Curriculum Vitae

Ludwig Holleis

lholleis@stanford.edu | www.linkedin.com/in/ludwigholleis

Education

- PhD in Physics at UC Santa Barbara 2020 – 2026
- M.Sc. Physics at UC Santa Barbara – GPA 4.0 (=A) 2020-2023
- M.Sc. Applied and Engineering Physics at TU Munich – GPA 1.4 (= A) 2016 – 2019
- Exchange semester at the University of Virginia – Charlottesville Fall 2017
- B.Sc. Physics at TU Munich – GPA 1.8 (84th percentile, = A-) 2013-2016

Relevant Experience

GLAM Postdoctoral Fellow | Stanford Univeristy | Stanford November 2026 – Present

- Developing novel qubit architectures, specifically based on the planaron geometry with the goal of 'hot' qubits – qubits that operate at higher temperatures than state of the art technologies
- Investigating condensed matter phenomena in hybrid 2D material – superconducting circuit devices and leveraging them in microelectronic architectures

Postdoctoral Scholar | UC Santa Barbara | Santa Barbara September 2026 – October 2026

- Investigating current driven domain dymanics within magnetic phases of rhombohedral graphene
- Developing novel fabrication methods and frequency generators based on rhombohedral graphene

Graduate Student Researcher | UC Santa Barbara | Santa Barbara October 2020 – September 2026

- Microwave reflectometry measurements of multilayer graphene superconductors in order to determine their pairing symmetry and to extract kinetic inductance across several symmetry broken phases
- Fabrication of van-der-Waals heterostructure microelectronics utilizing nanofabrication facilities including photo- and electron beam lithography, e-beam and atomic layer deposition as well as plasma etching
- Novel application development of photothermal infrared atomic force microscopy (AFM-IR) as well scanning microwave impedance microscopy (sMIM) on multilayer graphene characterizing domain structures
- Transport and capacitance measurements to investigate superconductivity and nematic symmetry breaking in Bernal bilayer and rhombohedral multilayer graphene at milli-Kelvin temperatures

Research Assistant | Max Planck Institute for Chemical Physics of Solids | Dresden April 2020 – September 2020

- Development of a portable, pulsed high field magnet system in a liquid helium cryostat
- Achieved record breaking 33 T pulses of 1 ms length – outperforming similar experimental setups – and successful measurement of critical fields in NbN wires

Process Integration Engineer | Infineon | Dresden October 2019 – March 2020

- Process Integration of the world leading semiconductor 80/100 V PowerMOSFET technologies
- Planning of experiments like electrical characterization, SEM, TEM to overcome technological weaknesses

Visiting Scholar | University of Virginia | Charlottesville January 2018 – May 2019

- Data analysis of susceptibility and ultrasound measurements of the quantum materials $RuCl_3$ or UPt_3 for quantum computing and superconductivity applications
- Application of machine learning to enhance magnetocaloric properties of single molecule magnets

Scientific Publications (Google scholar: https://scholar.google.com/citations?user=SNzOeZoAAAAJ&hl=en)

First Author publications

- **L. Holleis**, Y. Choi, C. Zhang, J. H. Farrell, G. Bargas, A. Hsu, Z. Chen, I. Sackin, W. Zhou, Y. Guo, T. Charpentier, Y. Jiang, B. A. Foutty, A. Keough, M. E. Huber, T. Taniguchi, K. Watanabe, A. Lucas, A. F. Young, arXiv:2604.21912 (2026), **accepted Nature Nanotechnology**

- **L. Holleis,** T. Xie, S. Xu, H. Zhou, C.L. Patterson, A. Panigrahi, T. Taniguchi, K. Watanabe, L.S. Levitov, C. Jin, E. Berg, A.F. Young, "*Fluctuating magnetism and Pomeranchuk effect in multilayer graphene*", **Nature**, 2025; 640:355–360.

- C.L. Patterson*, O.I. Sheekey*, T.B. Arp*, **L. Holleis***, J.M. Koh, Y. Choi, T. Xie, S. Xu, Y. Guo, H. Stoyanov, E. Redekop, C. Zhang, G. Babikyan, D. Gong, H. Zhou, X. Cheng, T. Taniguchi, K. Watanabe, M.E. Huber, C. Jin, É. Lantagne-Hurtubise, J. Alicea, A.F. Young, "*Superconductivity and spin canting in spin–orbit-coupled trilayer graphene*", **Nature**, 2025; 641:632–638. (*: these authors contributed equally)

- **L. Holleis**, L. Cohen, N. Samuelson, C.L. Patterson, Y. Choi, M. Valentini, O. Sheekey, Y. Choi, J. Zhou, H. Stoyanov, T. Taniguchi, K. Watanabe, Q. Hu, J.H. Kim, C. Phillips, P. De Wolf, A.F. Young, "*Nanoscale infrared and microwave imaging of stacking faults in multilayer graphene*", **ACS Nanoletters**, 2025, 12487-12494.

- **L. Holleis**, C.L. Patterson, Y. Zhang, Y. Vituri, H.M. Yoo, H. Zhou, T. Taniguchi, K. Watanabe, E. Berg, S. Nadj-Perge, A.F. Young, "*Nematicity and orbital depairing in superconducting Bernal bilayer graphene*", **Nature Physics**, 2025; 21:444– 450.

- **L. Holleis**, J.C. Prestigiacomo, Z. Fan, S. Nishimoto, M. Osofsky, G.W. Chern, J. van den Brink, B.S. Shivaram, "*Anomalous and anisotropic nonlinear susceptibility in the proximate Kitaev magnet α-$RuCl_3$*", **npj Quantum Materials**, 2021; 6:66.

