Erik Kalz

Curriculum Vitae

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Education

01/2026-04/2026	**Postdoctoral research fellowship**, *University of Tel Aviv*, Israel, Successful candidate for the "Joint Postdoctoral and PhD Exchange Fellowships by the Tel Aviv University and the University of Potsdam" to work in the group of Prof. Yael Roichman at Tel Aviv University
Dissertation	*Tracer transport in interacting odd-diffusive systems.* Through a combination of first-principles theory, kinetic approaches, and statistical mechanics in the dilute limit, as well as field-theoretic approaches for crowded systems, I show how such symmetries, or their deliberate breaking, manifest themselves in unconventional transport phenomena of tracer particles. The particular focus of this cumulative thesis lies on odd-diffusive (also chiral) systems, i.e., systems with a broken time-reversal and/or parity symmetry. The thesis was granted with **summa cum laude** ("highest honours"). Reviewers: Prof. Ralf Metzler, Prof. Abhinav Sharma and Prof. Holger Stark
09/2022-12/2025	**Doctorate in theoretical physics**, *University of Potsdam*, Germany
Master Thesis	*Diffusion under the effect of Lorentz force.* Supervised by Prof. Jens-Uwe Sommer and Dr. Abhinav Sharma. Brownian particles under the effect of Lorentz force show an unexpected diffusive behaviour: Collisions can enhance the self-diffusion instead of reducing it, as ordinarily. The thesis was graded with **highest grade 1.0** and published in the Springer-Nature book-series **BestMasters**. The research was published as a *Physical Review Letter* and selected as an **Editors' Suggestion**.
04/2020-05/2022	**Master of physics**, *Technical University of Dresden*, Germany, Minor: philosophy
07/2019-12/2019	**Semester abroad**, *Norwegian University of Science and Technology*, Trondheim, Norway, enrolled as master student
Bachelor Thesis	*Entropy production in a non-equilibrium system of hard rods in confinement.* Supervised by Prof. Jens-Uwe Sommer and Dr. Abhinav Sharma. Density Functional Theory was used in equilibrium and in dynamics to study the entropy production of interacting particles. The thesis was graded with **highest grade 1.0**
10/2016-01/2020	**Bachelor of physics**, *Technical University of Dresden*, Germany, Minor: philosophy
07/2016	**Abitur with highest grade 1.0**, *diploma from german secondary school, qualifying for university admission or matriculation*
2010-2016	**Secondary school**, *Max-Steenbeck-Gymnasium Cottbus*, Germany, *secondary school with extended education in mathematics, science, computer science and technology*

Awards

Postdoctoral fellowship	Successful candidate in the "Joint Postdoctoral and PhD Exchange Fellowships by the Tel Aviv University and the University of Potsdam".
IOP Impact Award	The publication "Field theory of active chiral hard disks: a first-principles approach to steric interactions" in *Journal of Physics A* has been recognised for the "impact [it has] achieved in such a short period of time".
Emergent Talent Speaker	Awarded to my talk "Subtle interactions in odd-diffusive systems" at the conference "Venice meeting on fluctuations in small complex systems VII" (2024) in Venice, Italy.

Best Communication	Awarded to my talk "Interactions enhance self-diffusion in odd-diffusive systems" at the conference "New Trends in Nonequilibrium Statistical Mechanics" (2023) in Erice, Sicily.
Springer BestMasters	Springer Nature awards publication to the best master's theses which have been completed at renowned Universities in Germany, Austria, and Switzerland (2022).
PRL Editors' Suggestion	The publication "Collisions enhance self-diffusion in odd-diffusive systems" in *Physical Review Letters* was selected as an "Editors' Suggestion" (2022).

Academic Metrics & Services

Publications	2 preprints under review, 6 peer-reviewed journal articles (4 first-authored, 2 as corresponding author), 1 book
Citations	165+ citations, h-index: 6 (Google Scholar)
Conferences	14 invited talks, 10+ contributing talks, and 5+ contributing posters at international conferences
Organization	○ Guest-editing a *New Journal of Physics* 'Focus On' issue on "Broken symmetries and odd transport in statistical physics" together with R. Metzler and A. Sharma
	○ DPG-SKM 2025 focus session "Broken symmetries in statistical physics: Dynamics of odd systems" together with R. Metzler and A. Sharma
	○ 4 semester Metzler group seminar (70+ international speakers)
Supervision	6 Bachelor students (5 finished, 1 ongoing), 3 Master students (1 finished, 2 ongoing)
Teaching	○ undergraduate teaching assistant: 1 semester mathematics for physicists, 4 semesters mathematics for engineers, 4 semesters logic for philosophy,
	○ graduate teaching assistant: 1 semester theoretical mechanics for physicists

