Babak Seradjeh

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Professional Path

2024–Now **Associate Chair,** Department of Physics, Indiana University Bloomington
2022–Now **Professor,** Indiana University Bloomington
2017–2018 **Visiting Scientist,** Max Planck Institute for the Physics of Complex Systems, Dresden, Germany
2016–2022 **Associate Professor,** Indiana University Bloomington
2011–2016 **Assistant Professor,** Indiana University Bloomington
2008–2011 **Postdoctoral Research Associate,** University of Illinois, Urbana-Champaign
2006–2008 **Postdoctoral Fellow,** University of British Columbia

Awards and Distinctions

2025 **IU Trustees Teaching Award,** IUB.
2023-2025 **NASF-EAGER,** $300,000 (co-PI), with A. Gumennik (PI), P. Richerme (co-PI).
2019-2023 **Department of Energy award,** $900,000 (co-PI), with P. Richerme (PI), G. Ortiz (co-PI).
2021 **IU Faculty Research Support Program – External Submission** $58,426 (PI).
2015-2018 **US-Israel Binational Science Foundation Award,** $75,000 (PI), with E. Grosfeld (PI).
2014-2020 **National Science Foundation CAREER Award,** $474,024 (PI).
2016 **IU Ostrom Outreach Grant** $5,660 (PI), with R. Tayloe (PI).
2015 **Outstanding Junior Faculty Award,** Indiana University, Bloomington.
2014 **Joseph and Sophia Konopinski Award for Outstanding Teaching,** IUB.
2013 **Outstanding Undergraduate Teaching Award,** Department of Physics, IUB.
2008 **NSERC Postdoctoral Fellowship,** $80,000, Location of tenure: UIUC.
2006 **NSERC Industrial R&D Fellowship,** $60,000 (declined).
2006 **President's PhD Stipend,** $6,000, (Simon Fraser University).
2002–2004 **Graduate Fellowship,** $24,000 (Simon Fraser University).
2004 **Billy Jones Memorial Graduate Scholarship,** $2,700 (Simon Fraser University).
2003 **Sulzer Pumps Inc. Graduate Scholarship,** $1,000 (Simon Fraser University).
1995–1998 **Undergraduate Scholarship,** IPM, Tehran, Iran.
1998 **2nd Place (Physics),** National Graduate Studies Examination, Iran.
1994 **1st/2nd Place (Physics/General),** National University Entrance Examination, Iran.

Education

Aug 2006 **PhD in Physics** Simon Fraser University, Burnaby, British Columbia, Canada
Aug 2000 **MSc in Physics** Sharif University of Technology, Tehran, Iran
Jun 1998 **BSc in Physics** Sharif University of Technology, Tehran, Iran

Publication profile

Publications

total = 47; 45 peer-reviewed (all available on arXiv).
18 Letters and Rapid Communications 1 Editors' Suggestion 4 Open Access

Citations

total ∼ 1786, h-index = 22 (Source: NASA ADS);
total ∼ 2320, h-index = 24 (Source: Google Scholar).

Preprints (group members underlined)

2. A. Kostelecký, R. Lehnert, M. Schreck, **B. Seradjeh**, *Physical interpretation of large Lorentz violation via Weyl semimetals*, Under review in New Journal of Physics, preprint arXiv:2412.18034.

1. A. Kumar, Y. Li, **B. Seradjeh**, *Enhancement of High Harmonic Generation in Bulk Floquet Systems*, Under review in SciPost Physics, preprint arXiv:2207.02830.

Publications (at Indiana University; group members underlined)

45. A. Kostelecký, R. Lehnert, M. Schreck, **B. Seradjeh**, *Nonperturbative Lorentz violation and field quantization*, Phys. Lett. B **865**, 139414 (2025); arXiv:2412.19733. Open Access

44. S. Aich, **B. Seradjeh**, *Multiple tunable real-space degeneracies in graphene irradiated by twisted light*, Phys. Rev. B **110**, 054314 (2024); arXiv:2311.04792.

43. R. Kumari, **B. Seradjeh**, A. Kundu, *Josephson-Current Signatures of Unpaired Floquet Majorana Bound States*, Phys. Rev. Lett. **133**, 196601 (2024); arXiv:2301.07707. Letter

42. A. Kostelecký, R. Lehnert, N. McGinnis, M. Schreck, **B. Seradjeh**, *Lorentz violation in Dirac and Weyl semimetals*, Phys. Rev. Res. **4**, 023106 (2022); arXiv:2112.14293. Open Access

41. A. Eaton, Y. Li, H. A. Fertig, **B. Seradjeh**, *Renormalized magic angles in asymmetric twisted graphene multilayers*, Phys. Rev. B **106**, 045117 (2022); arXiv:2202.12502.

