Debanjan Chowdhury

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Appointments

Associate Professor (with tenure) Cornell University, USA	02/2026 -
J.A. Yelencsics Rosevear '65 & F.M. Rosevear '64 Assistant Professor Cornell University, USA	07/2024 - 01/2026
Assistant Professor Cornell University, USA	01/2020 - 01/2026
Gordon and Betty Moore Foundation Postdoctoral Fellow Massachusetts Institute of Technology (MIT), USA	07/2016 - 06/2019

Education

Ph.D. in Physics (Advisor: Subir Sachdev) Harvard University, USA Thesis: *Interplay of broken symmetries and quantum criticality in correlated electronic systems.*	08/2010 - 05/2016
A.M. (Master of Arts) in Physics Harvard University, USA	09/2010 - 05/2012
M.Sc. (Master of Science-Integrated) in Physics Indian Institute of Technology, Kanpur, India.	07/2005 - 05/2010

Selected Honors

Department of Energy Early Career Research Award, 2025 - 2030

Scialog Fellow (RCSA), Quantum Matter and Information, 2025

Alfred P. Sloan Research Fellow in Physics, 2023 - 2025

National Science Foundation CAREER Award, 2023 - 2028

Gordon and Betty Moore Foundation Fellowship (2016-2019), MIT, USA

Graduate Society Research Fellowship (2014-2015), GSAS, Harvard University, USA

Feinberg Graduate School Fellowship (2013), Weizmann Institute of Science, Israel

E.M. Purcell Fellowship (2010-2011), Harvard University, USA

Kishore Vaigyanik Protsahan Yojana (KVPY) Fellowship (2006-2010), Govt. of India

Publications (Since 01/2020)

Google Scholar (> 5600 citations; h-index= 36)
†: equal authorship

1. L. Zhang†, A.T. Pierce†, X. Wang, S. Reinhardt, K. Watanabe, T. Taniguchi, K.F. Mak, J. Shan, Debanjan Chowdhury, and Valla Fatemi, *Strongly coupled ultracompressed self-cavity plasmon polaritons at millikelvin temperatures*, arXiv:2610.00473
2. S. Banerjee, H. Guo, Debanjan Chowdhury, *Bootstrap certification of string order in quantum spin chains*, arXiv:2609.22420
3. Y. Lee, H. Jin, S. Chandra, B.H. Goodge, E. Lesne, T. Confalone, F. Tafuri, D. Massarotti, G. Haider, K. Nielsch, B. Büchner, C. Felser, Debanjan Chowdhury, N. Poccia, U. Vool, *Resolving unconventional gap structure in kagome superconductors with hybrid microwave circuits*, arXiv:2609.00964
4. X. Wang, S. Banerjee, Debanjan Chowdhury, *Determinant Quantum-Quantum Monte Carlo: Coherent Auxiliary-Field Sampling*, arXiv: 2608.28742
5. H. Guo, Debanjan Chowdhury, *Floquet Quasiparticle Poisoning of Frozonium*, arXiv:2608.12454
6. J.Z. Kim†, O. Lesser†, Debanjan Chowdhury, *Charting the emergent low-dimensional manifold of quantum materials*, arXiv:2606.12520
7. D. Pimenov, N. R. Poniatowski, C. G. L. Bøttcher, A. Yacoby, Debanjan Chowdhury, *Dynamical Control of Superconductivity in Superconductor-Ferromagnet Bilayers*, arXiv:2606.12544
8. O. Lesser, Debanjan Chowdhury, *Competing nonlinearities, criticality, and order-to-chaos transition in deep networks*, arXiv:2605.05294
9. H. Guo, Debanjan Chowdhury, *Can electronic quantum criticality drive phonon-induced linear-in-temperature resistivity?*, **SciPost Phys. 21**, 047 (2026)
10. Debanjan Chowdhury, *Information, Dissipation, and Planckian Optimality*, arXiv:2602.04953
11. Debanjan Chowdhury, *Planckian Bounds via Spectral Moments of Optical Conductivity*, arXiv:2512.09979
12. A. T. Pierce†, C. Vaswani†, D. Pimenov, S. Xu, K. Watanabe, T. Taniguchi, E. Mueller, Debanjan Chowdhury, K. F. Mak and J. Shan, *Imaging propagating terahertz collective modes in two-dimensional semiconductor double layers*, arXiv:2511.22962
13. X. Wang, J.S. Hofmann, Debanjan Chowdhury, *Intertwined Orders, Quantum Criticality and Skyrmions in Tunable Topological Bands*, arXiv:2510.21913
14. H. Guo, Debanjan Chowdhury, *Phonon Induced Energy Relaxation in Quantum Critical Metals*, **Physical Review Letters 136**, 126503 (2026)
15. R. Mukherjee†, H. Guo†, Debanjan Chowdhury, *Floquet Thermalization via Instantons near Dynamical Freezing*, **Physical Review X 16**, 011041 (2026)
16. K. Lewellen, R. Mukherjee†, H. Guo†, S. Roy, V. Fatemi, Debanjan Chowdhury, *Frozonium: Freezing Anharmonicity in Floquet Superconducting Circuits*, **Newton 2**, 100434 (2026)
17. H. Pan, J.V. Roggeveen, E. Berg, J. Carrasquilla, Debanjan Chowdhury, S. Ganguli, F. Ghimenti, J. Hasik, H. Hunt, H.-C. Jiang, M. Kamb, Y.-J. Kao, E. Khatami, M.J. Lawler, D. Luo, T. Neupert, X.L. Qi, M.P. Brenner, E.A. Kim, *CMT-Benchmark: A Benchmark for Condensed Matter Theory Built by Expert Researchers*, **International Conference on Learning Representations**, 35522-35540 (2026)
18. X. Wang, J.F. Mendez-Valderrama, J.S. Hofmann, Debanjan Chowdhury, *Spin-Polaron Mediated Superconductivity in Doped Chern Antiferromagnets*, arXiv:2507.22971
19. O. Lesser†, S. Banerjee†, X. Wang, J. Kim, E. Altman, Debanjan Chowdhury, *Gaplessness from disorder and quantum geometry in gapped superconductors*, **Physical Review B 113**, 035109 (2026)
20. E. Buznach, Debanjan Chowdhury, J. Ruhman, *Unveiling a Hidden Percolation Transition in Monitored Clifford Circuits: Inroads from ZX-Calculus*, **Physical Review Letters 135**, 050402 (2025).

