

Yunqiu Kelly Luo

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Research Interests

Experimental condensed matter physics, van der Waals quantum materials, spin-based quantum information processing, ultrafast magneto-optics dynamics, fast microwave electronics, spin-orbit torque.

Appointments

- 2023-present **University of Southern California**, Gabilan Assistant Professor of Physics and Astronomy
- 2019- present **Cornell University**, Department of Physics, Kavli Institute for Nanoscale Science
- Visiting Scientist (2023-)
 - Presidential Postdoctoral Fellow and Honorary Kavli Fellow (2019-22)
 - Advisers: Daniel C. Ralph (primary), Kin Fai Mak, and Jie Shan

Education

- 2013-2019 **The Ohio State University**, M.S. and Ph.D. in Physics
- Thesis: Information transduction between spintronic, photonic, and magnetic states in two-dimensional hybrid systems
 - Adviser: Roland K. Kawakami
- 2012-2013 **University of California, Riverside**, Ph.D. program in Physics
- 2008-2012 **The Hong Kong University of Science & Technology**, B.S. Physics (Math Minor)
- On Exchange at the University of California, Santa Barbara (2011-12)

Awards and Fellowships

- 2023- Gabilan Assistant Professorship, University of Southern California
- 2019-2022 Presidential Postdoctoral Fellow, Honorary Kavli Postdoctoral Fellow, Cornell University
- 2019 Invited Attendee at the Rising Stars in Physics Workshop, Stanford University
- 2019 The Bunny and Thomas Clark Graduate Scholarship, Ohio State Physics Dept.
- 2018-2019 Presidential Graduate Fellow, Ohio State University
- 2018 March Meeting GMAG and DCMP Travel Awards, American Physical Society (APS)
- 2018 Young Scientist Award, PCSI 45th Conference, American Vacuum Society
- 2017 Best Poster Award, Ohio State Materials Week
- 2014 Best Student Presentation Award, C-Spin Annual Review, Semiconductor Research Corp.
- 2012-2013 Dean's Distinguished Fellowship, UC Riverside
- 2009-2010 Dean's List, Hong Kong Univ. of Sci. and Tech. Physics Dept.
- 2009 Silver Prize, International Genetically Engineered Machine (iGEM) Jamboree at MIT
- 2008-2012 School of Science Scholarship, Hong Kong Univ. of Sci. and Tech.

Leadership and Service

- 2023-present **USC Physics and Astronomy Colloquium Committee, Search Committee**, member
- 2023-present **USC Physics and Astronomy Colloquium Committee, Search Committee**, member
- 2023-present **USC Physics and Astronomy Women in Physics**, faculty adviser
- 2023-present **Materials Research Society Spring Meeting**, symposium organizer
- 2022 **Cornell Center for Materials Research DEIA committee**, member
- 2021-present **NSF National Extreme Ultrafast Science Facility (NeXUS)**, user workshop panelist
- 2021-present **APS Conference for Undergraduate Women in Physics (CUWiP)**
 - o NOC liaison, overall conference chair at Cornell and Ithaca College site (2021-2023)
 - o SoCal Consortium, faculty member (2023-present)
- 2018-present **American Physics Society (APS) March Meeting**
 - o GMAG focus session organizing committee member (2023), lead (2024), symposium organizer (2024)
 - o GMAG and DCMP session chairs (2018 – 2023)
- 2018-present **Journal Referee:** Nature Electronics, Nature Communications, NPG Asia Materials, Nano Letters, ACS Nano, Applied Physics Letter, AIP advances MMM conference, IEEE Transactions on Magnetics – Conferences.
- 2017, 2019 **Ohio State Denman Undergraduate Research Forum**, poster judge