Experience

since 02/2026	**postdoctoral research assistant**, *Institute for Physics & Astronomy, University of Potsdam*, Germany
09/2022-01/2026	**research assistant**, *Institute for Physics & Astronomy, University of Potsdam*, Germany
06/2022-03/2023	**assistance of tax consultancy**, *Agency of Ramona Kalz*, Finsterwalde, Germany
01/2022-03/2022	**research assistant**, *Leibniz-Institute for Polymer Research Dresden*, Germany
09/2021-02/2022	**script-writing**, *Institute of Analysis, Technical University Dresden*, Germany
01/2020-10/2020	**internship**, *Leibniz-Institute for Polymer Research Dresden*, Germany

Selected Talks and Conferences

11/2025	**Invited talk** at the "Physical Chemistry Seminar" (Tel Aviv University)
09/2025	**Invited talk** at the "Spintronics and Quantum Information Seminar" (AMU Poznań)
06/2025	**Invited talk** at the "Industrial and Applied Mathematics Seminar" (U Oxford)
06/2025	**Invited talk** in the group of Prof. M. Cates (U Cambridge)
10/2024	**Contributing talk** at the conference "Third Infinity 2024"(Göttingen)
09/2024	**Contributing talk & poster** at the "Venice meeting on fluctuations in small complex systems VII"
05/2024	**Invited talk** at the SIAM chapter seminar (U Potsdam)
05/2024	**Invited talk** at the "Statistical Physics and Nonlinear Dynamics Seminar" (HU Berlin)
04/2024	**Invited talk** in the group of Prof. H. Stark (TU Berlin)

10/2023   **Contributing talk** at the conference "New Trends in Noneqquilibrium Statistical Mechanics" (Erice, IT)

07/2023   **Invited talk** at the seminar of DFG-TRR 146 (JGU Mainz)

04/2023   **Invited talk** at the "Philosophy of Physics" seminar by U. Scheffler (TU Dresden)

04/2023   **Invited talk** in the group of Prof. C. Sellhuber-Unkel (RKU Heidelberg)

05/2022   **Invited talk** in the group of Prof. J. Brader (U Fribourg)

04/2022   **Invited talk** in the group of Prof. H. Löwen (HHU Düsseldorf)

▬▬▬ Publications

ORCID: 0000-0003-3294-7365,

[*] These authors contributed equally

A Preprints

A1 J. Wójcik and **E. Kalz**. The chiral random walk: A quantum-inspired framework for odd diffusion. *arXiv preprint*, arXiv:2602.09920, 2026

A2 **E. Kalz**[*], S. Ravichandir[*], J. Birkenmeier, R. Metzler, and A. Sharma. Reversal of tracer advection and Hall drift in an interacting chiral fluid. *arXiv preprint*, arXiv:2503.04544, 2025

B Journal Articles

B1 P. L. Muzzeddu[*], **E. Kalz**[*], A. Gambassi, A. Sharma, and R. Metzler. Self-diffusion anomalies of an odd tracer in soft-core media. *New Journal of Physics*, 27(3):033025, 2025   **@open access**

B2 A. Langer, A. Sharma, R. Metzler, and **E. Kalz**. Dance of odd-diffusive particles: A Fourier approach. *Physical Review Research*, 6(4):043036, 2024   **@open access**

B3 **E. Kalz**, A. Sharma, and R. Metzler. Field theory of active chiral hard disks: A first-principles approach to steric interactions. *Journal of Physics A: Mathematical and Theoretical*, 57(26):265002, 2024   **@open access**   **@IOP impact award 2024**

B4 **E. Kalz**, H. D. Vuijk, J.-U. Sommer, R. Metzler, and A. Sharma. Oscillatory force autocorrelations in equilibrium odd-diffusive systems. *Physical Review Letters*, 132(5):057102, 2024

B5 **E. Kalz**[*], H. D. Vuijk[*], I. Abdoli, J.-U. Sommer, H. Löwen, and A. Sharma. Collisions enhance self-diffusion in odd-diffusive systems. *Physical Review Letters*, 129(9):090601, 2022   **@selected as PRL Editors' suggestion**

B6 I. Abdoli, **E. Kalz**, H. D. Vuijk, R. Wittmann, J.-U. Sommer, J. M. Brader, and A. Sharma. Correlations in multithermostat Brownian systems with Lorentz force. *New Journal of Physics*, 22(9):093057, 2020   **@open access**

C Books

C1 **E. Kalz**. *Diffusion under the Effect of Lorentz Force.* Springer Spektrum Wiesbaden, 2022