21. D. Mao, J.F. Mendez-Valderrama, Debanjan Chowdhury, *Low-energy optical absorption in correlated insulators: Projected sum rules and the role of quantum geometry*, **Physical Review B 112**, 075116 (2025). (**Editors' Suggestion**)

22. H. Guo, R. Mukherjee, Debanjan Chowdhury, *Dynamical Freezing in Exactly Solvable Models of Driven Chaotic Quantum Dots*, **Physical Review Letters 134**, 226501 (2025).

23. S. Kim†, J.F. Mendez-Valderrama†, X. Wang†, Debanjan Chowdhury, *Theory of Correlated Insulators and Superconductor at $\nu = 1$ in Twisted WSe_2*, **Nature Communications 16**, 1701 (2025).

24. R. Mukherjee†, H. Guo†, K. Lewellen, Debanjan Chowdhury, *Arresting Quantum Chaos Dynamically in Transmon Arrays*, **Newton 1**, 100011 (2025).

25. J.F. Mendez-Valderrama†, S. Kim†, Debanjan Chowdhury, *Correlated Topological Mixed-Valence Insulators in Moiré Hetero-Bilayers*, **Physical Review B 110**, L201105 (2024). (**Letter**) (**Editors' Suggestion**)

26. Z. Yang, C. Marcenat, S. Kim, S. Imajo, M. Kimata, T. Nomura, A.D. Muer, D.K. Maude, F. Iga, T. Klein, Debanjan Chowdhury, Y. Kohama, *Evidence for large thermodynamic signatures of in-gap fermionic quasiparticle states in a Kondo insulator*, **Nature Communications 15**, 7801 (2024).

27. X. Wang, J.F. Mendez-Valderrama, J.S. Hofmann, Debanjan Chowdhury, *Intertwined magnetism and superconductivity in isolated correlated flat bands*, **Physical Review B 110**, L041105 (2024). (**Letter**) (**Editors' Suggestion**)

28. S. Kim, M. Saad, D. Mao, A. Agarwala, Debanjan Chowdhury, *Quasicrystalline Spin Liquid*, **Physical Review B 110**, 214438 (2024).

29. J.F. Mendez-Valderrama, D. Mao, Debanjan Chowdhury, *Low-energy optical sum-rule in moiré graphene*, **Physical Review Letters 133**, 196501 (2024).

30. W. Zhao†, B. Shen†, Z. Tao†, S. Kim, P. Knüppel, Z. Han, Y. Zhang, K. Watanabe, T. Taniguchi, Debanjan Chowdhury, J. Shan, K.F. Mak, *Emergence of ferromagnetism at the onset of moiré Kondo breakdown*, **Nature Physics 20**, 1772 - 1777 (2024).

31. X. Wang, R. Moessner and Debanjan Chowdhury, *Interaction-mitigated Landau damping*, **Physical Review B 109**, L121102 (2024). (**Letter**)

32. T.G. Kiely and Debanjan Chowdhury, *Continuous Wigner-Mott Transition at $\nu = 1/5$*, **Physical Review B 110**, L241112 (2024). (**Letter**) (**Editors' Suggestion**)

33. D. Mao and Debanjan Chowdhury, *Upper bounds on superconducting and excitonic phase-stiffness for interacting isolated narrow bands*, **Physical Review B, 109**, 024507 (2024). (**Editors' Suggestion**)

34. Z. Yang, B. Fauque, T. Nomura, T. Shitaokoshi, S. Kim, Debanjan Chowdhury, Z. Pribulova, J. Kacmarcik, A. Pourret, G. Knebel, D. Aoki, T. Klein, D. K. Maude, C. Marcenat, Y. Kohama, *Unveiling the double-peak structure of quantum oscillations in the specific heat*, **Nature Communications 14**, 7006 (2023).

35. J.F. Mendez-Valderrama†, E. Tulipman†, E. Zhakina, A.P. Mackenzie, E. Berg and Debanjan Chowdhury, *$T-$linear resistivity from magneto-elastic scattering: application to $PdCrO_2$*, **Proceedings of the National Academy of Sciences 120 (36)**, e2305609120 (2023).

36. E. Zhakina, R. Daou, A. Maignan, P.H. McGuinness, M. König, H. Rosner, S. Kim, S. Khim, R. Grasset, M. Konczykowski, E. Tulipman, J.F. Mendez-Valderrama, Debanjan Chowdhury, E. Berg, and A.P. Mackenzie, *Investigation of Planckian behavior in a high-conductivity oxide: $PdCrO_2$*, **Proceedings of the National Academy of Sciences 120 (36)**, e2307334120 (2023).

