

Mathias S. Scheurer

Curriculum Vitae

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Personal details

Date of birth June 18, 1988
Place of birth Heilbronn, Germany
Present citizenship Germany

Research positions

06/2023–today **Full Professor (W3)** at the Institute for Theoretical Physics III at the University of Stuttgart

09/2020–05/2023 **Assistant Professor** at the Institute for Theoretical Physics at the University of Innsbruck

03/2017–08/2020 **Post-doctoral Fellow** in the Department of Physics at Harvard University
Faculty Advisor Subir Sachdev

05/2016–02/2017 **Post-doctoral Fellow** in the Department of Physics at Karlsruhe Institute of Technology
Faculty Advisor Jörg Schmalian

02/2013 – 05/2013 **Graduate research assistant** with Peter P. Orth at Karlsruhe Institute of Technology

Education

06/2013–04/2016 **PhD in Physics**, Karlsruhe Institute of Technology
Thesis Mechanism, symmetry and topology of ordered phases in correlated systems
Advisor Jörg Schmalian
Final grade summa cum laude (with highest honor)

12/2012 **Diploma in Physics**, Karlsruhe Institute of Technology
Thesis Non-adiabatic processes in Majorana qubit systems
Advisor Alexander Shnirman
Final grade 1.0 (with distinction)

10/2007–12/2012 **Undergraduate studies in physics**, Karlsruhe Institute of Technology

02/2011–07/2011 Exchange student at University of Technology Sydney

06/2007 **Abitur** (High-school diploma) at Elly-Heuss-Knapp-Gymnasium, Heilbronn, Germany
Final grade 1.0

Awards & Grants

- 2022–2027 **ERC Starting Grant**, see [here](#), for project “SuperCorr: Understanding, Engineering, and Probing Correlated Many-Body Physics in Superlattices of Graphene and Beyond”
- 04/2017 **Otto Haxel PhD award**, awarded by “Freundeskreis des Forschungszentrums Karlsruhe e.V.” and DPG for outstanding PhD thesis in 2016 at the universities of Göttingen, Heidelberg, and Karlsruhe
- 03/2017–02/2019 **Post-doctoral fellowship of the National Academy of Sciences Leopoldina**, grant number LPDS 2016-12
- 03/2011–06/2011 **Scholarship of the German Academic Exchange Service (DAAD)** for studying 4 months at University of Technology Sydney
- 10/2007 – 12/2012 **Scholarship of the German National Academic Foundation** (“Stiftung des deutschen Volkes”) during undergraduate studies
- 07/2007 – 07/2016 **Scholarship of e-fellows.net** during undergraduate and graduate studies
- 07/2007 **Robert Mayer award** of the city of Heilbronn, awarded to the best high-school students in natural sciences of 2006/2007

Teaching experience

Lecturer at University of Stuttgart for:

- Winter 24/25 Advanced Many-Body Theory (4h/week),
the associated exercise class (2h/week)
- Summer 24 Quantum Field Theory (4h/week),
the associated exercise class (2h/week)
Hauptseminar “Moiré Materials & Quantum Magnetism”
- Winter 23/24 Advanced Quantum Mechanics (4h/week),
the associated exercise class (2h/week)

Lecturer at University of Innsbruck for:

- Summer 23 Statistical Physics (4h/week),
Seminar with Bachelor's Thesis (1 student)
- Winter 22/23 Theory of Condensed Matter (3h/week),
Research Seminar: Solid State Physics 2022 (2h/week), and
1 lecture in joint class Modern Physics (3h)
- Summer 22 Advanced Theory of Condensed Matter (3h/week),
Applications of Condensed Matter Theory (1h/week), and
Seminar with Bachelor's Thesis (3 students)
- Winter 21/22 Theory of Condensed Matter (3h/week) and
Research Seminar: Solid State Physics 2022 (2h/week)

- Summer 21 Advanced Theory of Condensed Matter (3h/week) and Seminar with Bachelor's Thesis (3 students)
- Winter 20/21 Theory of Condensed Matter (3h/week), the associated exercises "Proseminar" (2h/week), and 1 lecture in joint class Modern Physics (3h)

Head teaching assistant for Condensed Matter Theory II (Introduction to many-body field theory) at Karlsruhe Institute of Technology, Summer 2016

Responsibilities: Designing weekly exercise sheets complementing the lecture, presentation of solutions and Q&A with students (2 hours per week)

