, 193-199 (2022) [arXiv:2109.12631].
13. *Theory of zero-field diode effect in twisted trilayer graphene*, H. D. Scammell, J.I.A. Li, and M. S. Scheurer, *2D Materials* **9**, 025027 (2022) [arXiv:2112.09115].
14. *Unconventional pairing in  $(Ca,Sr)_3(Ir,Rh)_4Sn_{13}$  superconductors revealed by controlling disorder*, E. H. Krenkel, M. A. Tanatar, M. Konczykowski, R. Grasset, E. I. Timmons, S. Ghimire, K. R. Joshi, Y. Lee, Liqin Ke, S. Chen, C. Petrovic, P. P. Orth, M. S. Scheurer, R. Prozorov, *Phys. Rev. B* **105**, 094521 (2022) [arXiv:2110.02025].
15. *Universal moiré nematic phase in twisted graphitic systems*, C. Rubio Verdu, S. Turkel, Y. Song, L. Klebel, R. Samajdar, M. S. Scheurer, J. Venderbos, H. Ochoa, X. Lede, D. Kennes, R. Fernandes, A. Rubio, and A. Pasupathy, *Nature Physics* **18**, 196–202 (2022) [arXiv:2009.11645].
16. *Photocurrent-driven transient symmetry breaking in the Weyl semimetal TaAs*, N. Sirica, P. P. Orth, M. S. Scheurer, Y.M. Dai, M.-C. Lee, P. Padmanabhan, L.T. Mix, L.X. Zhao, G.F. Chen, B. Xu, R. Yang, B. Shen, C.-C. Lee, H. Lin, T.A. Cochran, S.A. Trugman, J.-X. Zhu, M.Z. Hasan, N. Ni, X.G. Qiu, A.J. Taylor, D.A. Yarotski, R.P. Prasankumar, *Nature Materials* **21**, 62–66 (2022) [arXiv:2005.10308].
17. *Generative models for sampling and phase transition indication in spin systems*, J. Singh, V. Arora, V. Gupta, M. S. Scheurer, *SciPost Phys.* **11**, 043 (2021) [arXiv:2006.11868].
18. *Learning crystal field parameters using convolutional neural networks*, N.

Berthussen, Y. Sizyuk, M. S. Scheurer, and P. Orth, *SciPost Phys.* **11**, 011 (2021) [arXiv:2011.12911].

19. *Phonon Hall viscosity from phonon-spinon interactions*, Y. Zhang\*, Y. Teng\*, R. Samajdar, S. Sachdev, and M. S. Scheurer, *Phys. Rev. B* **104**, 035103 (2021) [arXiv:2103.05650].
20. *Electric-field-tunable electronic nematic order in twisted double-bilayer graphene*, R. Samajdar\*, M. S. Scheurer\*, S. Turkel, C. Rubio-Verdú, A. Pasupathy, J. Venderbos, and R. Fernandes, *2D Materials* **8**, 034005 (2021) [arXiv:2102.08385].
21. *Time-reversal symmetry breaking and multigap superconductivity in the noncentrosymmetric superconductor  $La_7Ni_3$* , Arushi, D. Singh, A. D. Hillier, M. S. Scheurer, R. P. Singh, *Phys. Rev. B* **103**, 174502 (2021) [arXiv:2012.05654].
22. *Anomalous mirror symmetry breaking in a model insulating cuprate  $Sr_2CuO_2Cl_2$* , A. de la Torre, K. L. Seyler, L. Zhao, S. Di Matteo, M. S. Scheurer, Y. Li, B. Yu, M. Greven, S. Sachdev, M. R. Norman, D. Hsieh, *Nature Physics* **17**, 777-781 (2021) [arXiv:2008.06516].
23. *Superconductivity, correlated insulators, and Wess-Zumino-Witten terms in twisted bilayer graphene*, M. Christos, S. Sachdev, M. S. Scheurer, *PNAS* **117**, 29543 (2020) [arXiv:2007.00007].
24. *Time-reversal-symmetry breaking and unconventional pairing in the noncentrosymmetric superconductor  $La_7Rh_3$  probed by  $\mu$ SR*, D. Singh, M. S. Scheurer, A. D. Hillier, R. P. Singh, *Phys. Rev. B* **102**, 134511 (2020) [arXiv:1802.01533].
25. *Bilocal quantum criticality*, H. D. Scammell, M. S. Scheurer, S. Sachdev, *Phys. Rev. Research* **2**, 033390 (2020) [arXiv:2006.01834].
26. *Protection of parity-time symmetry in topological many-body systems: non-Hermitian toric code and fracton models*, H. Shackleton, M. S. Scheurer, *Phys. Rev. Research* **2**, 033022 (2020) [arXiv:2005.09668].
27. *Unquantized thermal Hall effect in quantum spin liquids with spinon Fermi surfaces*, Y. Teng, Y. Zhang, M. S. Scheurer, S. Sachdev, *Phys. Rev. Research* **2**, 033283 (2020) [arXiv:2005.02396].
28. *Microscopic theory of superconductivity in twisted double-bilayer graphene*, R. Samajdar and M. S. Scheurer, *Phys. Rev. B* **102**, 064501 (2020) [arXiv:2001.07716].
29. *Not all doped Mott insulators have a pseudogap: key role of van Hove*

singularities, W. Wu, M. S. Scheurer, M. Ferrero, A. Georges, *Phys. Rev. Research* **2**, 033067 (2020) [arXiv:2001.00019].