37. S.J. Thornton, D. Liarte, P. Abbamonte, J.P. Sethna and Debanjan Chowdhury, *Jamming and unusual charge density fluctuations of strange metals*, **Nature Communications 14**, 3919 (2023).

38. D. Mao and Debanjan Chowdhury, *Diamagnetic response and phase stiffness for interacting isolated narrow bands*, **Proceedings of the National Academy of Sciences 120 (11)**, e2217816120 (2023).

39. X. Wang and Debanjan Chowdhury, *Collective density fluctuations of strange metals with critical Fermi surfaces*, **Physical Review B 107**, 125157 (2023). (**Editors' Suggestion**)

40. A.J. McRoberts[†], J.F. Mendez-Valderrama[†], R. Moessner and Debanjan Chowdhury, *An intermediate scale theory for electrons coupled to frustrated local-moments*, **Physical Review B 107**, L020402 (2023). (**Letter**)

41. S. Kim, A. Agarwala and Debanjan Chowdhury, *Fractionalization and topology in amorphous electronic solids*, **Physical Review Letters 130,** 026202 (2023).

42. S. Kim, T. Senthil and Debanjan Chowdhury, *Continuous Mott transition in moiré semiconductors: role of long-wavelength inhomogeneities*, **Physical Review Letters 130,** 066301 (2023).

43. J. Hofmann, E. Berg and Debanjan Chowdhury, *Superconductivity, charge density wave and supersolidity in flat bands with tunable quantum metric*, **Physical Review Letters 130**, 226001 (2023).

44. S. Xie, B.D. Faeth, Y. Tang, L. Li, E. Gerber, C.T. Parzyck, Debanjan Chowdhury, Y.-H. Zhang, C. Jozwiak, A. Bostwick, E. Rotenberg, E-A. Kim, J. Shan, K.F. Mak and K.M. Shen, *Strong interlayer interactions in bilayer and trilayer moiré superlattices*, **Science Advances 8**, eabk1911 (2022).

45. D.B. Liarte, S. Thornton, E. Schwen, I. Cohen, Debanjan Chowdhury, and J.P. Sethna, *Universal scaling for disordered viscoelastic matter II: Collapses, global behavior and spatio-temporal properties*, arXiv:2202.13933 (2022)

46. D.B. Liarte, S. Thornton, E. Schwen, I. Cohen, Debanjan Chowdhury, and J.P. Sethna, *Universal scaling for disordered viscoelastic matter near the onset of rigidity*, **Physical Review E 106**, L052601 (2022). (**Letter**)

47. S. Musser, T. Senthil and Debanjan Chowdhury, *Theory of a continuous bandwidth-tuned Wigner-Mott transition*, **Physical Review B 106**, 155145 (2022).

48. S. Musser, Debanjan Chowdhury, P.A. Lee and T. Senthil, *Interpreting Angle Dependent Magnetoresistance in Layered Materials: Application to Cuprates*, **Physical Review B 105**, 125105 (2022).

49. [*Review*] Debanjan Chowdhury, A. Georges, O. Parcollet and S. Sachdev, *Sachdev-Ye-Kitaev Models and Beyond: A Window into Non-Fermi Liquids*, **Reviews of Modern Physics 94**, 035004 (2022).

50. J. Hofmann, Debanjan Chowdhury, S.A. Kivelson and E. Berg, *Heuristic bounds on superconductivity and how to exceed them*, **npj Quantum Materials 7**, 83 (2022).

51. T. Li, S. Jiang, L. Li, Y. Zhang, K. Kang, J. Zhu, K. Watanabe, T. Taniguchi, Debanjan Chowdhury, L. Fu, J. Shan and K.F. Mak, *Continuos Mott transition in semiconductor moiré superlattices*, **Nature 597**, 350 (2021).

52. C. Lewandowski, S. Nadj-Perge and Debanjan Chowdhury, *Does filling-dependent band renormalization aid pairing in twisted bilayer graphene?*, **npj Quantum Materials 6**, 82 (2021).

53. J.F. Mendez-Valderrama and Debanjan Chowdhury, *Bad metallic transport in geometrically frustrated models*, **Physical Review B 103**, 195111 (2021).

54. C. Lewandowski, Debanjan Chowdhury and J. Ruhman, *Pairing in magic-angle twisted bilayer graphene: role of phonon and plasmon umklapp*, **Physical Review B 103**, 235401 (2021). (**Editors' Suggestion**)

55. L. Zou and Debanjan Chowdhury, *Deconfined metal-insulator transitions in quantum Hall bilayers*, **Physical Review Research 2**, 032071(R) (2020). (**Rapid Communication**).

56. L. Zou and Debanjan Chowdhury, *Deconfined metallic quantum criticality: a U(2) gauge theoretic approach*, **Physical Review Research 2**, 023344 (2020).

57. J. Hofmann, E. Berg and Debanjan Chowdhury, *Superconductivity, pseudogap and phase separation in topological flat bands*, **Physical Review B 102**, 201112(R) (2020). (**Editors' Suggestion**)

58. [*Review*] Debanjan Chowdhury and E. Berg, *The unreasonable effectiveness of Eliashberg theory for pairing of non-Fermi liquids*, **Annals of Physics 417**, 168125 (2020).
Special issue: *Dedicated to Gerasim Eliashberg.*

59. Debanjan Chowdhury and E. Berg, *Intrinsic superconducting instabilities of a solvable example of incoherent metal*, **Physical Review Research 2**, 013301 (2020).