Teaching assistant at Karlsruhe Institute of Technology for **five** different classes:

- Summer 15 Theoretical Physics D (Quantum mechanics)
- Winter 14/15 Experimental Physics V (Solid state physics)
- Summer 14 Theoretical Physics F (Statistical mechanics)
- Winter 13/14 Theoretical Physics A (Classical mechanics)
- Summer 13 Theoretical Optics (Classical and quantum optics)

Responsibilities: Presentation of solutions to exercise sheets and Q&A with students (2 hours per week), grading of homework and exams

Professional service

- Scientific journals** Editorial College member at SciPost; Peer-review for Nature, Science, Nature Communications, Scientific Reports, Physical Review X, Physical Review Letters, Physical Review B, Annals of Physics, IOP Machine Learning: Science and Technology, and EPJ Quantum Technology
- Grants** Review of proposals for "Deutsche Forschungsgemeinschaft" (Germany), "National Academy of Sciences Leopoldina" (Germany), "European Research Council" (EU), "Swiss National Science Foundation" (Switzerland), "U.S. Department of Energy" (USA), "Israel Science Foundation" (Israel), "French National Research Agency" (France), "National Research Foundation" (Singapore), and "National Research, Development and Innovation Office" (Hungary)
- Books** Review of book proposal for Taylor & Francis Group

Publications

In total **81 manuscripts**: 8 preprints online, 1 book chapter, 1 News & Views article (Nature), and 71 published in peer-reviewed journals: Science (1), Nature Materials (1), Nature Physics (6), Nature Communications (5), Physical Review X (2), Proceedings of the National Academy of Sciences (4), Physical Review Letters (4), 2D Materials (2), SciPost Physics (4), ACS Nano Letters (1), ACS Nano (1), npj Quantum Materials (1), Scientific Reports (1), Physical Review B Letter (3), Physical Review B (26), Physical Review Research (8), and Journal of Physical Chemistry C (1).

Complete list of publications available online:

Submitted

1. *Eliashberg Theory and Superfluid Stiffness of Band-Off-Diagonal Pairing in Twisted Graphene*, B. Putzer and M. S. Scheurer, [arXiv:2501.12435](#).
2. *Dissipation-enhanced non-reciprocal superconductivity: application to multi-valley superconductors*, Sayan Banerjee and M. S. Scheurer, [arXiv:2501.01501](#).
3. *Physics-informed Transformers for Electronic Quantum States*, J. A. Sobral, M. Perle, M. S. Scheurer, [arXiv:2412.12248](#).
4. *Adatom engineering magnetic order in superconductors: Applications to altermagnetic superconductivity*, L. Pupim and M. S. Scheurer, [arXiv:2411.02489](#).
5. *Fractionalized Altermagnets: from neighboring and altermagnetic spin-liquids to fractionalized spin-orbit coupling*, J. A. Sobral, S. Mandal, M. S. Scheurer, [arXiv:2410.10949](#).
6. *Approximate symmetries, insulators, and superconductivity in continuum-model description of twisted WSe₂*, M. Christos, P. M. Bonetti, M. S. Scheurer [arXiv:2407.02393](#).
7. *Quadratic Dirac fermions and the competition of ordered states in twisted bilayer graphene*, J. Ingham, T. Li, M. S. Scheurer, H. D. Scammell, [arXiv:2308.00748](#).
8. *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](#).

Published

9. *A Novel Perspective on Ideal Chern Bands with Strong Short-Range Repulsion: Applications to Correlated Metals, Superconductivity, and Topological Order*, P. H. Wilhelm, A. M. Läuchli, M. S. Scheurer, *Phys. Rev. Research* **6**, 043240 (2024) [[arXiv:2406.09505](#)].
10. *Band theory for heterostructures with interface superlattices*, Bernhard Putzer, Lucas V. Pupim, M. S. Scheurer, *Phys. Rev. B* **110**, 125143 (2024) [[arXiv:2404.12420](#)].
11. *Altermagnetic superconducting diode effect*, S. Banerjee, M. S. Scheurer, *Phys. Rev. B* **110**, 024503, *Editors' Suggestion* (2024) [[arXiv:2402.14071](#)].
12. *AdvNF: Reducing Mode Collapse in Conditional Normalising Flows using Adversarial Learning*, Vikas Kanaujia, M. S. Scheurer, Vipul Arora, *SciPost Phys.* **16**, 132 (2024) [[arXiv:2401.15948](#)].

