Ruishi Qi

Curriculum Vitae

(510)-833-4696
ruishiqi@berkeley.edu
225 Birge Hall, UC Berkeley

Last updated on 9th May, 2026

Research Areas

- Strongly correlated quantum matter
- Excitonic insulators and condensates
- Two-dimensional materials
- Low-temperature optics and transport

Academic Appointments

2026 – **Stanford Science Fellow**, Stanford University
Incoming fellow starting July 2026 Faculty host: Prof. Tony F. Heinz

Education

2020 – 2026 **Ph.D. in physics**, University of California, Berkeley
Advisor: Prof. Feng Wang
Thesis: Correlated exciton physics in van der Waals electron-hole bilayers

2020 – 2022 **M.A. in physics**, University of California, Berkeley

2016 – 2020 **B.S. in physics**, Peking University (PKU)
GPA: 3.9/4; Rank: 1/200+

Publications

30+ peer-reviewed articles; 1000+ citations. Full publication record: Google Scholar.

†: equal contribution; ‡: corresponding author.

Selected first- and corresponding-author publications

1. **R. Qi**†‡, Q. Li†, J. Nie, ..., F. Wang‡. Two-component exciton condensates in an electron-hole bilayer. ***Nature*** accepted. arXiv:2603.15443 (2026).

2. **R. Qi**†‡, Q. Li†, Z. Zhang, ..., F. Wang‡. Gate-tunable biexcitons in electron-hole-electron trilayers. Under revision at ***Science***.

3. **R. Qi**†, Q. Li†, H. Kim, ..., F. Wang‡. An exciton crystal in a moiré excitonic insulator. ***Nature Physics*** 22, 514-520 (2026).
Featured in *Nature Physics* News & Views; *Nature Reviews Materials* Research Highlight

4. **R. Qi**†, Q. Li†, Z. Zhang, ..., F. Wang‡. Competition between excitonic insulators and quantum Hall states in correlated electron-hole bilayers. ***Nature Materials*** 25, 35-41 (2026).

5. Z. Zhang†‡, **R. Qi**†, J. Xie, ..., F. Wang‡. Orbital dependent Coulomb drag in electron-hole bilayer graphene heterostructures. ***Physical Review Letters*** 136, 126303 (2026).
Featured in *Physical Review Letters* Editor's suggestion

6. Z. Lu†‡, **R. Qi**†, R. Dutta†, ..., F. Wang‡. Nature of emergent moiré excitations in $MoSe_2/WS_2$ moiré superlattices. ***Nano Letters*** 26 (12), 4096-4102 (2026).

7. **R. Qi**, Q. Li, Z. Zhang, ..., F. Wang‡. Electrically controlled interlayer trion fluid in

electron-hole bilayers. ***Science*** 390 (6770), 299-303 (2025).
Featured in *Science* Perspective

8. **R. Qi**[†], A. Joe[†‡], Z. Zhang, ..., F. Wang[‡]. Perfect Coulomb drag and exciton transport in an excitonic insulator. ***Science*** 388 (6744), 278-283 (2025).
Featured in *Journal Club for Condensed Matter Physics*

9. **R. Qi**[†], A. Joe[†‡], Z. Zhang, ..., F. Wang[‡]. Thermodynamic behavior of correlated electron-hole fluids in van der Waals heterostructures. ***Nature Communications*** 14, 8264 (2023).

10. **R. Qi**[†], R. Shi[†], Y. Li, ..., P. Gao[‡]. Measuring phonon dispersion at an interface. ***Nature*** 599, 399-403 (2021).

11. **R. Qi**[†], N. Li[†], J. Du, ..., P. Gao[‡]. Four-dimensional vibrational spectroscopy for nanoscale mapping of phonon dispersion in BN nanotubes. ***Nature Communications*** 12, 1179 (2021).

12. **R. Qi**[†], R. Wang[†], Y. Li, ..., P. Gao[‡]. Probing far-infrared surface phonon polaritons in semiconductor nanostructures at nanoscale. ***Nano Letters*** 19 (8), 5070-5076 (2019).

Collaborative publications

13. Z. Lu[†‡], J. Nie[†], ..., **R. Qi**, ..., F Wang[‡]. Tunable Interlayer Charge-transfer States in MoSe2/WS2 Moiré Superlattices. arXiv:2605.05571.

14. J. Rodriguez, **R. Qi**, C. Xu, F. Wang, J. Analytis, H. Taghinejad. Electrically controlled Heat Assisted Magnetic Recording in Intercalated 2D Magnets. arXiv:2605.06645.