60. D. Mao, Debanjan Chowdhury, T. Senthil, *Slow scrambling and hidden integrability in a random rotor model*, **Physical Review B 102**, 094306 (2020).

61. Y. Cao†, Debanjan Chowdhury†, D. Rodan-Legrain, O Rubies-Bigorda, K. Watanabe, T. Taniguchi, T. Senthil and P. Jarillo-Herrero, *Strange metal in magic-angle graphene with universal Planckian dissipation*, **Physical Review Letters 124**, 076801 (2020). (**Editors' Suggestion**) (**Featured in Physics**)

Publications (Pre-2020)

1. T.A. Webb, M.C. Boyer, Y. Yin, Debanjan Chowdhury, Y. He, T. Kondo, T. Takeuchi, H. Ikuta, E.W. Hudson, J.E. Hoffman and M.H. Hamidian , *Density wave probes cuprate quantum phase transition*,**Physical Review X 9**, 021021 (2019).

2. A. Zong, X. Shen, A. Kogar, L. Ye, C. Marks, Debanjan Chowdhury, T. Rohwer, B. Freelon, S. Weathersby, R. Li, J. Yang, J. Checkelsky, X. Wang and N. Gedik, *Ultrafast manipulation of mirror domain walls in a charge density wave*, **Science Advances 4**, eaau5501 (2018).

3. Debanjan Chowdhury, Y. Werman, E. Berg and T. Senthil, *Translationally invariant non-Fermi liquid metals with critical Fermi-surfaces: Solvable models*, **Physical Review X 8**, 031024 (2018).

4. Debanjan Chowdhury†, B. Skinner† and P.A. Lee, *Semiclassical theory of the tunneling anomaly in partially spin-polarized compressible quantum Hall states*, **Physical Review B 97**, 195114 (2018).

5. A. Klein, S. Lederer, Debanjan Chowdhury, E. Berg and A.V. Chubukov, *Dynamical susceptibility of a near-critical non-conserved order parameter and B_{2g} Raman response in Fe-based superconductors*, **Physical Review B 98**, 041101(R) (2018). (**Rapid Communication**).

6. Debanjan Chowdhury†, B. Skinner† and P.A. Lee, *Effect of magnetization on the tunneling anomaly in compressible quantum Hall states*, **Physical Review Letters 120**, 266601 (2018).

7. I. Sodemann, Debanjan Chowdhury and T. Senthil, *Quantum oscillations in insulators with neutral Fermi-surfaces*, **Physical Review B 97**, 045152 (2018).

8. A. Klein, S. Lederer, Debanjan Chowdhury, E. Berg and A.V. Chubukov, *Dynamical susceptibility near a long-wavelength critical point with a non-conserved order parameter*, **Physical Review B 97**, 155115 (2018).

9. Debanjan Chowdhury, I. Sodemann and T. Senthil, *Mixed-valence insulators with neutral Fermi-surfaces*, **Nature Communications 9** 1766, (2018).

10. A.A. Patel, Debanjan Chowdhury, S. Sachdev and B. Swingle, *Quantum butterfly effect in weakly interacting disordered metals*, **Physical Review X 7**, 031047 (2017).

11. Debanjan Chowdhury and B. Swingle, *Onset of many-body chaos in the $O(N)$ model*, **Physical Review D 96**, 065005 (2017).

12. B. Swingle and Debanjan Chowdhury, *Slow scrambling in disordered quantum systems*, **Physical Review B 95**, 060201(R) (2017). (**Rapid Communication**) (**Editors' Suggestion**)

13. A.A. Patel and Debanjan Chowdhury, *Two dimensional spin liquids with $\mathbb{Z}_2$ topological order in an array of quantum wires*, **Physical Review B 94**, 195130 (2016).

14. [*Review*] S. Sachdev and Debanjan Chowdhury, *The novel metallic states of the cuprates: topological Fermi liquids and strange metals*, **Progress of Theoretical and Experimental Physics 12C102**, (2016).
Special issue: "Nambu, A foreteller of Modern Physics III".

15. A.A. Patel, Debanjan Chowdhury, A. Allais and S. Sachdev, *Confinement transition to density wave order in metallic doped spin liquids*, **Physical Review B 93**, 165139 (2016).

16. Y. Wang, Debanjan Chowdhury and A.V. Chubukov, *Fluctuating charge order in the cuprates: spatial anisotropy and feedback from superconductivity*, **Physical Review B 92**, 161103(R) (2015). (**Rapid Communication**)

17. Debanjan Chowdhury, J. Orenstein, S. Sachdev and T. Senthil, *Phase transition beneath the superconducting dome in $BaFe_2(As_{1-x}P_x)_2$*, **Physical Review B 92**, 081113(R) (2015). (**Rapid Communication**)

18. [*Review*] Debanjan Chowdhury and S. Sachdev, *The enigma of the pseudogap phase of the cuprate superconductors*, Invited chapter in the book "Quantum criticality in condensed matter" (World Scientific, ISBN: 978-981-4704-08-3)

19. Debanjan Chowdhury and S. Sachdev, *Higgs criticality in a two-dimensional metal*, **Physical Review B 91**, 115123 (2015).

20. Debanjan Chowdhury and S. Sachdev, *Density-wave instabilities of fractionalized Fermi liquids*, **Physical Review B 90**, 245136 (2014).