13. *Vestigial singlet pairing in a fluctuating magnetic triplet superconductor and its implications for graphene superlattices*, Prathyush P. Poduval, M. S. Scheurer, *Nature Communications* **15**, 1713 (2024) [[arXiv:2301.01344](#)].
14. *An exactly solvable dissipative spin liquid*, H. Shackleton, M. S. Scheurer, *Phys. Rev. B* **109**, 085115 (2024) [[arXiv:2307.05743](#)].
15. *Anisotropic multiband superconductivity in 2M-WS₂ probed by controlled disorder*, S. Ghimire, K. R. Joshi, M. Konczykowski, R. Grasset, A. Datta, M. A. Tanatar, D. Berube, S.-Y. Xu, Y. Fang, F. Huang, P. P. Orth, M. S. Scheurer, R. Prozorov, *Phys. Rev. Research* **6**, 013124 (2024) [[arXiv:2307.14891](#)].
16. *Electron irradiation reveals robust fully gapped superconductivity in LaNiGa₂*, S. Ghimire, K. R. Joshi, E. H. Krenkel, M. A. Tanatar, Yunshu Shi, M. Konczykowski, R. Grasset, V. Taufour, P. P. Orth, M. S. Scheurer, R. Prozorov, *Phys. Rev. B* **109**, 024515 (2024) [[arXiv:2311.12222](#)].
17. *Displacement-field-tunable superconductivity in an inversion-symmetric twisted van der Waals heterostructure*, H. D. Scammell, M. S. Scheurer, *Phys. Rev. B* **109**, 035159 (2024) [[arXiv:2308.10530](#)].
18. *Enhanced Superconducting Diode Effect due to coexisting Phases*, S. Banerjee, M. S. Scheurer, *Phys. Rev. Lett.* **132**, 046003 (2024) [[arXiv:2304.03303](#)].
19. *Broken time-reversal symmetry in cubic skutterudite-like superconductor Y₃Ru₄Ge₁₃*, A. Kataria, J. A. T. Verezhak, O. Prakash, R. K. Kushwaha, A. Thamizhavel, S. Ramakrishnan, M. S. Scheurer, A. D. Hillier, R. P. Singh, *Phys. Rev. B* **108**, 214512 (2023) [[arXiv:2308.15064](#)].
20. *Classifying topological neural network quantum states via diffusion maps*, Y. Teng, S. Sachdev, M. S. Scheurer, *Phys. Rev. B* **108**, 205152 (2023) [[arXiv:2301.02683](#)].
21. *Nodal band-off-diagonal superconductivity in twisted graphene superlattices*, M. Christos, S. Sachdev, M. S. Scheurer, *Nature Communications* **14**, 7134 (2023) [[arXiv:2303.17529](#)].
22. *Machine Learning Microscopic Form of Nematic Order in twisted double-bilayer graphene*, J. A. Sobral, S. Obernauer, S. Turkel, A. N. Pasupathy, M. S. Scheurer, *Nature Communications* **14**, 5012 (2023) [[arXiv:2302.12274](#)].
23. *Recent Advances in 2D Material Theory, Synthesis, Properties, and Applications*, Y.-C. Lin et al., *ACS Nano* **17** (11), 9694–9747 (2023).

24. *A model of d-wave superconductivity, antiferromagnetism, and charge order on the square lattice*, M. Christos, Z.-X. Luo, H. Shackleton, M. S. Scheurer, Subir Sachdev, *PNAS* **120**, e2302701120 (2023) [[arXiv:2302.07885](#)].
25. *Time-reversal symmetry breaking in superconducting low-carrier-density quasi-skutterudite Lu₃O₅Ge₁₃*, A. Kataria, J. A. T. Verezhak, O. Prakash, R. K. Kushwaha, A. Thamizhavel, S. Ramakrishnan, M. S. Scheurer, A. D. Hillier, R. P. Singh, *Phys. Rev. B* **107**, L100506 (Letter) [[arXiv:2211.03084](#)].
26. *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, *Nature Physics* **19**, 1156–1162 (2023) [[arXiv:2206.08354](#)].
27. *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, *SciPost Phys.* **14**, 040 (2023) [[arXiv:2204.05317](#)].
28. *Tunable superconductivity and Möbius Fermi surfaces in an inversion-symmetric twisted van der Waals heterostructure*, H. D. Scammell, M. S. Scheurer, *Phys. Rev. Lett.* **130**, 066001 (2023) [[arXiv:2210.03125](#)].
29. *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](#)].
30. *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](#)].
31. *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](#)].
32. *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](#)].
33. *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](#)].
34. *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](#)].