40. Y. Li, A. Eaton, H. A. Fertig, **B. Seradjeh**, *Dirac Magic and Lifshitz Transitions in AA-Stacked Twisted Multilayer Graphene*, Phys. Rev. Lett. **128**, 026404 (2022); arXiv:2107.10687. Letter

39. A. Kumar, G. Ortiz, P. Richerme, **B. Seradjeh**, *Floquet Gauge Pumps as Sensors for Spectral Degeneracies Protected by Symmetry or Topology*, Phys. Rev. Lett. **126**, 206602 (2021); arXiv:2012.09677. Letter

38. Y. Li, H. A. Fertig, **B. Seradjeh**, *Floquet-engineered topological flat bands in irradiated twisted bilayer graphene*, Phys. Rev. Res. **2**, 043275 (2020); arXiv:1910.04711. Open Access

37. D. Dahan, E. Grosfeld, **B. Seradjeh**, *Dynamically induced topology and quantum monodromies in a proximity quenched gapless wire*, Phys. Rev. B **102**, 125142 (2020); arXiv:1908.06111.

36. A. Kumar, M. Rodriguez-Vega, T. Pereg-Barnea, **B. Seradjeh**, *Linear response theory and optical conductivity of Floquet topological insulators*, Phys. Rev. B **101**, 174314 (2020); arXiv:1912.12753.

35. M. Rodriguez-Vega, A. Kumar, **B. Seradjeh**, *Higher-order Floquet topological phases with corner and bulk bound states*, Phys. Rev. B **100**, 085138 (2019); arXiv:1811.04808. Editors' Suggestion

34. F. N. Ünal, **B. Seradjeh**, A. Eckardt, *How to Directly Measure Floquet Topological Invariants in Optical Lattices*, Phys. Rev. Lett. **122**, 253601 (2019); arXiv:1812.04636. Letter

33. M. Rodriguez-Vega, M. Lentz, **B. Seradjeh**, *Floquet Perturbation Theory: Formalism and Application to the Low Frequency Limit*, New J. Phys. **20**, 093022 (2018); arXiv:1805.01190. Open Access

32. M. Rodriguez-Vega, H. A. Fertig, **B. Seradjeh**, *Quantum noise detects Floquet topological phases*, Phys. Rev. B **98**, 041113(R) (2018); arXiv:1803.10646. Rapid Communication

31. M. Rodriguez-Vega, **B. Seradjeh**, *Universal Fluctuations of Floquet Topological Invariants at Low Frequencies*, Phys. Rev. Lett. **121**, 036402 (2018); arXiv:1706.05303. Letter

30. **B. Seradjeh**, M. Vennettilli, *Surface spectra of Weyl semimetals through self-adjoint extensions*, Phys. Rev. B **97**, 075132 (2018); arXiv:1712.04355.

29. A. Rahmani, **B. Seradjeh**, M. Franz, *Optimal diabatic dynamics of Majorana-based quantum gates*, Phys. Rev. B **96**, 075158 (2017); arXiv:1605.03611.

28. D. Dahan, M. T. Ahari, G. Ortiz, **B. Seradjeh**, E. Grosfeld, *Non-Abelian fermion parity interferometry of Majorana bound states in a Fermi sea*, Phys. Rev. B **95**, 201114(R) (2017); arXiv:1609.04627. Rapid Communication

27. A. Kundu, H.A. Fertig, **B. Seradjeh**, *Floquet-Engineered Valleytronics in Dirac Systems*, Phys. Rev. Lett. **116**, 016802 (2016); arXiv:1505.03818. Letter

26. M. T. Ahari, G. Ortiz, **B. Seradjeh**, *On the role of self-adjointness in the continuum formulation of topological quantum phases*, Am. J. Phys. **84**, 858 (2016); arXiv:1508.02682.

25. D. Ariad, **B. Seradjeh**, E. Grosfeld, *On the effective theory of vortices in two-dimensional spinless chiral p-wave superfluid*, Phys. Rev. B **92**, 035136 (2015); arXiv:1407.2553.