Outreach

- 2023 Volunteer and student buddy for Expanding Your Horizons at Cornell: an annual one-day conference for 7th-9th grade girls designed to stimulate their interests in math and science
- 2020-2023 Overall chair for Cornell and Ithaca College planning committee, APS Conferences for Undergraduate Women in Physics (CUWiP)
 - o Lead proposal writer for two years (2022, 2023 (awarded))
 - o Raised over \$70k to accommodate >200 undergraduate students from the U.S. and Canada
 - o Organized local planning committee with >30 faculty, staff, undergraduate and graduate students, and postdocs from Cornell and Ithaca college
- 2019 Physics demo volunteer, Ohio State Fair
- 2017-22 Member of Pelotonia Team Buckeye – Team College of Arts and Sciences: an annual charity bike ride event to support research at Ohio State James Cancer Center
 - o Together with thousands of fellow riders and volunteers, we rode 100-miles in one day to raise funds for cancer research.
 - o Independently raised over \$7k to date.
- 2015-19 Science lesson teacher at Innis Elementary School and Mansion Day School with Ohio State Center for Emergent Materials Scientific Thinkers bi-weekly program

Teaching

- 2023 Spring **Fundamentals of Physics III: Optics and Modern Physics (PHYS153L)**, Lower-division course for physics and engineering majors, instructor
- 2023 Fall **Physics for the Life Sciences (PHYS135bL)**, USC general education course, instructor
- 2014, 2016 **Algebra-based (PHYS1201) and Calculus-based (PHYS1250) Introduction to Classical Physics**, Ohio State, graduate teaching assistant
- o Tasks include grading, teaching recitation and lab sessions independently.
 - o Occasional substitute lecturer for PHYS 1250 with a classroom size of ~200 students

Invited Talks and Conference Presentation Awards

- Mar. 2024 *Spin-orbit torque in magnetic heterostructures: exchange interactions and ultrasensitive Sagnac optical interferometry*
Symposium on advanced probes for low-dimensional spin and magnetic orders, 2024 APS March Meeting, Minneapolis MN
- Sep. 2023 *Spin-orbit torque in magnetic van der Waals heterostructures: exchange interactions and high-sensitivity Sagnac optical interferometry*
Electrical & Computer Engineering Dep Seminar, UCLA
- Aug. 2023 *Sagnac interferometry for high-sensitivity optical measurements of spin-orbit torque*
SPIE Spintronics XVI Conference, San Diego CA
- Jul. 2023 *Active matter from driven magnets*
Gordon Research Seminar on Spin Dynamics in Nanostructures, Discussion lead, Les Diablerets, VD, Switzerland
- Jun. 2023 **Materials Innovators in Quantum Materials workshop**, Panelist, NSF MRSEC at Columbia University
- Mar. 2023 *Spintronics with 2D and topological materials: outstanding opportunities in van der Waals heterostructures*
Mork Family Department of Chemical Engineering and Materials Science Colloquium, University of Southern California
- Aug. 2022 *Spintronics with 2D and topological materials: outstanding opportunities in van der Waals heterostructures*
Molecular Foundry User Meeting, Lawrence Berkeley National Lab, CA
- Jul. 2022 *Spintronics with 2D and topological materials: outstanding opportunities in van der Waals heterostructures*
NSF REU Students Research Talk, Cornell University
- Jun. 2022 *Manipulation of optical magnetic properties of quantum materials*
Gordon Research Seminar on Two Dimensional Electronics Beyond Graphene, Discussion lead, Manchester NH
- May 2022 *Sagnac interferometry for high-sensitivity optical measurement of spin-orbit torque*
Materials Innovators Workshop: 2D Materials, NSF MRSEC at Cornell University
- Mar. 2022 *Sagnac interferometry for high-sensitivity optical measurement of spin-orbit torque*