30. *Pairing in twisted double-bilayer graphene and related moiré superlattice systems*, M. S. Scheurer and R. Samajdar, *Phys. Rev. Research* **2**, 033062 (2020) [arXiv:1906.03258].
31. *Unsupervised machine learning and band topology*, M. S. Scheurer, R.-J. Slager, *Phys. Rev. Lett.* **124**, 226401 (2020) [arXiv:2001.01711].
32. *Phases of  $SU(2)$  gauge theory with multiple adjoint Higgs fields in  $2+1$  dimensions*, H. D. Scammell, K. Patekar, M. S. Scheurer, S. Sachdev, *Phys. Rev. B* **101**, 205124 (2020) [arXiv:1912.06108].
33. *Gauge Theories for the Thermal Hall Effect*, H. Guo, R. Samajdar, M. S. Scheurer, S. Sachdev, *Phys. Rev. B* **101**, 195126, Editors' Suggestion (2020) [arXiv:2002.01947].
34. *Electron irradiation effects on superconductivity in  $PdTe_2$ : an application of a generalized Anderson theorem*, E. I. Timmons, S. Teknowijoyo, M. Kończykowski, O. Cavani, M. A. Tanatar, S. Ghimire, K. Cho, Y. Lee, L. Ke, N. H. Jo, S. L. Bud'ko, P. C. Canfield, P. P. Orth, M. S. Scheurer, R. Prozorov, *Phys. Rev. Research* **2**, 023140 (2020) [arXiv:2001.04673].
35. *Enhanced thermal Hall effect in the square-lattice Néel state*, R. Samajdar, M. S. Scheurer, S. Chatterjee, H. Guo, C. Xu, and S. Sachdev, *Nature Physics* **15**, 1290-1294 (2019) [arXiv:1903.01992].
36. *Spectroscopy of graphene with a magic twist*, M. S. Scheurer, *Nature* **572**, 40-41 (2019).
37. *Identifying topological order through unsupervised machine learning*, J. F. Rodriguez-Nieva and M. S. Scheurer, *Nature Physics* **15**, 790-795 (2019) [arXiv:1805.05961].
38. *Thermal Hall effect in square-lattice spin liquids: a Schwinger boson mean-field study*, R. Samajdar, S. Chatterjee, S. Sachdev, M. S. Scheurer, *Phys. Rev. B* **99**, 165126 (2019) [arXiv:1812.08792].
39. *Gauge theory for the cuprates near optimal doping*, S. Sachdev, H. D. Scammell, M. S. Scheurer, and G. Tarnopolsky, *Phys. Rev. B* **99**, 054516, Editors' Suggestion (2019) [arXiv:1811.04930].
40. *Fermi surface reconstruction in electron-doped cuprates without antiferromagnetic long-range order*, J.-F. He, C. R. Rotundu, M. S. Scheurer, Y. He, M. Hashimoto, K. Xu, Y. Wang, E. W. Huang, T. Jia, S.-D. Chen, B. Moritz, D.-H. Lu, Y. S. Lee, T. P. Devereaux, and Z. X. Shen, *PNAS* **116** (9) 3449 (2019) [arXiv:1811.04992].