24. A. Kundu, H.A. Fertig, **B. Seradjeh**, *Effective Theory of Floquet Topological Transitions*, Phys. Rev. Lett. **113**, 236803 (2014); arXiv:1406.1490. Letter

23. Y. Li, A. Kundu, F. Zhong, **B. Seradjeh**, *Tunable Floquet Majorana fermions in driven coupled quantum dots*, Phys. Rev. B **90**, 121401(R) (2014)); arXiv:1402.7353. Rapid Communication

22. W. K. Zhu, M. Wang, **B. Seradjeh**, F. Yang, S. X. Zhang, *Enhanced weak ferromagnetism and conductivity in hole-doped pyrochlore iridate* $Y_2Ir_2O_7$, Phys. Rev. B **90**, 054419 (2014); arXiv:1501.00615.

21. C.-K. Lu, **B. Seradjeh**, *Zero modes of the generalized fermion-vortex system in magnetic field*, Phys. Rev. B **89**, 245448 (2014); arXiv:1403.8092.

20. A. Kundu, **B. Seradjeh**, *Transport Signatures of Floquet Majorana Fermions in Driven Topological Superconductors*, Phys. Rev. Lett. **111**, 136402 (2013); arXiv:1301.4433. Letter

19. **B. Seradjeh**, *Majorana edge modes of topological exciton condensate with superconductors*, Phys. Rev. B **86**, 121101(R) (2012); arXiv:arXiv:1203.6628. Rapid Communication

18. **B. Seradjeh**, *Topological exciton condensate of imbalanced electrons and holes*, Physics Review B **85**, 235146 (2012); arXiv:1202.6240.

Publications (post-doctoral)

17. **B. Seradjeh**, E. Grosfeld, *Unpaired Majorana fermions in a layered topological superconductor*, Phys. Rev. B **83**, 174521 (2011); arXiv:1102.0360.

16. E. Grosfeld, **B. Seradjeh**, S. Vishveshwara, *Proposed Aharonov-Casher interference measurement of non-Abelian vortices in chiral p-wave superconductors*, Phys. Rev. B **83**, 104513 (2011); arXiv:1004.2295.

15. **B. Seradjeh**, J. Wu, P. Phillips, *Reply to Comment on* "Signatures of Surface States in Bismuth at High Magnetic Fields," Phys. Rev. Lett. **104**, 059706 (2010); arXiv:0910.2734. Letter

14. **B. Seradjeh**, J. Wu, P. Phillips, *Signatures of Surface States in Bismuth at High Magnetic Fields*, Phys. Rev. Lett. **103**, 136803 (2009); arXiv:0905.0689. Letter

13. **B. Seradjeh**, J. Moore, M. Franz, *Exciton Condensation and Fractionalization in a Topological Insulator Film*, Phys. Rev. Lett. **103**, 066402 (2009); arXiv:0902.1147. Letter

12. G. Rosenberg, **B. Seradjeh**, C. Weeks, M. Franz, *Creation and manipulation of anyons in a layered superconductor–2DEG system*, Phys. Rev. B **79**, 205102 (2009); arXiv:0812.3140.

11. **B. Seradjeh**, H. Weber, M. Franz, *Vortices, Zero Modes and Fractionalization in Bilayer-Graphene Exciton Condensate*, Phys. Rev. Lett. **101**, 246404 (2008); arXiv:0806.0849. Letter

10. **B. Seradjeh**, M. Franz, *Fractional Statistics of Topological Defects in Graphene and Related Structures*, Phys. Rev. Lett. **101**, 146401 (2008); arXiv:0709.4258. Letter

9. **B. Seradjeh**, *Midgap spectrum of the fermion-vortex system*, Nature Phys. **805**, 182 (2008); arXiv:0807.0618.

8. **B. Seradjeh**, C. Weeks, M. Franz, *Fractionalization in a square-lattice model with time-reversal symmetry*, Phys. Rev. B **77**, 033104 (2008); arXiv:0706.1559.

7. C. Weeks, G. Rosenberg, **B. Seradjeh**, M. Franz, *Anyons in a weakly interacting system*, Nature Phys. **3**, 796 (2007); arXiv:cond-mat/0703001.

6. **B. Seradjeh**, I. Herbut, *Excitons in QED_3 and spin response in a phase-fluctuating d-wave superconductor*, Phys. Rev. B **76**, 024503 (2007); arXiv:cond-mat/0701724.

Publications (pre-doctoral)

5. M. Case, **B. Seradjeh**, I. Herbut, *Self-consistent theory of compact QED_3 with relativistic fermions*, Nature Phys. **676**, 672-686 (2004); arXiv:cond-mat/0308260.