- 2022 APS March Meeting**, GMAG focus session invited speaker, Chicago IL
- Mar. 2022 *Spintronics with 2D and topological materials: outstanding opportunities in van der Waals heterostructures*
Physics Colloquium, University of Nebraska-Lincoln
- Feb. 2022 *Spintronics with 2D and topological materials: outstanding opportunities in van der Waals heterostructures*
Condensed Matter Seminar, University of Wisconsin-Madison
- Feb. 2022 *Spintronics with 2D and topological materials: outstanding opportunities in van der Waals heterostructures*
Physics Colloquium (via zoom), Northeastern University
- Feb. 2022 *Spintronics with 2D and topological materials: outstanding opportunities in van der Waals heterostructures*
Physics CAMP Seminar, Penn State University
- Jan. 2022 *Spintronics with 2D and topological materials: outstanding opportunities in van der Waals heterostructures*
Physics Colloquium (via zoom), University of Southern California
- Sep. 2021 *Sagnac interferometry for high-sensitivity optical measurement of spin-orbit torque*
Condensed Matter Seminar, Stony Brook University
- Mar. 2021 *Spintronics with 2D and topological materials: outstanding opportunities in van der Waals heterostructures*
Physics and Chemistry Research Seminar (via zoom), University of Toronto
- Feb. 2021 *Spintronics with 2D and topological materials: outstanding opportunities in van der Waals heterostructures*
Physics Special Seminar (via zoom), UCLA
- Jan. 2020 *Spintronics with 2D materials: new functionalities with heterostructures*
Physics Colloquium, University of Georgia
- Aug. 2019 *Electrical control of opto-valleytronic spin and charge injections in monolayer MoS₂/graphene hybrid van der Waals systems*
SPIE Spintronics XII, San Diego CA
- Apr. 2019 *Spintronics with 2D materials: new functionalities with heterostructure*
Rising Star in Physics Workshop, invited participant, Stanford University
- Mar. 2019 *Electrical gate control of photon-spin and photon-charge conversions in van der Waals heterostructures*
2019 APS March Meeting, GMAG focus session invited speaker, Boston MA
- Jan. 2018 *Opto-valleytronic spin injection in MoS₂/graphene hybrid spin valve*
Young Scientist Award, 45th Conference on the Physics and Chemistry of Surfaces & Interfaces (PCSI 45), Kona HI
- May 2017 *Opto-valleytronic spin injection in MoS₂/graphene hybrid spin valve*

Best Poster Award, Ohio State Materials Week

Sep. 2014 *Opto-electronic and spin dependent properties of transition metal dichalcogenides*
Best Student Presentation Award, Center for Spintronic Materials, Interfaces and Novel architectures (C-Spin) Annual Review, Minneapolis MN