35. *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](#)].
36. *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. Ledesma, D. Kennes, R. Fernandes, A. Rubio, and A. Pasupathy, *Nature Physics* **18**, 196–202 (2022) [[arXiv:2009.11645](#)].
37. *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](#)].
38. *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](#)].
39. *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](#)].
40. *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](#)].
41. *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](#)].
42. *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](#)].
43. *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](#)].

44. *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](#)].
45. *Time-reversal-symmetry breaking and unconventional pairing in the noncentrosymmetric superconductor La_7Rh_3 probed by μ SR*, D. Singh, M. S. Scheurer, A. D. Hillier, R. P. Singh, *Phys. Rev. B* **102**, 134511 (2020) [[arXiv:1802.01533](#)].
46. *Bilocal quantum criticality*, H. D. Scammell, M. S. Scheurer, S. Sachdev, *Phys. Rev. Research* **2**, 033390 (2020) [[arXiv:2006.01834](#)].
47. *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](#)].
48. *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](#)].
49. *Microscopic theory of superconductivity in twisted double-bilayer graphene*, R. Samajdar and M. S. Scheurer, *Phys. Rev. B* **102**, 064501 (2020) [[arXiv:2001.07716](#)].
50. *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](#)].
51. *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](#)].
52. *Unsupervised machine learning and band topology*, M. S. Scheurer, R.-J. Slager, *Phys. Rev. Lett.* **124**, 226401 (2020) [[arXiv:2001.01711](#)].
53. *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](#)].
54. *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](#)].
55. *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](#)].

56. *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](#)].
57. *Spectroscopy of graphene with a magic twist*, [M. S. Scheurer](#), [Nature](#) **572**, 40-41 (2019).
58. *Identifying topological order through unsupervised machine learning*, J. F. Rodriguez-Nieva and [M. S. Scheurer](#), [Nature Physics](#) **15**, 790-795 (2019) [[arXiv:1805.05961](#)].
59. *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](#)].
60. *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](#)].
61. *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](#)].
62. *Designing morphotropic phase composition in BiFeO₃*, 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).
63. *Orbital currents in insulating and doped antiferromagnets*, [M. S. Scheurer](#) and S. Sachdev, [Phys. Rev. B](#) **98**, 235126 (2018) [[arXiv:1808.04826](#)].
64. *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](#)].
65. *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](#)].
66. *Nodeless superconductivity in type-II Dirac semimetal PdTe₂: 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](#)].
67. *Hierarchy of Information Scrambling, Thermalization, and Hydrody-*

dynamic Flow in Graphene, M. J. Klug, [M. S. Scheurer](#), J. Schmalian, *Phys. Rev. B* **98**, 045102 (2018) [[arXiv:1712.08813](#)].

68. *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](#)].
69. *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](#)].
70. *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](#)].
71. *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](#)].
72. *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](#)].
73. *Mechanism, time-reversal symmetry, and topology of superconductivity in noncentrosymmetric systems*, [M. S. Scheurer](#), *Phys. Rev. B* **93**, 174509 (2016) [[arXiv:1601.05459](#)].
74. *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](#)].
75. *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).
76. *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](#)].
77. *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](#)].
78. *Topological superconductivity and unconventional pairing in oxide interfaces*, [M. S. Scheurer](#) and J. Schmalian, *Nat. Commun.* **6**, 6005 (2015) [[arXiv:1404.4039](#)].