21. A. Allais, Debanjan Chowdhury and S. Sachdev, *Connecting high field quantum oscillations to zero-field electron spectral functions in the underdoped cuprates*, **Nature Communications 5**, 5771 (2014).

22. Debanjan Chowdhury and S. Sachdev, *Feedback of superconducting fluctuations on charge order in the underdoped cuprates*, **Physical Review B 90**, 134516 (2014).

23. M. Punk, Debanjan Chowdhury and S. Sachdev, *Topological excitations and the dynamic structure factor of spin-liquids on the kagome lattice*, **Nature Physics 10**, 289-293 (2014).

24. Debanjan Chowdhury, B. Swingle, E. Berg and S. Sachdev, *Singularity of the London penetration depth at quantum critical points in superconductors*, **Physical Review Letters 111**, 157004 (2013).

25. Debanjan Chowdhury, S. Raju, S. Sachdev, A. Singh and P. Strack, *Multipoint correlators of conformal field theories: implications for quantum critical transport*, **Physical Review B 87**, 085138 (2013).

26. P. Mandal, Debanjan Chowdhury, S.S. Banerjee and T. Tamegai, *High sensitivity differential magneto-optical imaging with a compact Faraday modulator*, **Review of Scientific Instruments 83**, 123906 (2012).

27. D. Bergeron, Debanjan Chowdhury, M. Punk, S. Sachdev and A.-M.S. Tremblay, *Breakdown of Fermi liquid behavior at the $(\pi, \pi) = 2\mathbf{k}_F$ spin-density wave quantum critical point: the case of electron-doped cuprates*, **Physical Review B 86**, 155123 (2012). (**Editors' suggestion**)

28. N.W.Goehring, P.K. Trong, J.S. Bois, Debanjan Chowdhury, E.M. Nicola, A.A. Hyman and S.W. Grill, *Polarization of PAR proteins by advective triggering of a pattern forming system*, **Science 334**, 6059, 1137-1141 (2011). (**Editors' choice**)

29. Debanjan Chowdhury, E. Berg and S. Sachdev, *Nematic order in the vicinity of a vortex in superconducting FeSe*, **Physical Review B 84**, 205113 (2011).

30. N.W. Goehring, Debanjan Chowdhury, S.W. Grill, A.A. Hyman, *FRAP analysis of membrane-associated proteins: lateral diffusion and membrane-cytoplasmic exchange*, **Biophysical Journal 99**, 8, 2443-2452 (2010).

31. Debanjan Chowdhury and M.C. Cross, *Synchronization of oscillators with long-range power law interactions*, **Physical Review E 82**, 016205 (2010).
32. Debanjan Chowdhury, U. Divakaran and A. Dutta, *Adiabatic dynamics in passage across quantum critical lines and gapless phases.* **Physical Review E 81**, 012101 (2010).
33. A. Garai, Debanjan Chowdhury, D. Chowdhury and T.V. Ramakrishnan, *Stochastic kinetics of ribosomes: single motor properties and collective behavior.* **Physical Review E 80**, 011908 (2009).
34. Debanjan Chowdhury, *Searching for targets on a model DNA: Effects of intersegment hopping, detachment and reattachment*, **International Journal of Modern Physics C (IJMPC) 20**, 6, 817 (2009).

Invited Talks (Since 01/2020)

1. *Strongly correlated quantum materials*, QPHORIA 2026, Pennsylvania State University, October 2, 2026.
2. Colloquium, Initiative for the Theoretical Sciences, CUNY Graduate Center, September 17, 2026
3. Moore workshop on *Hybrid Quantum Matter: Dressed, Driven, and Dynamic Quantum Systems*, Columbia University, August 17, 2026
4. Young research leaders workshop on *Topological materials and beyond*, Korea Institute for Advanced Study, Seoul, June 30, 2026
5. Recent advances in studies of strongly correlated electrons, ICISE Quy Nhon, Vietnam, June 1, 2026.
6. 130^{th} Statistical Mechanics Conference, Rutgers University, May 11, 2026.
7. Pittsburgh Quantum Institute Distinguished Seminar, Carnegie Mellon University, April 14, 2026.
8. AFOSR-LPS Program review, Arlington, March 3, 2026
9. Physics Colloquium, Johns Hopkins University, February 26, 2026
10. Lectures at the SFB Correlated Quantum Materials and Solid State Quantum Systems Summer School, Julius-Maximilians-Universität Würzburg, September 16-18, 2025
11. Young research leaders workshop on *Topological materials and beyond*, Rice Global Center, Paris, July 28, 2025
12. Lectures at the Boulder Summer School for Condensed Matter and Materials Physics on *Dynamics of Correlated Electrons*, July 15-16, 2025
13. Physics Colloquium, Cornell University, February 24, 2025
14. Condensed Matter & Biological Physics seminar, Johns Hopkins University, October 23, 2024
15. KITP workshop on *Tunable two-dimensional materials: moiré and beyond*, Kavli Institute for Theoretical Physics, UC Santa Barbara, September 19, 2024
16. Gordon research conference on *Correlated electron systems: Unconventional Phenomena in Quantum Matter*, Mt. Holyoke college, June 24, 2024
17. Young research leaders workshop on *Topological materials and beyond*, IAS HKUST, Hong Kong, June 17, 2024
18. KITP workshop on *Correlated gapless quantum matter*, Kavli Institute for Theoretical Physics, UC Santa Barbara, May 9, 2024
19. Condensed Matter Physics seminar, Harvard University, April 4, 2024
20. Pro-QM seminar, Columbia University, March 20, 2024
21. APS March Meeting — Minneapolis, Focus session on 2D Materials, March 7, 2024