4. I. Herbut, **B. Seradjeh**, S. Sachdev, G. Murthy, *Absence of U(1) spin liquids in two dimensions*, Phys. Rev. B **68**, 195110 (2003); arXiv:cond-mat/0306537.

3. I. Herbut, **B. Seradjeh**, *Permanent Confinement in Compact QED_3 with Fermionic Matter*, Phys. Rev. Lett. **91**, 171601 (2003); arXiv:cond-mat/0305296. Letter

2. **B. Seradjeh**, I. Herbut, *Fine structure of chiral symmetry breaking in the QED_3 theory of underdoped high-T_c superconductors*, Phys. Rev. B **66**, 184507 (2002); arXiv:cond-mat/0207221.

1. V. Karimipour, **B. Seradjeh**, *A new class of models for surface relaxation with exact mean-field solution*, Europhys. Lett. **57**, 658-664 (2002); arXiv:cond-mat/0104196.

Selected Invited Talks

Floquet Topology from Twists in Irradiated Graphene

MAR 2025 QuTech Seminar, TU Delft, The Netherlands.

MAR 2025 International Workshop on Topological Nonlinear Optics in Quantum Materials, Institute for Solid State Physics, University of Tokyo, Kashiwa, Japan.

Floquet Topology and Nonequilibrium Dynamics in Quantum Matter

FEB 2025 Quantum Matter Seminar, Northeastern University, Boston, MA.

Lectures on Topology and Nonequilibrium Dynamics in Quantum Matter + Lorentz Violation

JAN 2025 Keynote speaker, International Workshop on Topological Quantum Matter, ICN-UNAM, Mexico City, Mexico.

SME Applications in Condensed Matter

MAY 2024 Lecture, IUCSS Summer School 2024, Bloomington, IN

Lorentz Violation in Condensed Matter

JAN 2024 IUCSS Workshop on Theoretical Aspect of SME, Bloomington, IN

Floquet gauge pumps and signatures of Floquet topology in Josephson junctions

APR 2023 Colloquium, Temple University, Philadelphia, PA.

Tuning topology by twists and light in flatland

OCT 2022 ICMT Seminar, University of Illinois, Urbana-Champaign, IL.

Lorentz violation in Dirac and Weyl semimetals

MAY 2022 IUCSS 9$^{\text{th}}$ meeting on CPT and Lorentz Symmetry, Bloomington, IN (virtual).

Quantum playdough: Nonequilibrium dynamics and topology in synthetic quantum matter
SEP 2021 Colloquium, Indiana University, Bloomington, IN.
SME and CMP: Perspective and recent Results
MAY 2021 IUCSS SME 2021 Summer School, Bloomington, IN (virtual)
Engineering topological phases of synthetic quantum matter
JUL 2021 IASBS 26th Physics School, Institute for Advanced Studies in Basic Sciences, Zanjan, Iran (virtual).
Floquet-engineered topological phases and probes of quantum matter
APR 2021 Seminar, Ben-Gurion University, Beer Sheva, Israel (virtual).
APR 2021 QuSpin Seminar, Norwegian University of Science and Technology, Trondheim, Norway (virtual).
OCT 2020 Colloquium, Lehigh University, Lehigh, PA (virtual).
Lorentz violation and Weyl semimetals
NOV 2020 IUCSS SME 2020, Bloomington, IN (virtual).
Higher-order Floquet topological phases with corner and bulk bound states
JUL 2019 Aspen Center for Physics.
JUN 2019 MPI-PKS Workshop on Engineering Nonequilibrium Dynamics of Open Quantum System.
FEB 2019 SBQMI Workshop on Synthetic Topological Matter, University of British Columbia, BC.
Floquet topology: fast, slow, and across
SEP 2018 CMP Seminar, Michigan State University, Lansing, MI.
Topology and adiabatic limit in slowly driven quantum systems
MAR 2018 IoP Topical Research Meeting on Topological States in Strongly Interacting Light-Matter Systems.
Universal Fluctuations of Floquet topological invariants at low frequencies
FEB 2018 CMT Seminar, Weizmann Institute, Rehovot, Israel.
JAN 2018 CMT Seminar, INSPIRE, Johannes Gutenberg University, Mainz, Germany.
JAN 2018 LCN Seminar, University College London, UK.
JUL 2017 Aspen Center for Physics.