79. *Nonadiabatic processes in Majorana qubit systems*, M. S. Scheurer and A. Shnirman, *Phys. Rev. B* **88**, 064515 (2013) [arXiv:1305.4923].
80. *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

81. *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).

authors indicated with * contributed equally

Presentations

Talks

1. *Superconductivity due to and in spite of magnetism*, invited talk at Winter School of IMPRS-CMS, IMPRS-CPQM & MPI-UBC-UTokyo Center, Stuttgart, Germany, December 3, 2024
2. *Superconductivity in topological bands*, invited talk at CT.QMAT conference on Complexity and Topology, Dresden, Germany, September 24, 2024
3. *Superconductivity in van der Waal moiré systems*, seminar at Harvard University, Cambridge, USA, September 6, 2024
4. *Superconductivity in van der Waal moiré systems*, seminar at Brown University, Providence, USA, September 5, 2024
5. *Conventional superconductors with unconventional properties*, colloquium at Karlsruhe Institute of Technology, Karlsruhe, Germany, July 19, 2024
6. *Conventional superconductors with unconventional properties*, colloquium at Ruhr-Universität Bochum, Bochum, Germany, June 17, 2024
7. *Superconducting diode effect in moiré systems & altermagnets*, invited talk at conference on superconductivity, correlations, transport and layered materials, Bratislava, Slovakia, April 29, 2024
8. *Moiré superlattices as tunable platforms for novel quantum phases*, colloquium at University of Würzburg, Würzburg, Germany, February 5, 2024.
9. *Machine learning for many-body physics*, ICP colloquium, University of Stuttgart, Stuttgart, Germany, January 29, 2024

10. *Fluctuating triplet pairing, multiband superconductivity and an exactly solvable dissipative spin liquid*, invited talk at ICTP Conference on Fractionalization and Emergent Gauge Fields in Quantum Matter, Trieste, Italy, December 6, 2023, [recording available online](#).
11. *Exotic many-body physics in van der Waals moiré systems*, invited talk at Ringberg symposium on Exotic States of Quantum Condensed Matter, Ringberg Castle, Germany, November 15, 2023.
12. *Engineering many-body physics in van der Waals moiré systems*, seminar talk at Center for Quantum Science at the University of Tübingen, Tübingen, Germany, October 24, 2023.
13. *Novel states of matter in van der Waals moiré systems*, Workshop on Criticality, Dynamics, and nonequilibrium Behavior in Quantum Systems, University of Évora, Portugal, October 2, 2023.
14. *Exotic many-body physics in van der Waals moiré systems*, Korrelationstage 2023, MPI-PKS, Dresden, Germany, September 14, 2023.
15. *Strongly correlated physics in van der Waals moiré systems*, Invited talk at Solvay Workshop on SYK—from strongly correlated systems to quantum gravity, Brussels, BEL, June 27, 2023.
16. *Exotic many-body physics in van der Waals moiré systems*, Seminar at University of Oxford, Oxford, UK, February 8, 2023.
17. *Exotic superconductivity and magnetism in van der Waals moiré systems*, Seminar at Max-Planck Institute for Solid-State Research, Stuttgart, September 22, 2022.
18. *Zero-field superconducting diode effect in twisted trilayer graphene*, invited talk at IBS-APCTP conference on Advances in the Physics of Topological & Correlated Matter, Daejeon, Korea, September 20, 2022 (virtual).
19. *Theory of zero-field superconducting diode effect in trilayer graphene*, Invited talk at Virtual Science Forum conference on Superconducting diode effects, Mai 19, 2022, [Material Online](#).
20. *Quantum many-body physics in moiré superlattices*, Invited talk at 3rd PhD symposium on Correlated Magnetism, Dresden, April 5, 2022.
21. *Many-body physics in several twisted graphene systems*, Seminar, Wrocław University of Science & Technology, November 17, 2021, virtually.
22. *Correlated many-body physics in twisted trilayer graphene*, joint annual meeting of ÖPG and SPS, Innsbruck, September 1, 2021.