15. B. Han, R. Shi, ..., **R. Qi**, ..., P. Gao[‡]. Electron Microscopy Measurement of Picometer-Level Distortion Induced Local Phonons at a Defect. ***Nano Letters*** 26 (4), 1449-1454 (2026).

16. S.D. Chen[‡], **R. Qi**, H. Kim, ..., F. Wang[‡]. Terahertz electrodynamics in a zero-field Wigner crystal. arXiv:2509.10624.

17. T. Chistolini[†], ..., **R. Qi**, ..., F. Wang[‡]. Contactless cavity sensing of superfluid stiffness in atomically thin 4Hb-TaS_2. arXiv:2510.25124.

18. S.D. Chen, Q. Feng, W. Zhao, **R. Qi**, ..., F. Wang[‡]. Direct Measurement of Terahertz Conductivity in a Gated Monolayer Semiconductor. ***Nano Letters*** 25 (19) 7998-8002 (2025).

19. C. He, Z. Hua, P. He, **R. Qi**, ..., P. Gao[‡]. Measurement of far-infrared surface phonon polaritons in AlN nanowires via electron microscope. ***Chinese Physics B*** 35, 037901 (2025).

20. Q. Feng[†], C. Uzundal[†], ..., **R. Qi**, ..., F. Wang[‡]. Femtojoule All-optical Nonlinearity for Deep Learning with Incoherent Illumination. ***Science Advances*** 11, eads4224 (2025).

21. P. He[†], J. Li[†], ..., **R. Qi**, ..., P. Gao[‡]. Strongly confined Mid-infrared to Terahertz Phonon Polaritons in Ultra-thin $SrTiO_3$. ***Science Advances*** 11, eady7316 (2025).

22. Y. Li[†], B. Han[†], ..., **R. Qi**, ..., P. Gao[‡]. Single-dislocation phonons: atomic-scale measurement and their thermal properties. ***Chinese Physics Letters*** 42, 066302 (2025).

23. Y. Yoon‡, Z. Lu, C. Uzundal, **R. Qi**, ..., F. Wang‡. Terahertz phonon engineering with van der Waals heterostructures. ***Nature*** 631, 771-776 (2024).

24. J. Xie, ..., **R. Qi**, ..., F. Wang‡. Low Resistance Contact to P-type Monolayer WSe_2. ***Nano Letters*** 24 (20), 5937-5943 (2024).

25. Z. Zhang†, J. Xie†, W, Zhao, **R. Qi**, ..., F. Wang‡. Engineering correlated insulators in bilayer graphene with a remote Coulomb superlattice. ***Nature Materials*** 23, 189-195 (2024).

26. R. Shi†, Q. Li†, ..., **R. Qi**, ..., P. Gao‡. Atomic-scale observation of localized phonons at FeSe/$SrTiO_3$ interface. ***Nature Communications*** 15, 3418 (2024).

27. Z. Zhang, ..., **R. Qi**, ..., X. Wang‡. Probing Hyperbolic Shear Polaritons in β-Ga_2O_3 Nanostructures Using STEM-EELS. ***Advanced Materials*** 36, 2204884 (2024).

28. J. Yan, ..., **R. Qi**, ..., Y. Ikuhara‡. Nanoscale Localized Phonons at Al_2O_3 Grain Boundaries. ***Nano Letters*** 24, 11, 3323-3330 (2024).

29. M. Wu, R. Shi, **R. Qi**, ..., P. Gao‡. Four-dimensional electron energy-loss spectroscopy. ***Ultramicroscopy*** 253, 113818 (2023).

30. M. Wu†, R. Shi†, **R. Qi**†, ..., P. Gao‡. Effects of localized interface phonons on heat conductivity in ingredient heterogeneous solids. ***Chinese Physics Letters***, 40 (3), 036801 (2023).

31. X. Guo†, N. Li†, X. Yang‡, **R. Qi**, ..., Q. Dai‡. Hyperbolic whispering-gallery phonon polaritons in boron-nitride nanotubes. ***Nature Nanotechnology*** 18, 529-534 (2023).

32. N. Li†, R. Shi†, Y. Li†, **R. Qi**, ..., P. Gao‡. Phonon transition across an isotopic interface. ***Nature Communications*** 14, 2382 (2023).

33. Y. Li, **R. Qi**, ..., P. Gao‡. Atomic-scale probing of heterointerface phonon bridges in nitride semiconductor. ***Proceedings of the National Academy of Sciences*** 119 (8), e2117027119 (2022).