22. ICTS program on *Stability of quantum matter in and out of equilibrium at various scales*, Bengaluru, January 15, 2024
23. KIAS-IBS-PCS Workshop on *Correlation, & Topology in Quantum Matter*, Seoul, December 19, 2023
24. Workshop on *Recent advances in superconductivity: Theory and Experiment*, University of Florida, Gainesville, December 14, 2023
25. Quantum matter seminar, University of Toronto, November 1, 2023
26. Google Quantum AI group, Santa Barbara, September 22, 2023
27. KITP conference on *Electronic correlations beyond the quasiparticle paradigm*, Kavli Institute for Theoretical Physics, UC Santa Barbara, September 19, 2023
28. KITP workshop on *Quantum materials with and without quasiparticles*, Kavli Institute for Theoretical Physics, UC Santa Barbara, September 7, 2023
29. Theory seminar, Laboratoire de Physique et Modélisation des Milieux Condensés, Grenoble, June 16, 2023
30. Quantum matter seminar, University of Waterloo, April 12, 2023
31. CMTC JLDS seminar, Condensed matter theory center, University of Maryland College Park, April 4, 2023
32. CM-AMO seminar, University of Michigan Ann Arbor, March 28, 2023
33. CAMP seminar, Pennsylvania State University State College, March 13, 2023
34. Condensed matter seminar, Indian Institute of Technology Kanpur, January 11, 2023
35. Physics Colloquium, Indian Institute of Technology Kanpur, January 10, 2023
36. SRITP conference on *A Quantum Many-body Handshake: Theory and Simulation meet Experiment*, Weizmann Institute of Science, Rehovot, December 11, 2022
37. Physics Colloquium, Bar-Ilan University, December 5, 2022
38. Chez Pierre seminar, MIT, November 14, 2022
39. Condensed Matter Physics seminar, Harvard University, November 10, 2022
40. Theory seminar, University of Oslo, September 21, 2022
41. QDev seminar, Niels Bohr Institute, University of Copenhagen, September 19, 2022
42. ICTP conference on *Strongly correlated matter: From quantum criticality to flat bands* (virtual), Trieste, August 26, 2022
43. CT.QMAT-22 conference on *Complexity and topology in quantum matter*, Würzburg, July 27, 2022
44. Condensed Matter seminar, Max-Planck-Institut für Physik Komplexer Systeme, Dresden, July 19, 2022
45. Condensed matter seminar (virtual), Ohio State University, April 11, 2022
46. Condensed Matter seminar (virtual), UC San Diego, February 16, 2022
47. QMAT-21 conference, Tata Institute of Fundamental Research (virtual), December 10, 2021
48. Condensed Matter Theory tutorial+seminar (virtual), Caltech, October 28, 2021
49. Physics Colloquium (virtual), The City College of New York, September 29, 2021
50. SPICE workshop on *Coherent order and transport in spin active systems: Interplay between magnetism and superconductivity* (virtual), Johannes Gutenberg Universität, Mainz, Germany, November 18, 2020
51. CMSA Quantum Matter seminar (virtual), Harvard University, July 9, 2020
52. Matter and Radiation seminar (virtual), University of Stavanger, June 3, 2020

Invited Talks (Pre-2020)

1. ICTS meeting on *Novel phases of quantum matter*, International Center for Theoretical Sciences, Bangalore, December 23, 2019
2. Condensed Matter Theory seminar, Karlsruhe Institute of Technology, Karlsruhe, October 21, 2019
3. Condensed Matter Theory seminar, Ludwig-Maximilians Universität, Munich, October 18, 2019
4. Condensed Matter Theory seminar, Technische Universität, Munich, October 16, 2019
5. Condensed Matter Theory seminar, Technische Universität, Dresden, October 4, 2019
6. Lectures at International Max-Planck Research School (IMPRS) organized by Max-Planck-Institut für Physik Komplexer Systeme, Karpacz, September 2 - 4, 2019
7. Condensed Matter seminar, Max-Planck-Institut für Physik Komplexer Systeme, Dresden, August 29, 2019
8. SFB Colloquium, Institute for theoretical Physics, University of Cologne, August 26, 2019
9. Condensed Matter seminar, Bar-Ilan University, Ramat-Gan, July 7, 2019
10. Condensed Matter seminar, Weizmann Institute of Science, Rehovot, July 3, 2019
11. Theoretical Physics seminar, Yale University, April 1, 2019
12. Physics Colloquium, Iowa State University, Ames, March 27, 2019
13. Physics Colloquium, University of Texas, Austin, February 28, 2019
14. LASSP seminar, Cornell University, February 19, 2019
15. Physics Colloquium, New York University, February 13, 2019
16. Seminar, Center for Computational Quantum Physics (CCQ), Flatiron Institute, New York, February 12, 2019
17. Condensed Matter seminar, University of Pennsylvania, Philadelphia, February 6, 2019
18. Physics Colloquium, Ohio State University, Columbus, January 31, 2019
19. KITP Rapid Response workshop on *Correlations in Moire flat bands*, Kavli Institute for Theoretical Physics, UC Santa Barbara, January 22, 2019
20. Condensed Matter, Atomic and Molecular Physics seminar, Pennsylvania State University, State College, January 16, 2019
21. Condensed Matter Theory seminar, CMTC, University of Maryland, College Park, October 23, 2018
22. MPS conference on *Ultra Quantum Matter II*, Simons Foundation, New York, August 22, 2018
23. Kadanoff seminar, Kadanoff Center for Theoretical Physics, University of Chicago, May 22, 2018
24. Condensed Matter Physics seminar, Brown University, February 6, 2018
25. Condensed Matter seminar, National high magnetic field laboratory, Tallahassee, October 13, 2017
26. Condensed Matter Theory seminar, Ludwig-Maximilians Universität, Munich, September 7, 2017
27. Condensed Matter Theory seminar, Technische Universität, Dresden, September 5, 2017
28. Condensed Matter Theory seminar, Technische Universität, Munich, August 28, 2017
29. KITP workshop on *Intertwined order and fluctuations in quantum materials*, Kavli Institute for Theoretical Physics, UC Santa Barbara, July 27, 2017
30. Condensed Matter Theory seminar, MIT, April 28, 2017.
31. Condensed Matter Physics seminar, Caltech, April 12, 2017.

