

Hryhoriy Polshyn – CV

CONTACT

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RESEARCH APPOINTMENTS

Assistant Professor, June 2022 – present
Institute of Science and Technology Austria (ISTA) Klosterneuburg, Austria

Postdoctoral Scholar Oct 2017 – May 2022
Department of Physics, University of California, Santa Barbara Santa Barbara, CA, USA
PI: Andrea Young
Investigation of correlated electron physics in novel van der Waals heterostructures using electronic transport measurements and magnetic imaging.

PhD Research Assistant Aug 2009 – Aug 2017
Department of Physics, University of Illinois Urbana-Champaign Urbana, IL, USA
Advisor: Raffi Budakian
Developed a new magnetic force microscopy technique, Φ_0 -MFM and applied it to investigate vortex dynamics and phase slips in mesoscopic superconductors.

Research Assistant Sep 2007 – June 2009
Center of Scanning Probe Microscopy, Institute of Metal Physics of NASU Kyiv, Ukraine

EDUCATION

Ph.D. in Physics August 2017
University of Illinois at Urbana-Champaign (UIUC)
Dissertation title: "Magnetic Force Microscopy Studies of Mesoscopic Superconducting Structures".
Thesis advisor: Raffi Budakian

M.S. in Applied Mathematics and Physics, summa cum laude June 2009
Moscow Institute of Physics and Technology (MIPT), Moscow, Russia

B.S. in Applied Mathematics and Physics, summa cum laude June 2007
Moscow Institute of Physics and Technology (MIPT), Moscow, Russia

HONORS

2016 JORDAN S. ASKETH FELLOWSHIP
in recognition of an outstanding European graduate student in the fields of physics, chemistry and medicine.

SYNERGISTIC ACTIVITIES

1. Referee for Science, Nature Communications, Nano Letters, Physical Review X, Physical Review Research, Physical Review B, Scientific Reports, and Applied Physics Letters.
2. Proposal reviewer for the Gordon and Betty Moore Foundation.

RESEARCH ARTICLES

Preprints

1. A. Alexandradinata, N.P. Armitage, A. Baydin, [and 44 others including **H. Polshyn**] “The Future of the Correlated Electron Problem”, [arXiv:2010.00584](https://arxiv.org/abs/2010.00584), (2020).

Published

1. **H. Polshyn**, Y. Zhang, M. A. Kumar, T. Soejima, P. Ledwith, K. Watanabe, T. Taniguchi, A. Vishwanath, M. P. Zaletel, A. F. Young “Topological charge density waves at half-integer filling of a moiré superlattice”, *Nature Physics*, **18**, 42-47 (2022).
2. T. Naibert, **H. Polshyn**, R. G. Menacho, M. Durkin, B. Wolin, V. Chua, I. M. Shem, T. Hughes, N. Mason, R. Budakian “Imaging and controlling vortex dynamics in mesoscopic superconductor-normal-superconductor arrays”, *Phys. Rev. B* **103**, 224526 (2021).
3. C. L. Tschirhart*, M. Serlin*, **H. Polshyn**, A. Shragai, Z. Xia, J. Zhu, Y. Zhang, K. Watanabe, T. Taniguchi, M. E. Huber, A. F. Young “Imaging orbital ferromagnetism in a moire Chern insulator”, *Science* **372**(6548) (2021).
4. **H. Polshyn**, J. Zhu, M. A. Kumar, Y. Zhang, F. Yang, C. L. Tschirhart, M. Serlin, K. Watanabe, T. Taniguchi, A. H. MacDonald, A. F. Young “Electrical switching of magnetic order in an orbital Chern insulator”, *Nature*, **588**, 66-70 (2020).
5. M. Serlin*, C. L. Tschirhart*, **H. Polshyn***, Y. Zhang, J. Zhu, K. Watanabe, T. Taniguchi, L. Balents, A. F. Young “Intrinsic quantized anomalous Hall effect in a moiré heterostructure”, *Science* **367**(6480), 900-903 (2020).
6. H. Zhou, **H. Polshyn**, T. Taniguchi, K. Watanabe, A. F. Young “Solids of quantum Hall skyrmions in graphene”, *Nature Physics*, **16**(2), 154-158 (2020).
7. **H. Polshyn***, M. Yankowitz*, S. Chen, Y. Zhang, K. Watanabe, T. Taniguchi, C. R. Dean, A. F. Young “Large linear-in-temperature resistivity in twisted bilayer graphene”, *Nature Physics*, **15**(10), 1011-1016 (2019).
8. **H. Polshyn**, T. Naibert, R. Budakian “Manipulating multivortex states in superconducting structures”, *Nano Letters* **19**(8), 5476-5482 (2019).
9. M. Yankowitz*, S. Chen*, **H. Polshyn***, K. Watanabe, T. Taniguchi, D. Graf, A.F. Young, C.R. Dean “Tuning superconductivity in twisted bilayer graphene”, *Science* **363**(6431), 1059-1064 (2019).
10. **H. Polshyn**, H. Zhou, E. Spanton, T. Taniguchi, K. Watanabe, A.F. Young “Quantitative transport measurements of fractional quantum Hall energy gaps in edgeless graphene devices”, *Phys. Rev. Lett.* **121**, 226801 (2018).
11. **H. Polshyn**, T. Naibert, R. Budakian “Imaging and controlling multi-vortex states and their dynamics in multiply connected superconducting structures with magnetic force microscopy”, *Phys. Rev. B* **97** 184501 (2018).