23. *More moiré is better: many-body physics in several twisted graphene systems*, Condensed Matter Seminar, Niels Bohr Institute, October 29, 2021, virtually.
24. *More moiré is better: many-body physics in several twisted graphene systems*, Condensed Matter Seminar, TU Munich, June 30, 2021, virtually.
25. *Many-body physics in 'other' twisted graphene systems*, at conference Correlations in Novel Quantum Materials, June 10, 2021, [Material Online](#).
26. *Form and field-tunability of nematic order in twisted double-bilayer graphene*, March Meeting 2021, March 16, 2021, virtually.
27. *Superconductivity, its relation to the correlated insulators, and field-controlled nematicity in moiré graphene*, Seminar, Bar-Ilan University, January 7, 2021, virtually.
28. *Superconductivity, its relation to the correlated insulators, and field-controlled nematicity in twisted graphene*, at KITP Program: Correlated Systems with Multicomponent Local Hilbert Spaces, Dec 14, 2020, virtually [Material Online](#).
29. *Correlated many-body physics in moiré superlattices of graphene*, BLABS Seminar, Los Alamos National Laboratory, October 12, 2020, virtually.
30. *Superconductivity and its relation to the correlated insulators in moiré graphene*, Seminar, Weizmann Institute of Science, September 23, 2020, virtually.
31. *Moiré superlattices of graphene as a platform for many-body physics*, Colloquium, University of Innsbruck, June 16, 2020, virtually.
32. *Gauge theories for the thermal Hall effect*, virtual March Meeting 2020, March 13, 2020, [Material Online](#).
33. *Unsupervised machine learning of topological phase transitions*, virtual March Meeting 2020, March 11, 2020, [Material Online](#).
34. *Topology and correlations in two-dimensional systems*, Condensed Matter Seminar, UC Irvine, February 10, 2020, Irvine (USA).
35. *Topology and correlations in two-dimensional systems*, CAMP Seminar, Penn State University, January 29, 2020, State College (USA).
36. *Topology and correlations in two-dimensional systems*, Colloquium, Carnegie Mellon University, January 13, 2020, Pittsburgh (USA).

37. *Effective theories for the strongly coupled Hubbard model*, CCQ Seminar, Flatiron Institute, December 12, 2019, New York City (USA).
38. *Effective theories for the strongly interacting Hubbard model*, CQP Colloquium, New York University, December 11, 2019, New York City (USA).
39. *Gauge theories for the cuprates: thermal Hall effect and pseudogap*, CMSA Condensed Matter/Math seminar, Harvard University, November 7, 2019, Cambridge (USA).
40. *Gauge theories for the cuprates: thermal Hall effect and optimal doping*, Condensed Matter/Biophysics seminar, University of Florida, November 4, 2019, Gainesville (USA).
41. *Gauge theories for the strongly coupled Hubbard model*, Seminar at University of Innsbruck, October 22, 2019, Innsbruck (Austria).
42. *Gauge theories for the cuprates: thermal Hall effect and optimal doping*, Boston College, October 10, 2019, Newton (USA).
43. *Enhanced thermal Hall effect in the square-lattice Néel state*, Symposium on Theory of Novel Materials at Max Planck Institute of Solid State Research, September 26, 2019, Stuttgart (Germany).
44. *Gauge theories for the cuprates: thermal Hall effect*, at conference Quantum criticality and topology in correlated electron systems at Max Planck Institute for the Physics of Complex Systems, August 5, 2019, Dresden (Germany).
45. *Gauge theories for the cuprates near optimal doping*, at APS March Meeting 2019, March 4, 2019, Boston (USA).
46. *Gauge theories for the cuprates*, Condensed Matter Theory Seminar, University of Cologne, February 14, 2019, Cologne (Germany).
47. *Topology in correlated condensed matter systems*, LASSP and AEP seminar, Cornell University, February 05, 2019, Ithaca (USA).
48. *Gauge theories of fluctuating antiferromagnetism for the cuprate superconductors*, Seminar of the Institute for Theoretical Condensed Matter Physics, Karlsruhe Institute of Technology, December 06, 2018, Karlsruhe (Germany).
49. *Gauge theories of fluctuating antiferromagnetism for the cuprate superconductors*, CMT Seminar at TU Dresden, December 04, 2018, Dresden (Germany).