32. Condensed Matter Theory seminar, CMTC, University of Maryland, College Park, March 7, 2016.
33. Condensed Matter Theory seminar, ICMT, University of Illinois, Urbana-Champaign, December 1, 2015.
34. Condensed Matter Theory seminar, MIT, November 5, 2015.
35. Condensed Matter Physics seminar, Kavli Institute for Theoretical Physics, UC Santa Barbara, October 28, 2015.
36. Condensed Matter Physics seminar, Caltech, October 26, 2015.
37. Strongly Correlated Theory seminar, LASSP, Cornell University, October 15, 2015.
38. *Quantum Design* conference, Max-Planck-Institut für Physik Komplexer Systeme, Dresden, July 22, 2015.
39. Condensed Matter Theory seminar, Max-Planck-Institut für Physik Komplexer Systeme, Dresden, July 9, 2015.
40. Solid State Theory seminar, Ludwig-Maximilians Universität, Munich, June 25, 2015.
41. *Fermions-2015* conference, Ruprecht Karls Universität, Heidelberg, April 20, 2015.
42. Center for Condensed Matter Theory seminar, Indian Institute of Science, Bangalore, January 9, 2015.
43. ICTS seminar, International Center for Theoretical Sciences, Bangalore, January 8, 2015.
44. Theoretical Physics seminar, Indian Association for the Cultivation of Science, Kolkata, December 29, 2014.
45. Condensed Matter Theory seminar, MIT, November 18, 2014.
46. Gordon Research Seminar on *Correlated Electron Systems*, Mt. Holyoke College, June 22, 2014.
47. Condensed Matter Physics seminar, Indian Institute of Technology Kanpur, January 15, 2014.
48. Condensed Matter Physics seminar, Weizmann Institute of Science, Rehovot, December 25, 2013.
49. Scientific departmental conference - Weizmann Institute of Science, Ma'alot Tarshiha, December 18, 2013.

Graduate Researchers Supervised

01/2020 - 07/2024 J.F. Mendez-Valderrama, PCCM Fellow, Princeton University
Thesis: *Strong-Coupling Approaches for Electronic Transport and Superconductivity*

01/2021 - 07/2026 Sunghoon Kim, CMTC-JLDS Fellow, Univ. of Maryland, College Park
Thesis: *Interplay of Strong Correlations, Topology, and Disorder in Two-Dimensional Quantum Matter*

08/2021 - present Xuepeng Wang

08/2022 - present Keiran Lewellen

08/2023 - 12/2024 Rohit Mukherjee (Fulbright exchange student)

09/2024 - present Sagnik Banerjee

Postdoc Researchers Supervised

08/2021 - 07/2024 Dan Mao, Bethe/KIC Fellow, Now senior postdoc, Univ. of Zürich

09/2022 - 08/2025 Dimitri Pimenov, Now at IQM Quantum Computers

07/2023 - 05/2026 Haoyu Guo, Wilkins/KIC Fellow, Now associate professor at IOP, Beijing

08/2024 - present Omri Lesser, Bethe/KIC Fellow

09/2026 - present Yunchao Zhang

Undergraduate Researchers Supervised

01/2020 - 05/2020 Junkai Dong, Graduate student at Harvard followed by postdoc at Stanford

08/2020 - 12/2020 Gregorio de la Fuente Simarro, Now graduate student at MIT

08/2021 - 01/2022 Zihao Qi, Visiting student from Caltech; Now graduate student at Cornell

06/2022 - 09/2022 Domagoj Perkovic, Visiting student from Cambridge; Now graduate student at Oxford

Teaching

PHYS 3727: *Advanced Electricity & Magnetism* Fall 2024
The course covered advanced topics in electromagnetic theory and their applications, and was largely based on Chapters 1-6, 8, and 14 of *Classical Electromagnetic Radiation* by M.A. Heald and J.B. Marion. The students were at the junior/senior level.

PHYS 7636: *Solid-State Physics II* Spring 2024
Course contents based on the material developed previously for PHYS 7687 in Fall 2020. The course covered advanced topics in quantum many-body physics (see below).

PHYS 3727: *Advanced Electricity & Magnetism* Fall 2023
Similar to Fall 2024.

PHYS 7636: *Solid-State Physics II* Spring 2023
Similar to the contents from Fall 2020.

Phys 2218: *Physics III: Waves & Thermal Physics* Spring 2022
Approximately two-thirds of the course covered a variety of wave phenomena, based largely on *The Physics of Waves* by H. Georgi, and *Vibrations and Waves* by A.P. French. The remaining one-third of the course covered introductory topics in thermal physics based on *An Introduction to Thermal Physics* by D.V. Schroeder. The students were at the sophomore level.