Publications

- [1] W. Zhou, A. J. Bishop, X. S. Zhang, K. Robinson, I. Lyalin, Z. Li, R. Bailey-Crandell, **Y. K. Luo**, D. C. Ralph, D. A. Muller, and R. K. Kawakami, *Tuning the Curie temperature of a 2D magnet/topological insulator heterostructure to above room temperature by epitaxial growth*. [arXiv: 2308.13620](#) accepted in Physical Review Materials (2023)
- [2] T. M. J. Cham*, R. Dorrian, X. S. Zhang, A. H. Dismukes, D. G. Chica, X. Roy, A. F. May, D. A. Muller, D. C. Ralph, and **Y. K. Luo***, *Exchange bias between van der Waals materials: tilted magnetic states and field-free spin-orbit-torque switching*. [Advanced Materials](#), 2305739 (2023)
- [3] S. Karimeddiny*, T. M. J. Cham*, O. Smedley, D. C. Ralph, and **Y. K. Luo***, *Sagnac interferometry for high-sensitivity optical measurements of spin-orbit torque*. [Science Advances](#) **9**, eadi9039 (2023)
- [4] **Y. K. Luo**, T. Zhou, M. R. Neupane, A. Matos-Abiague, R. Bailey-Crandell, M. J. Newburger, I. Iyalin, I. Žutić, and R. K. Kawakami, *van der Waals photothermoelectric effect in atomic layer heterojunctions*. Submitted.
- [5] T. M. J. Cham*, S. Karimeddiny, A. H. Dismukes, X. Roy, D. C. Ralph, and **Y. K. Luo***, *Anisotropic gigahertz frequency antiferromagnetic resonance in layered van der Waals semiconductor*. [Nano Letters](#), **22**, 6716-6723 (2022)
- [6] S. Karimeddiny*, T. M. Cham, D. C. Ralph, and **Y. K. Luo***, *Sagnac interferometry for high-sensitivity optical measurements of spin-orbit torque*. [arXiv: 2109.13759](#) (2021)
- [7] S. Naseem, I. V. Pinchuk, **Y. K. Luo**, R. K. Kawakami, S. Khan, S. Husain, and W. Khan, *Epitaxial growth of Cobalt doped TiO₂ thin films on LaAlO₃(100) substrate by MBE and their opto-magnetic based applications*. [Applied Surface Science](#), **493**, 691-702 (2019)
- [8] J. Xu, T. Zhu, **Y. K. Luo**, Y.-M. Lu, and R. K. Kawakami, *Strong and tunable spin lifetime anisotropy in dual-gated bilayer graphene*. [Physical Review Letters \(Editors' Suggestion, Featured in Physics\)](#), **121**, 127703 (2018)
- [9] D. J. O'Hara, T. Zhu, A. H. Trout, A. S. Ahmed, **Y. K. Luo**, C. H. Lee, M. R. Brenner, S. Rajan, J. Gupta, D. W. McComb, and R. K. Kawakami, *Room temperature intrinsic ferromagnetism in epitaxial manganese selenide films in the monolayer limit*. [Nano Letters](#), **18**, 3125-3131 (2018)
- [10] E. J. McCormick, M. J. Newburger, **Y. K. Luo**, K. M. McCreary, S. Singh, I. B. Martin, E. J. Cichewicz, B. T. Jonker, and R. K. Kawakami, *Imaging spin dynamics in monolayer WS₂ by time-resolved Kerr rotation*. [2D Materials](#), **5**, 011010 (2018)
- [11] J. R. Young, M. Chilcote, M. Barone, J. Xu, J. Katoch, **Y. K. Luo**, S. Mueller, T. J. Asel, S. K. Fullerton-Shirey, R. Kawakami, J. A. Gupta, L. J. Brillson, and E. Johnston-Halperin, *Uniform large-area growth of nanotemplated high-quality monolayer MoS₂*. [Applied Physics Letters](#), **110**, 263103 (2017)

- [12] **Y. K. Luo***, J. Xu*, T. Zhu, G. Wu, E. J. McCormick, M. R. Neupane, and R. K. Kawakami, *Opto-valleytronic spin injection in monolayer MoS₂/few-layer graphene hybrid spin valves*. [Nano Letters](#), **17**, 3877–3883 (2017)
- [13] W. Amamou, P. M. Odenthal, E. J. Bushong, D. J. O’Hara, **Y. K. Luo**, J. van Baren, I. Pinchuk, Y. Wu, A. S. Ahmed, J. Katoch, M. W. Bockrath, H. WK Tom, J. E. Goldberger, and R. K. Kawakami, *Large area epitaxial germanane for electronic devices*. [2D Materials](#), **2**, 035012 (2015)
- [14] H. Wen, T. Zhu, **Y. K. Luo**, W. Amamou, and R. K. Kawakami, *Current-based detection of nonlocal spin transport in graphene for spin-based logic applications*. [Journal of Applied Physics](#), **115**, 17B741 (2014)
- [15] J.-R. Chen, P. M. Odenthal, A. G. Swartz, G. C. Floyd, H. Wen, **K. Y. Luo**, and R. K. Kawakami, *Control of Schottky barriers in single layer MoS₂ transistors with ferromagnetic contacts*. [Nano Letters](#), **13**, 3106–3110 (2013)
- [16] J. Hagemeyer, C. Bonato, T.-A. Truong, H. Kim, G. J. Beirne, M. Bakker, M. P. van Exter, **Y. Luo**, P. Petroff, and D. Bouwmeester, *HI photonic crystal cavities for hybrid quantum information protocols*. [Optics Express](#), **20**, 24714-24726 (2012).

*Equal contribution