34. R. Zhu†, ..., **R. Qi**, ..., P. Gao‡. Dynamics of Polar Skyrmion Bubbles under Electric Fields. ***Physical Review Letters*** 129 (10), 107601 (2022).

35. X. Guo†, N. Li†, C. Wu, X. Dai, **R. Qi**, ..., Q. Dai‡. Studying Plasmon Dispersion of MXene for Enhanced Electromagnetic Absorption. ***Advanced Materials*** 34 (33), 2270237 (2022).

36. Y. Yoon, Z. Zhang, **R. Qi**, ..., F. Wang‡. Charge Transfer Dynamics in $MoSe_2$/hBN/WSe_2 Heterostructures. ***Nano Letters*** 22 (24), 10140-10146 (2022).

37. N. Li†, X. Guo†, X. Yang‡, **R. Qi**, ..., P. Gao‡. Direct observation of highly confined phonon polaritons in suspended monolayer hexagonal boron nitride. ***Nature Materials*** 20, 43-48 (2021).

38. S. Zhao†, E. Wang†, E. A. Üzer, S. Guo, **R. Qi**, ..., F. Wang‡. Anisotropic moiré optical transitions in twisted monolayer/bilayer phosphorene heterostructures. ***Nature Communications*** 12, 3947 (2021).

39. W. Dong†, **R. Qi**†, ..., P. Gao‡. Broad-Spectral-Range Sustainability and Controllable Excitation of Hyperbolic Phonon Polaritons in α-MoO_3. ***Advanced Materials*** 32, 2002014

(2020).

40. Y. Li, **R. Qi**, R. Shi, N. Li, P. Gao‡. Manipulation of surface phonon polaritons in SiC nanorods. ***Science Bulletin*** 65 (10), 820-826 (2020).

41. Y. Li†, M. Wu†, **R. Qi**, ..., P. Gao‡. Probing lattice vibrations at SiO_2/Si surface and interface with nanometer resolution. ***Chinese Physics Letters*** 36 (2), 026801 (2019).

Honors and Fellowships

2026 – 2029 Stanford Science Fellow, Stanford University

2026 Jackson C. Koo Award, University of California, Berkeley

2026 Alex Zettl Graduate Student Award in Physics, University of California, Berkeley

2023 – 2024 Kavli ENSI Graduate Student Fellow, Kavli Energy NanoScience Institute

2020 Weiming Scholar, Peking University

2018, 2019 National Scholarship (China)

Research Experience

2021 – 2026 **Graduate Student Researcher**, Department of Physics, UC Berkeley

Ultrafast nano-optics group (PI: Prof. Feng Wang)

- Established electrically tunable van der Waals electron-hole bilayers as a platform for correlated exciton phases, including interlayer excitons, trions, biexcitons, exciton condensates, and exciton crystals.
- Developed optical spectroscopy approaches for measuring compressibility, Coulomb drag, and transport properties in strongly interacting two-dimensional systems.
- Designed and performed low-temperature, high-magnetic-field optical and transport experiments down to 10 mK and up to 12 T.

2018 – 2021 **Undergraduate Research Assistant**, Peking University

Electron microscopy laboratory (PI: Prof. Peng Gao)

- Developed electron energy-loss spectroscopy techniques combining nanometer spatial resolution, high momentum resolution, and milli-electron-volt energy resolution.
- Investigated local lattice dynamics at heterointerfaces and nanostructures.

Teaching and Mentoring

2020 – 2021 **Graduate Student Instructor**, Department of Physics, UC Berkeley

Physics 7A: Physics for Scientists and Engineers (Fall 2020, Spring 2021)

Led discussion and laboratory sections; graded homework and exams; held office hours.

2023 – 2024 **Undergraduate Research Mentor**, Berkeley Physics Innovators Initiative (Pi^2)

Mentored Berkeley undergraduate researchers (selective funded research program).

2022, 2025 **Undergraduate Research Mentor**, Berkeley Physics International Education (BPIE)

Mentored visiting undergraduate researchers.

Talks and Presentations

2026 "Correlated exciton physics in strongly coupled electron-hole bilayers", APS March Meeting, Denver

2026 "Excitonic insulators and condensates in electron-hole bilayers" (Poster), New Frontiers in Nanoscale Materials 2026 Symposium

2025 "Interlayer excitons and trions in electron-hole bilayers", Berkeley Condensed Matter Seminar

2024 "Perfect Coulomb drag and exciton transport in an excitonic insulator", APS March Meeting, Minneapolis

2024 "Correlated interlayer excitons and trions in electron-hole bilayers" (Poster), Kavli ENSI 10th Anniversary Symposium