- **L. Holleis**, B.S. Shivaram, P.V. Balachandran, "*Machine learning guided design of single-molecule magnets for magnetocaloric applications*", **Applied Physics Letters**, 2019; 114:222404.

Contributing Author publications

- O. I. Sheekey, T. B. Arp, B. A. Foutty, R. Zhang, T. Tan, **L. Holleis**, Y. Guo, S. S. Kalantre, C. Zhang, M. Zakharyan, D. Gong, A. Keough, Y. Choi, Y. Choi, S. Xu, T. Xie, B. Hodder Alexander, M. Hocking, Q. Cao, M. E. Huber, T. Taniguchi, K. Watanabe, C. Jin, E. Lantagne-Hurtubise, A. Sharpe, T. Devakul, Andrea F. Young, arXiv:2605.30316 (2026)

- C. Zhang, E. Redekop, H. Stoyanov, J. H. Farrell, S. Kim, **L. Holleis**, D. Gong, A. Keough, Y. Choi, T. Taniguchi, K. Watanabe, M. E. Huber, A. C. Bleszynski Jayich, A. Lucas, A. F. Young, arXiv:2603.11175 (2026)

- Y. Guo, O. I. Sheekey, T. Arp, K. Kolář, T. Charpentier, **L. Holleis**, B. Foutty, A. Keough, M. Kang-Chou, M. E. Huber, T. Taniguchi, K. Watanabe, C. Lewandowski, A. F. Young, arXiv:2511.17423 (2025), in print **Nature Physics**

- H. Kim, G. Rai, L. Crippa, D. Călugăru, H. Hu, Y. Choi, L. Kong, E. Baum, Y. Zhang, **L. Holleis**, K. Watanabe, T. Taniguchi, A. F. Young, B. A. Bernevig, R. Valentí, G. Sangiovanni, T. Wehling, A. Nadj-Perge, "*Resolving intervalley gaps and many-body resonances in moiré superconductors*", **Nature**, 2026, 650:592–598

- Y. Choi, Y. Choi, M. Valentini, C.L. Patterson, **L. Holleis**, O.I. Sheekey, H. Stoyanov, X. Cheng, T. Taniguchi, K. Watanabe, A.F. Young, "*Superconductivity and quantized anomalous Hall effect in rhombohedral graphene*", **Nature**, 2025; 639:342–347.

- T. Arp, O. Sheekey, H. Zhou, C.L. Tschirhart, C.L. Patterson, H.M. Yoo, **L. Holleis**, E. Redekop, G. Babikyan, T. Xie, J. Xiao, Y. Vituri, T. Holder, T. Taniguchi, K. Watanabe, M.E. Huber, E. Berg, A.F. Young, "*Intervalley coherence and intrinsic spin–orbit coupling in rhombohedral trilayer graphene*", **Nature Physics**, 2024; 20:1413–1420.

- T. Xie, T. Wolf, S. Xu, Z. Cui, R. Xiong, Y. Ou, P. Hays, **L. Holleis**, Y. Guo, O. Sheekey, C. Patterson, T. Arp, K. Watanabe, T. Taniguchi, S.A. Tongay, A. Young, A. MacDonald, C. Jin, "*Optical imaging of flavor order in flat band graphene*", ***Nat Commun*** 16, 5555, 2025.

- H. Kim, Y. Choi, É. Lantagne-Hurtubise, C. Lewandowski, A. Thomson, L. Kong, H. Zhou, E. Baum, Y. Zhang, **L. Holleis**, K. Watanabe, T. Taniguchi, A.F. Young, J. Alicea, S. Nadj-Perge, "*Imaging inter-valley coherent order in magic-angle twisted trilayer graphene*", **Nature**, 2023; 623:942–948.

- H. Zhou, **L. Holleis**, Y. Saito, L. Cohen, W. Huynh, C.L. Patterson, F. Yang, T. Taniguchi, K. Watanabe, A.F. Young, "*Isospin magnetism and spin-polarized superconductivity in Bernal bilayer graphene*", **Science**, 2022; 375:774–778.
- B.S. Shivaram, **L. Holleis**, V.W. Ulrich, J. Singleton, M. Jaime, "*Field angle tuned metamagnetism and Lifschitz transitions in UPt_3*", **Scientific Reports**, 2019; 9:8162.

Peer Review Activities and Invited Talks

- Reviewer for **Nature Physics**, **Nature Communications** and **Communications Physics**
- GLAM special seminar "Interplay of Superconductivity, Magnetism, and Isospin Fluctuations in Rhombohedral Graphene", Stanford (2025)
- Invited talk "*Nematicity in Spin-orbit proximitized Bilayer Graphene*", at ICSM 2023, Turkey
- Invited talk "*Nematicity in Spin-orbit proximitized Bilayer Graphene*" at University of Regensburg (2023)
- Invited talk "*Interplay of Superconductivity, Magnetism, and Isospin Fluctuations in Rhombohedral Graphene*" at APS March meeting (2026)

Further Qualifications

Languages German (native), English (proficient C2), Spanish (fundamentals A1)

Mentoring

- Mentoring of several undergraduate students on research (2021-present)
- Research mentorship program (RMP) at UCSB: Mentoring high school student on a research project during the summer (2023-2025)
- Advising of Worster Fellow Ruining Zhang during the summer 2021

Volunteer Work

Youth Counselor | TCE Gröbenzell | Tennis Club **February 2015 – March 2021**

- Organization of youth program with over 150 children ages 5 - 18
- Managed training and summer camps of 90 kids and 18 coaches, total annual revenue of 70,000€
- Coordination of 13 junior teams, team captain of the men's team