RESEARCH TALKS

Invited talks

1. “Orbital Chern insulators at integer and half-integer fillings of a moiré superlattice”, APS March Meeting 2022, Chicago, IL, March 17, 2022.
2. “Engineering topological phases in graphene moiré heterostructures”, Condensed Matter Resnick Seminar, Bar-Ilan University, Israel, November 25, 2021.
3. “Orbital Chern insulators in flat-band graphene moiré systems”, Condensed Matter Seminar at University of Cincinnati, September 22, 2021.

4. "Orbital Chern insulators in twisted bilayer and trilayer graphene", Aspen Center for Physics, Aspen, CO, July 21, 2021.
5. "Orbital Chern insulators in flat-band graphene moiré systems", Quantum Materials for Modern Magnetism & Spintronics (Q3MS), Hefei, China, July 12, 2021.
6. "Orbital Chern insulators in flat-band graphene moiré systems", Gordon and Betty Moore foundation EPIQS Postdoctoral Symposium, online event, May 26, 2021.
7. "Orbital Chern insulators in flat-band graphene moiré systems", Flatiron Institute, Moiré Materials Seminar, May 20, 2021.
8. "Orbital Chern insulators in flat-band graphene moiré systems", Condensed Matter Seminar, University of New Hampshire, April 2021.
9. "Orbital Chern insulator states in flat-band graphene moiré systems", Physics Colloquium, University of Notre Dame, March 4, 2021.
10. "Engineering topological phases in graphene moiré heterostructures", Department of Materials Science & Engineering Seminar, University of Pennsylvania, March 2, 2021.
11. "Orbital Chern insulator states in flat-band graphene moiré systems", Condensed Matter Seminar, Caltech, Pasadena, CA, February 16, 2021.
12. "Electrical switching of magnetic order in an orbital Chern Insulator", Joint UCSB NSF Quantum Foundry/Yale Quantum Institute Workshop, online event, December 2020.
13. "Electronic structure and scattering mechanisms in twisted bilayer graphene", UCSB-MRSEC 2020 Summer Symposium, online event, September 2020.
14. "Voltage-controlled magnetic and topological orders in an orbital Chern insulator hosted by twisted monolayer-bilayer graphene", MURI program seminar, online event, July 2020.
15. "Nonvolatile switching of magnetic order by electric field in an orbital Chern insulator", UCSB NSF Quantum Foundry seminar, UCSB, April 2020.
16. "Topology and correlations in narrow band moiré systems", ARO program review, Durham, NC, January 2020.
17. "Probing and controlling vortex states in multiply-connected mesoscopic superconducting structures", UCSB Condensed matter seminar, Santa Barbara, CA, July 2017.

Contributed talks

18. "Orbital Chern insulator states in twisted monolayer-bilayer graphene and electrical switching of topological and magnetic order", 2021 APS March Meeting, online event, March 2021.
19. "Normal state transport in superconducting twisted bilayer graphene", 2019 APS March Meeting, Boston, MA, March 2019.
20. "Probing and controlling fluxoid states in multiply-connected mesoscopic superconducting structures", 2017 APS March Meeting, New Orleans, LA, March 2017.
21. "Study of vortex states and dynamics in mesoscopic superconducting samples with MFM", 2016 APS March Meeting, Baltimore, MD, March 2016.
22. "Study of Fe(Se, Te) micron-sized rings by magnetic force microscopy", 2015 APS March Meeting, San Antonio, TX, March 2015.
23. "Superconducting Fe(Se, Te) thin films grown by MBE: growth, properties, and fabrication of submicron structures", 2013 EFRC CES Fall Workshop, BNL, Upton, NY, November 2013.
24. "Cantilever micro-susceptometry of submicron Bi2212 samples", 2013 APS March Meeting, Baltimore, MD, March 2013.
25. "Cantilever torque magnetometry study of multiply connected BSCCO arrays near T_c ", 2012 APS March Meeting, Boston, MA, March 2012.
26. "Search for vortices in the pseudogap regime by cantilever magnetometry", 2011 EFRC CES Fall Workshop, Urbana, IL, November 2011.

TEACHING EXPERIENCE

Teaching assistant

Department of Physics, UIUC

Urbana, IL

10 semesters during Fall 2009-Spring 2017

Modern Experimental Physics (4 semesters) - most advanced undergraduate-level physics lab at UIUC. I taught more than 40 students to independently operate a He4 cryostat and a thermal evaporator, perform transport and magnetic measurements of thin-film superconducting samples.

Electronic Circuits (1 semester) - advanced undergraduate-level electronics lab. I taught students to understand and assemble analog and digital electronic circuits.

Classical Physics Lab (2 semesters) - advanced undergraduate-level lab.

Light, Quantum Physics I, Condensed Matter Physics (1 semester each): - undergraduate courses. Responsibilities: grading homework assignments, holding office hours, proctoring exams.