50. *Gauge theories of fluctuating antiferromagnetism for the cuprate superconductors*, Seminar at University of Würzburg, November 29, 2018, Würzburg (Germany).
51. *Gauge theories of fluctuating antiferromagnetism for the cuprate superconductors*, Condensed Matter Seminar at University of Minnesota, November 14, 2018, Minneapolis (USA).
52. *SU(2) gauge theory of fluctuating magnetism: Fermi-surface reconstruction without translational-symmetry breaking*, at conference *Topology and Quantum Phases of Matter*, August 28, 2018, Cambridge (USA).
53. *Evidence for topological order in the pseudogap metal*, at APS March Meeting 2018, March 6, 2018, Los Angeles (USA).
54. *Topological order in the pseudogap metal*, Condensed Matter Physics Seminar at Iowa State University, February 15, 2018, Ames (USA).
55. *Evidence for topological order in the pseudogap metal from DMFT and QMC*, group seminar at Harvard University, October 27, 2017, Cambridge (USA).
56. *Mechanism, Symmetrie und Topologie geordneter Phasen in korrelierten Systemen*, at Otto-Haxel Symposium, April 7, 2017, Karlsruhe (Germany).
57. *Interplay between mechanism, symmetry and topology at superconducting interfaces*, at conference *Condensed Matter Physics in the City 2016*, July 7, 2016, London (England).
58. *Mechanism, symmetry, and topology of noncentrosymmetric superconductors*, Condensed Matter Seminar at University of St Andrews, June 1, 2016, St Andrews (Scotland).
59. *Interaction-induced topological superconductivity in 2D interfaces*, Landau Seminar at Loughborough University, October 14, 2015, Loughborough (England).
60. *Topological superconductivity and unconventional pairing in oxide interfaces*, at conference *Materials & Mechanisms of Superconductivity 2015*, August 27, 2015, Geneva (Switzerland).
61. *Time-reversal symmetry in superconducting interfaces and 2D sheets*, Seminar of the Institute for Theoretical Condensed Matter Physics, Karlsruhe Institute of Technology, June 25, 2015, Karlsruhe (Germany).
62. *Topological superconductivity in two-dimensional interfaces*, Seminar at University of Würzburg, May 29, 2015, Würzburg (Germany).

63. *Topological superconductivity and unconventional pairing in oxide interfaces*, DPG Spring Meeting 2015, March 16, 2015, Berlin (Germany).
64. *Superconductivity: Aspects of symmetry and topology*, at conference *Matière et Symétries*, December 3, 2014, Grenoble (France).
65. *Topological superconductivity and unconventional pairing in oxide interfaces*, at conference *Quantum Critical Matter – From Atoms to Bulk*, August 21, 2014, Obergurgl (Austria).
66. *Topological superconductivity and unconventional pairing in oxide interfaces*, Seminar of the Institute for Theoretical Condensed Matter Physics, Karlsruhe Institute of Technology, June 12, 2014, Karlsruhe (Germany).
67. *Interaction-induced instabilities in $\text{LaAlO}_3/\text{SrTiO}_3$ interfaces*, DPG Spring Meeting 2014, April 2, 2014, Dresden (Germany).

Posters

68. *Zero-field superconducting diode effect in twisted trilayer graphene*, at conference *Novel Electronic Properties of Two-Dimensional Materials*, July 11-15, 2022, San Sebastian (Spain).
69. *Zero-field superconducting diode effect in twisted trilayer graphene*, at conference *Correlations in Novel Quantum Materials 2022*, June 20-23, 2022, MPI Stuttgart (Germany).
70. *Theory of nematic order in twisted double-bilayer graphene*, at CIFAR-QM Meeting, Nov 2-3, 2020, virtually (on slack).
71. *Identifying topological order via unsupervised machine learning*, at postdoc meeting at Harvard University, September 12, 2018, Hull (USA).
72. *Topological order and broken symmetries in the pseudogap metal*, at *Gordon Conference on Correlated Electron Systems*, June 24–29, 2018, Mount Holyoke College (USA).
73. *Topological order and broken symmetries in the pseudogap metal*, at conference *Correlated Electron Systems – Novel Developments*, May 16–19, 2018, Minneapolis (USA).
74. *Evidence for topological order in the pseudogap metal from dynamical mean-field theory and quantum Monte Carlo*, at postdoc meeting at Harvard University, September 13, 2017, Hull (USA).
75. *Topological order and DMFT/QMC spectra for the pseudogap metal*,

at conference *Intertwined order and fluctuations in quantum materials*, July 31–August 5, 2017, University of California, Santa Barbara (USA).

76. *Topological order near the Néel state of the square-lattice antiferromagnet*, at *Gordon Conference on Novel trends in superconductivity of correlated electrons*, June 4–9, 2017, Waterville Valley (USA).
77. *Interaction-induced topological superconductivity in interfaces*, at summer school *COR. S.O.: New physics due to Spin-Orbit coupling in CORrelated electron systems*, August 4–14, 2015, Cargèse (France).
78. *Interaction-induced instabilities in perovskite heterointerfaces*, at *Gordon Conference on Correlated Electron Systems*, June 22–27, 2014, Mount Holyoke College (USA).
79. *Non-adiabatic effects due to the motion of Majorana fermions*, at conference *Majorana Fermions in Condensed Matter*, July 2–6, 2012, Leiden (Netherlands).