Haoyu Guo

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Employment

Institute of Physics, Chinese Academy of Sciences *2026 -*
Associate Professor

Cornell University *2023 - 2026*
Bethe-Wilkins-KIC postdoctoral Fellow

Education

Harvard University *2018 - 2023*
PhD in Physics
Dissertation: *Novel Transport Phenomena in Quantum Matter*
Dissertation Advisor: Prof. Subir Sachdev

Massachusetts Institute of Technology *2015 - 2018*
Bachelor of Science in Physics and Mathematics
Thesis: *Signatures of Hydrodynamic Transport in an Electron System*
Thesis Supervisor: Prof. Leonid Levitov

Peking University *2014 - 2015*
Major in Physics

Teaching

Teaching Fellow, Phys 268R, *Quantum Phases of Matter*, Prof. Subir Sachdev, Fall 2020. Recordings

Teaching Fellow, Phys 295A, *Introduction to Quantum Theory of Solids*, Prof. Subir, Savhdev, Fall 2019.

Awards

Kavli Institute for Theoretical Physics Graduate Fellowship, 2022

Harvard University Merit Fellowship, 2021

Harvard University Distinction in Teaching, Fall 2019 and Fall 2020

MIT Department of Physics The Joel Matthew Orloff Award for Research, 2018

45th International Physics Olympiad, Gold Medal, 2014

Selected Talks

1. Phonon thermal Hall effect from scattering off two-level systems
   Invited talk at APS March Meeting 2024, Session F42
2. Fluctuation Spectrum of Critical Fermi Surface from Eliashberg Theories
   Talk at KITP program *Correlated Gapless Quantum Matter*

3. Angular dynamics of 2+1D Fermi and non-Fermi liquids
   Invited talk at *Non-Fermi Liquids: Recent Developments and Future Prospects*, Workshop at Kadanoff Center for Theoretical Physics and James Franck Institute of University of Chicago, 2024

4. Transport in large-N critical Fermi surface
   Seminar at Harvard CMSA, 2022

5. Resonant side-jump thermal Hall effect of phonons coupled to dynamical defects
   Seminar at Harvard CMSA, 2022

Publication (Google Scholar page)

1. Haoyu Guo, Maria Tikhanovskaya, Paul Raccuglia, Alexey Vlaskin, Chris Co, Daniel J. Liebling, Scott Ellsworth, Matthew Abraham, Elizabeth Dorfman, N. P. Armitage, Chunhan Feng, Antoine Georges, Olivier Gingras, Dominik Kiese, Steven A. Kivelson, Vadim Oganesyan, B. J. Ramshaw, Subir Sachdev, T. Senthil, J. M. Tranquada, Michael P. Brenner, Subhashini Venugopalan and Eun-Ah Kim
   Expert Evaluation of LLM World Models: A High-T_c Superconductivity Case Study
   Proceedings of the National Academy of Sciences **123**, e2533676123 (2026)

2. Haoyu Guo and Debanjan Chowdhury
   Phonon Induced Energy Relaxation in Quantum Critical Metals
   Phys. Rev. Lett. **136**, 126503 (2026)

3. Haoyu Guo and Debanjan Chowdhury
   Can electronic quantum criticality drive phonon-induced linear-in-temperature resistivity?
   arXiv:2603.11176 (2026)

4. Keiran J. Lewellen, Rohit Mukherjee, Haoyu Guo, Saswata Roy, Valla Fatemi, and Debanjan Chowdhury
   Frozonium: Freezing Anharmonicity in Floquet Superconducting Circuits
   Newton, 100434 (2026)

5. Rohit Mukherjee, Haoyu Guo, and Debanjan Chowdhury
   Floquet-Thermalization via Instantons near Dynamical Freezing
   Phys. Rev. X **16**, 011041 (2026)

6. Avijit Maity, Haoyu Guo, Subir Sachdev, and Vikram Tripathi
   Thermal Hall response of an abelian chiral spin liquid at finite temperatures
   Phys. Rev. B **111**, 205119 (2025)

7. Haoyu Guo, Matthew S. Foster, Chao-Ming Jian, Andreas W.W. Ludwig
   Field theory of monitored, interacting fermion dynamics with charge conservation
   Phys. Rev. B **112**, 064304 (2025)

8. Yihang Zeng, Haoyu Guo, Olivia M. Ghosh, Kenji Watanabe, Takashi Taniguchi, Leonid S. Levitov, Cory R. Dean
   Quantitative measurement of viscosity in two-dimensional electron fluids
   arXiv:2407.05026 (2024)

9. Haoyu Guo
   Fluctuation spectrum of critical Fermi surfaces
   Phys. Rev. B **110**, 155130 (2024)

10. Chenyuan Li, Davide Valentinis, Aavishkar A. Patel, Haoyu Guo, Jörg Schmalian, Subir Sachdev, Ilya Esterlis

Strange metal and superconductor in the two-dimensional Yukawa-Sachdev-Ye-Kitaev model
Phys. Rev. Lett. **133**, 186502 (2024)

11. Rohit Mukherjee, Haoyu Guo, Keiran Lewellen, Debanjan Chowdhury
Arresting Quantum Chaos Dynamically in Transmon Arrays
Newton **1**, 100011 (2025)