Phys 4230: *Statistical Thermodynamics* Fall 2021
The course discussed basics of statistical mechanics and its connection to thermodynamics. The topics covered included an introduction to entropy, ensembles, and notion of ergodicity, and its applications to thermodynamics, quantum gases, and phase transitions. The students were at the junior and senior level.

AS 1102: *Arts & Sciences Advising Seminar* Fall 2021
Advising seminar for Arts & Sciences first year undergraduate students at Cornell. Led several discussion sessions and individual meetings throughout the semester to help the students get oriented at Cornell, and introduced them to some basic ideas related to quantum materials research.

Phys 6574: *Applications of Quantum Mechanics II* Spring 2021
The topics covered included time-dependent perturbation theory, scattering theory, quantization of the electromagnetic field, quantum statistics, and many-particle quantum mechanics. The materials were inspired in part by the textbooks *Modern Quantum Mechanics* by J.J. Sakurai and J. Napolitano, and *Lectures on Quantum Mechanics* by S. Weinberg.

Phys 7687: *Strongly Correlated Phases of Quantum Matter* Fall 2020
The topics covered included Fermi liquid theory, Boltzmann equation and collective modes, Superconductivity, Superfluidity in weakly interacting bosonic liquids, Mott insulators and quantum magnetism, Quantum spin liquids, Kondo effect, Non-Fermi liquids. I designed the course materials, taking inspiration from a variety of modern textbooks on the topic of quantum many-body systems.

Phys 4490: *Independent Study in Physics* Fall 2020
I advised a Physics sophomore on a short research project on the collective synchronization dynamics of coupled non-linear oscillators.

Phys 2208: *Fundamentals of Physics II* Spring 2020
Supporting staff member. Led discussion section and assisted with course logistics.

Department, College and University Service

- Minor special committee member for incoming graduate class, Fall 2024
- Examiner in Physics Q-exams Fall 2024, Spring 2023, Fall 2021, Fall 2020
- Member, LASSP faculty search committee for senior quantum hire, Spring 2024
- Reviewer for New Frontiers Grants for the College of Arts & Sciences, Spring 2024
- Undergraduate advising for Physics majors, Fall 2021 - present
- Member, Physics graduate admissions committee, July 2021 - June 2024
- LASSP theory overview at prospective visiting weekends 2024, 2021, 2020.
- Member, Executive committee, Kavli Institute at Cornell, September 2022 - present
- Search committee for LASSP Associate Director, Fall 2023
- LASSP & AEP seminar committee, Spring 2022; Fall 2025
- Participated in virtual Cornell STEM Programs Preview Day, Fall 2021
- Undergraduate advising for A&S first-year students in Fall 2021
- Member, Cornell Center for Materials Research, March 2021 - present
- Member, Climate, Equity, Diversity & Inclusion (CEDI) committee, July 2020 - July 2022.
- Member, Physics colloquium committee, July 2020 - June 2021; July 2025 - onwards

Current Funding

Air Force Office of Scientific Research (USD $300,000) 05/26 - 04/28
Frozonium: Dynamical Floquet Control from Qubits to Qudits

Department of Energy Early Career Research Award (USD $875,000) 08/25 - 07/30
Programmable Floquet Algorithms for Materials Research:
Enhanced Qubit Coherence and Entangled State Preparation on Quantum Hardware

National Science Foundation CAREER (USD $607,668) 04/23 - 03/28
Theories of Gapless Quantum Matter Beyond Quasiparticles

Alfred P. Sloan Research Fellowship (USD $75,000) 09/23 - 08/25

US-Israel Binational Science Foundation (USD $188,800; Co-PI: Jonathan Ruhman) 10/21-09/25
Simulating exotic magnetism and superconductivity in hybrid quantum materials

New Frontier Grant, College of Arts & Sciences, Cornell University (USD $ 200,000) 07/23 - 06/25
Probing dynamics of electronic quantum crystals on near-term quantum computers

NSF-XSEDE allocation ($\sim$ 9 million core hours; Co-PI Erez Berg) 03/21 - 09/23
QMC studies of strongly correlated phases and superconductivity in moiré materials and beyond

NSF-ACCESS allocation ($\sim$ 5 million core hours) 10/24 - present
QMC Studies of Correlated Topological Phases of Matter

NSF Graduate Research Fellowship supporting Keiran Lewellen 09/24 - present

Professional Service

- Peer reviewer for Nature, Science, PNAS, Nature Physics, Nature Communications, npj Quantum Materials, Physical Review Letters (PRL), Physical Review X (PRX), Physical Review B (PRB), SciPost, Scientific Reports, Europhysics Letters (EPL), Journal of Statistical Mechanics: Theory and Experiment
- Grant reviewer for National Science Foundation (NSF), Department of Energy (DoE), Israel Science Foundation (ISF), Isaac Newton Trust
- Co-Organizer, Aspen Summer Workshop on *Ultra Quantum Matter: Synergy Between Theory and Experiment*, July 27 - August 17, 2025
- Co-Organizer, Boulder School for Condensed Matter and Materials Physics on *Dynamics of Strongly Correlated Electrons*, June 30 - July 25, 2025
- Co-Chair, Gordon Research Seminar, Correlated Electron Systems, June 25 - 26, 2022
- Co-Organizer, *Recent developments in strongly correlated quantum matter*, NORDITA Stockholm, June 16 - July 2, 2022