Teaching and Other Experiences

2011–NOW (Assistant, Associate) Porfessor Indiana University – Bloomington
- ☐ P120 Energy & Technology | *Fall 2018, 2019, 2020*
- ☐ P222 Physics II | *Fall 2014, 2015, 2016, 2021*
- ☐ P441 Analytical Mechanics I | *Fall 2013, 2012, 2024*
- ☐ P442 Analytical Mechanics II | *Spring 2014, 2013*
- ☐ P453 Introduction to Quantum Mechanics | *Spring 2016, 2015, 2022, 2023, 2024*
- ☐ P454 Modern Physics (Quantum Mechanics II) | *Fall 2022, 2023*
- ☐ P556 Statistical Physics | *Spring 2019, 2020, 2021*
- ☐ P557 Introduction to Solid State Physics | *Fall 2011*
- ☐ P615 Condensed Matter Physics I | *Spring 2017*

2000–2006 Teaching Assistant, Simon Fraser University
2001–2003 Physics Subject Editor, Continuing Studies, Simon Fraser University
1999-2000 Physics Teacher, National Organization for Development of Exceptional Talents, Tehran, Iran
1999-2003 Subject Editor, Encyclopedia for Young People, Children's Book Council, Tehran, Iran
1998–2000 Teaching Assistant, Sharif University of Technology

Advisory Experience

Postdoctoral fellows:
Yantao Li (2019-2022), now Postdoctoral fellow at University of Alabama;
Daniel Ariad (2019-2020), now Postdoctoral Fellow at Johns Hopkins University;
Martin Rodriguez-Vega (2016-2018), now Associate Editor at Physical Review Letters;
Chi-Ken Lu (2012-2014), now Research Associate at Rutgers University;
Arijit Kundu (2012-2015), now Associate Professor at IIT-Kanpur.

Graduate Students:

Nicolas Lam (PhD, 2021-Now);
Suman Aich (PhD, 2020-Now);
Abhishek Kumar (PhD, 2016-2022), now Postdoctoral Fellow at Virginia Tech;
Mostafa Tanhayi Ahari (PhD, 2013-2015), now Postdoctoral Fellow at UIUC;
Yantao Li (PhD visiting student from Sun-Yat Sen University, 2013-2015).

Undergraduate Students:

Gabriel Chiselenco (REU 2023),
Zachary Anderson (REU 2022),
Brian Gould (REU 2021),
Willow Beemsterboer (Center of Excellence for Women & Technology REU 2020-2021),
Colleen Klein (Center of Excellence for Women & Technology REU 2019-2020),
Caitlin Patterson (REU 2019),
Meghan Lentz (REU 2017),
Michael Vennettilli (REU 2015),
Marvin Jones (STEM Summer Scholar 2013 and 2014),
Orsola C. Searle (REU 2014).
Jordan Venderley (REU 2013).

Service

Professional:

Editorial College Fellow, SciPost Physics (2021-Now).
Organizer, International Conference on Reproducibility in Condensed Matter Physics (2024).
Organizer, VSF Floquet Summer School (2022).
Founding Member, Virtual Science Forum (2019-Now).
Organizer, VSF Long Range Colloquium series (2020 and 2021).
Organizer, Observing Anyons 2020 mini-conference.
Editorial Board Member, Journal of Physics: Condensed Matter (2016-2022).
Referee: Science; Nature; Physical Review Letters; Physical Review B; Physical Review E; Nuclear Physics B; Journal of Physics: Condensed Matter; and European Physical Journal.
Reviewer, National Science Foundation; Fonds de Recherche du Québec.
Chair, Gordon Research Seminar for Gordon Research Conference – Correlated Electron Systems, 2012.

Departmental (Indiana University, Bloomington):

Associate Chair (2024-Now).
Member, Executive Committee (2020-2023), (2024-Now *ex officio*).
Chair, Colloquium Committee (2020-2023).
Member, various committees, notably Graduate Admissions, Outreach, and Diversity (2011-Now).
Faculty Member, IU Physics APS Bridge Program.
Faculty Advisor, IU Physics Club (2012-2018).
Founder and Faculty Advisor, IU Physics Undergraduate Seminar and Journal Club (2012-2018).

Campus-wide (Indiana University, Bloomington):

Member, Patten Lecture Committee (2024-Now).
Member, College of Arts and Sciences Tenure Committee (2022-Now).
Faculty Member, College of Arts and Sciences Academic Fairness Committee (2020-2021).
Member, Outstanding Junior Faculty Award Selection Committee, OVPR and VPFAA (2019).
Expert Panelist, NSF CAREER Award workshop, OVPR (2018).

Languages

English (fluent), Persian (native), French (intermediate), German (intermediate),
Italian (beginner), Spanish (beginner), Dutch (beginner), Arabic (working understanding).