12. Haoyu Guo, Rohit Mukherjee, Debanjan Chowdhury
Dynamical Freezing in Exactly Solvable Models of Driven Chaotic Quantum Dots
Phys. Rev. Lett. **134**, 226501 (2025)

13. Haoyu Guo
Fluctuation Spectrum of 2+1D Critical Fermi Surface and its Application to Optical Conductivity and Hydrodynamics
arXiv:2311.03458 (2023)

14. Haoyu Guo
Is the Migdal-Eliashberg Theory for 2+1D Critical Fermi Surface Stable?
arXiv:2311.03455 (2023)

15. Haoyu Guo, Davide Valentinis, Jörg Schmalian, Subir Sachdev, Aavishkar A. Patel
Cyclotron resonance and quantum oscillations of critical Fermi surfaces
Phys. Rev. B **109** (2024), 075162

16. Haoyu Guo
Phonon thermal Hall effect in a non-Kramers paramagnet
Phys. Rev. Research **5** (2023), 033197

17. Haoyu Guo, Aavishkar A. Patel, Ilya Esterlis, Subir Sachdev
Large N theory of critical Fermi surfaces II: conductivity
Phys. Rev. B **106** (2022), 115151

18. Aavishkar A. Patel, Haoyu Guo, Ilya Esterlis, Subir Sachdev
Universal theory of strange metals from spatially random interactions
Science **381**,790 (2023)

19. Haoyu Guo, Darshan G. Joshi, Subir Sachdev
Resonant thermal Hall effect of phonons coupled to dynamical defects
Proceedings of the National Academy of Sciences **119**, e2215141119 (2022)

20. Ilya Esterlis, Haoyu Guo, Aavishkar A Patel, Subir Sachdev
Large-N theory of critical Fermi surfaces
Phys. Rev. B **103** (2021), 235129 - *Featured in Physics, Editor's suggestion*

21. Haoyu Guo, Subir Sachdev
Extrinsic phonon thermal Hall transport from Hall viscosity
Phys. Rev. B **103** (2021), 205115

22. Maria Tikhanovskaya, Haoyu Guo, Subir Sachdev, Grigory Tarnopolsky
Excitation spectra of quantum matter without quasiparticles. II. Random $t - J$ models
Phys. Rev. B **103** (2021), 075142

23. Maria Tikhanovskaya, Haoyu Guo, Subir Sachdev, Grigory Tarnopolsky
Excitation spectra of quantum matter without quasiparticles. I. Sachdev-Ye-Kitaev models
Phys. Rev. B **103** (2021), 075141

24. Haoyu Guo, Yingfei Gu, Subir Sachdev
Linear in temperature resistivity in the limit of zero temperature from the time reparameterization

soft mode
Annals of Physics, 168202 (2020)

25. Haoyu Guo, Rhine Samajdar, Mathias S. Scheurer, Subir Sachdev
Gauge Theories for the Thermal Hall Effect
Physical Review B **101** (2020), 195126 - *Editor's suggestion*

26. Rhine Samajdar, Mathias S Scheurer, Shubhayu Chatterjee, Haoyu Guo, Cenke Xu, Subir Sachdev
Enhanced thermal Hall effect in the square-lattice Néel state
Nature Physics **15**, 1290-1294 (2019)

27. Patrick J Ledwith, Haoyu Guo, Andrey V Shytov, Leonid Levitov
The Hierarchy of Excitation Lifetimes in Two-Dimensional Fermi Gases
Annals of Physics, 167913 (2019)

28. Patrick J Ledwith, Haoyu Guo, Andrey V Shytov, Leonid Levitov
Tomographic Dynamics and Scale-Dependent Viscosity in 2D Electron Systems
Phys. Rev. Lett. **123** (2019), 116601

29. Haoyu Guo, Yingfei Gu, Subir Sachdev
Transport and Chaos in Lattice Sachdev-Ye-Kitaev Models
Phys. Rev. B **100** (2019), 045140

30. Patrick Ledwith, Haoyu Guo, Leonid Levitov
Angular Superdiffusion and Directional Memory in Two-Dimensional Electron Fluids
arXiv:1708.01915 (2017)

31. R. Krishna Kumar and D. A. Bandurin and F. M. D. Pellegrino and Y. Cao and A. Principi and H. Guo and G. H. Auton and M. Ben Shalom and L. A. Ponomarenko and G. Falkovich and K. Watanabe and T. Taniguchi and I. V. Grigorieva and L. S. Levitov and M. Polini and A. K. Geim
Superballistic flow of viscous electron fluid through graphene constrictions
Nature Physics **13**, 1182–1185(2017)

32. Haoyu Guo, Ekin Ilseven, Gregory Falkovich, and Leonid Levitov
Higher-than-Ballistic Conduction of Viscous Electron Flows
Proceedings of the National Academy of Sciences **114**, 3068–3073 (2017)

33. Haoyu Guo, Ekin Ilseven, Gregory Falkovich, Leonid Levitov
Stokes Paradox, Back Reflections and Interaction-Enhanced Conduction
arXiv:1612.09239 (2016)