41. *Designing morphotropic phase composition in BiFeO<sub>3</sub>*, A. Herklotz, S. F. Rus, N. B. Wisinger, C. Rouleau, E. J. Guo, A. Huon, S. KC, R. Roth, X. Yang, C. Vaswani, J. Wang, P. P. Orth, M. S. Scheurer, T. Z. Ward, *Nano Letters* **19**, 2, 1033 (2019).
42. *Orbital currents in insulating and doped antiferromagnets*, M. S. Scheurer and S. Sachdev, *Phys. Rev. B* **98**, 235126 (2018) [[arXiv:1808.04826](#)].
43. *Friedel oscillations and Majorana zero modes in inhomogeneous superconductors*, L. Lauke, M. S. Scheurer, A. Poenicke, J. Schmalian, *Phys. Rev. B* **98**, 134502 (2018) [[arXiv:1803.11421](#)].
44. *Triangular antiferromagnetism on the honeycomb lattice of twisted bilayer graphene*, A. Thomson, S. Chatterjee, S. Sachdev, M. S. Scheurer, *Phys. Rev. B* **98**, 075109 (2018) [[arXiv:1806.02837](#)].
45. *Nodeless superconductivity in type-II Dirac semimetal PdTe<sub>2</sub>: low-temperature London penetration depth and symmetry analysis*, S. Teknowijoyo, N. H. Jo, M. S. Scheurer, M. A. Tanatar, K. Cho, S. L. Bud'ko, P. P. Orth, P. C. Canfield, R. Prozorov, *Phys. Rev. B* **98**, 024508 (2018) [[arXiv:1804.00723](#)].
46. *Hierarchy of Information Scrambling, Thermalization, and Hydrodynamic Flow in Graphene*, M. J. Klug, M. S. Scheurer, J. Schmalian, *Phys. Rev. B* **98**, 045102 (2018) [[arXiv:1712.08813](#)].
47. *Topological order in the pseudogap metal*, M. S. Scheurer, S. Chatterjee, W. Wu, M. Ferrero, A. Georges, S. Sachdev, *PNAS* **115**, E3665 (2018) [[arXiv:1711.09925](#)].
48. *Pseudogap and Fermi surface topology in the two-dimensional Hubbard model*, W. Wu, M. S. Scheurer, S. Chatterjee, S. Sachdev, A. Georges, M. Ferrero, *Phys. Rev. X* **8**, 021048 (2018) [[arXiv:1707.06602](#)].
49. *Intertwining topological order and broken symmetry in a theory of fluctuating spin density waves*, S. Chatterjee, S. Sachdev, and M. S. Scheurer, *Phys. Rev. Lett.* **119**, 227002 (2017) [[arXiv:1705.06289](#)].
50. *Limits on dynamically generated spin-orbit coupling: Absence of  $l = 1$  Pomeranchuk instabilities in metals*, E. I. Kiselev, M. S. Scheurer, P. Wölfle, J. Schmalian, *Phys. Rev. B* **95**, 125122 (2017) [[arXiv:1611.01442](#)].
51. *Selection rules for Cooper pairing in two-dimensional interfaces and sheets*, M. S. Scheurer, D. F. Agterberg, and J. Schmalian, *npj Quantum Materials* **2**, 9 (2017) [[arXiv:1503.03646](#)].
52. *Mechanism, time-reversal symmetry, and topology of superconductivity*

*in noncentrosymmetric systems*, [M. S. Scheurer](#), *Phys. Rev. B* **93**, 174509 (2016) [[arXiv:1601.05459](#)].

53. *Pair breaking in multiorbital superconductors: An application to oxide interfaces*, [M. S. Scheurer](#), [M. Hoyer](#), and [J. Schmalian](#), *Phys. Rev. B* **92**, 014518 (2015) [[arXiv:1505.04919](#)].
54. *Anomalous quantum criticality in an itinerant ferromagnet*, [C. L. Huang](#), [D. Fuchs](#), [M. Wissinger](#), [R. Schneider](#), [M. C. Ling](#), [M. S. Scheurer](#), [J. Schmalian](#), and [H. v. Löhneysen](#), *Nat. Commun.* **6**, 8188 (2015).
55. *Pair breaking due to orbital magnetism in iron-based superconductors*, [M. Hoyer](#), [M. S. Scheurer](#), [S. V. Syzranov](#), and [J. Schmalian](#), *Phys. Rev. B* **91**, 054501 (2015)[[arXiv:1410.2555](#)].
56. *Dimensional crossover and cold-atom realization of topological Mott insulators*, [M. S. Scheurer](#), [S. Rachel](#), and [P. P. Orth](#), *Sci. Rep.* **5**, 8386 (2015) [[arXiv:1406.7396](#)].
57. *Topological superconductivity and unconventional pairing in oxide interfaces*, [M. S. Scheurer](#) and [J. Schmalian](#), *Nat. Commun.* **6**, 6005 (2015) [[arXiv:1404.4039](#)].
58. *Nonadiabatic processes in Majorana qubit systems*, [M. S. Scheurer](#) and [A. Shnirman](#), *Phys. Rev. B* **88**, 064515 (2013) [[arXiv:1305.4923](#)].
59. *Damping of Plasmons of Closely Coupled Sphere Chains Due to Disordered Gaps*, [M. S. Scheurer](#), [M. D. Arnold](#), [J. Setiadi](#), and [M. J. Ford](#), *J. Phys. Chem. C* **116**, 1335-1343 (2012).

#### Book chapters

60. *Surface and Interface Superconductivity*, [S. Gariglio](#), [M. S. Scheurer](#), [J. Schmalian](#), [A. M. R. V. L. Monteiro](#), [S. Goswami](#), and [A. D. Caviglia](#) in *The Oxford Handbook of Small Superconductors* (Oxford University Press, Oxford, 2017).

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