Arkady Kurnosov

Holon Institute of Technology | Department of Physics
Weizmann Institute of Science | Department of Physics of Complex Systems
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Education

Tulane University, New Orleans, LA, USA — 2009–2016
Ph.D.
Theoretical Investigation of Ultrafast Energy Transport in Polymer Chains
Advisor: Prof. Alexander Burin

Lomonosov Moscow State University, Moscow, Russia — 1998–2004
M.S. in Physics, Department of Physics

Academic Appointments

Holon Institute of Technology – Holon, Israel — Oct 2026 – Present
Senior Lecturer

Weizmann Institute of Science – Rehovot, Israel — Dec 2024 – Present
Academic Consultant

Ben-Gurion University of the Negev – Be'er Sheva, Israel — Oct 2024 – Jul 2025
Lecturer in Physics

Wesleyan University – Middletown, CT, USA — Sep 2023 – Jun 2024
Visiting Assistant Professor of Physics

Wesleyan University – Middletown, CT, USA — Jan 2020 – Aug 2023
Postdoctoral Research Associate
Wave Transport in Complex Systems Group

University of Houston – Houston, TX, USA — Sep 2016 – Oct 2018
Postdoctoral Researcher

Tulane University – New Orleans, LA, USA — Aug 2009 – May 2016
Graduate Teaching Assistant

Lyceum "Vtoraya Shkola" (High School #2)
Moscow, Russia — Aug 2005 – Jun 2009
Teacher of Physics and Astronomy

Research Interests

Quantum chaos and statistical approaches to open and driven systems;
Condensed matter theory and photonics;
Wave transport and localization phenomena in complex and disordered media;
Quantum and classical coherence effects, non-Hermitian physics, and exceptional point dynamics;
Vibrational and electronic energy transport in molecular and low-dimensional systems.

Peer-Reviewed Publications

[1] N. Wyszkovsky, A. Suntharalingam, M. Vitek, A. Kurnosov, L. J. Fernández-Alcázar, T. Kottos, *Observed enhanced emission at higher-order exceptional points*, Phys. Rev. Applied **24**, L061003 (2025). doi:10.1103/6j39-f1dx

[2] A. Kurnosov, V. Lubchenko, *The mechanism of electrical conduction in glassy semiconductors*, PNAS **122** (10), e2414650122 (2025). doi:10.1073/pnas.2414650122

[3] Arkady Kurnosov, Lucas J. Fernández-Alcázar, Alba Ramos, Boris Shapiro, and Tsampikos Kottos, *Optical kinetic theory of nonlinear multimode photonic networks*, Phys. Rev. Lett. **132**, 193802 (2024) [Editor's Suggestion]. doi:10.1103/PhysRevLett.132.193802

[4] Serena Landers, Arkady Kurnosov, William Tuxbury, Ilya Vitebskiy, and Tsampikos Kottos, *Nonlinear wavepacket dynamics in proximity to a stationary inflection point*, Phys. Rev. B **109**, 024312 (2024). doi:10.1103/PhysRevB.109.024312

[5] Abhishek Gupta, Arkady Kurnosov, Tsampikos Kottos, and Ramathasan Thevamaran, *Reconfigurable enhancement of actuation forces by engineered losses in non-Hermitian metamaterials*, Extreme Mech. Lett. **59**, 101979 (2023). doi:10.1016/j.eml.2023.101979

[6] Arkady Kurnosov, Lucas J. Fernández-Alcázar, Raúl Bustos-Marún, and Tsampikos Kottos, *Adiabatic monoparametric autonomous motors enabled by self-induced nonconservative forces*, Phys. Rev. Applied **18**, 064041 (2022). doi:10.1103/PhysRevApplied.18.064041

[7] V. Lubchenko, A. Kurnosov, *Temperature-driven narrowing of the insulating gap as a precursor of the insulator-to-metal transition: Implications for the electronic structure of solids*, J. Chem. Phys. **150**, 244502 (2019). doi:10.1063/1.5063587

[8] Layla N. Qasim, Arkady A. Kurnosov, Yuankai Yue, Zhiwei Lin, Alexander L. Burin, and Igor V. Rubtsov, *Energy transport in PEG oligomers: Contributions of different optical bands*, J. Phys. Chem. C **120**, 26663 (2016). doi:10.1021/acs.jpcc.6b09389

[9] Arkady A. Kurnosov, Igor V. Rubtsov, Andrii O. Maksymov, and Alexander L. Burin, *Electronic torsional sound in linear atomic chains: Chemical energy transport at 1000 km/s*, J. Chem. Phys. **145**, 034903 (2016). doi:10.1063/1.4958726

[10] Natalia I. Rubtsova, Layla L. Qasim, Arkady A. Kurnosov, Alexander A. Burin, and Igor V. Rubtsov, *Ballistic energy transport in oligomers*, Acc. Chem. Res. **48**, 2547 (2015). doi:10.1021/acs.accounts.5b00299

[11] Yuankai Yue, Layla N. Qasim, Arkady A. Kurnosov, Natalia I. Rubtsova, Robert T. Mackin, Hong Zhang, Boyu Zhang, Xiao Zhou, Janarthanan Jayawickramarajah, Alexander L. Burin, and Igor V. Rubtsov, *Band-selective ballistic energy transport in alkane oligomers: Towards controlling the transport speed*, J. Phys. Chem. B **119**, 6448 (2015). doi:10.1021/acs.jpcb.5b03658

[12] Arkady A. Kurnosov, Igor V. Rubtsov, and Alexander L. Burin, *Communication: Fast transport and relaxation of vibrational energy in polymer chains*, J. Chem. Phys. **142**, 011101 (2015). doi:10.1063/1.4905076

[13] Natalia I. Rubtsova, Arkady A. Kurnosov, Alexander A. Burin, and Igor V. Rubtsov, *Temperature dependence of the ballistic energy transport in perfluoroalkanes*, J. Phys. Chem. B **118**, 8381 (2014). doi:10.1021/jp502062p

[14] A. Burin, A. Kurnosov, *Fluctuator model of memory dip in hopping insulators*, J. Low Temp. Phys. **167**, 318 (2012). doi:10.1007/s10909-012-0466-1

[15] Sarah L. Tesar, John M. Leveritt III, Arkady A. Kurnosov, and Alexander L. Burin, *Temperature dependence for the rate of hole transfer in DNA: Nonadiabatic regime*, Chem. Phys. **393**, 13 (2012). doi:10.1016/j.chemphys.2011.11.017

[16] A. A. Kurnosov, A. N. Sobolevskiĭ, *A variational approach to the reconstruction of galactic peculiar velocities*, Moscow Univ. Phys. Bull. **62**, 147 (2007). doi:10.3103/S0027134907030058

[17] Yu. M. Yevdokimov, S. G. Skuridin, Yu. D. Nechipurenko, M. A. Zakharov, V. I. Salyanov, A. A. Kurnosov, V. D. Kuznetsov, and V. N. Nikiforov, *Nanoconstructions based on double-stranded*

nucleic acids, Int. J. Biol. Macromol. **36**, 103 (2005). doi:10.1016/j.ijbiomac.2005.04.004

Work in Progress

A. Kurnosov, S. Gnutzmann, U. Smilansky, *Characterization of Chaotic Evolution in Quantum Systems Induced by Random Hermitian Matrices*. https://arxiv.org/abs/2608.22571 Under review in Journal of Physics A.

A. Kurnosov, *Spectral properties of pseudo-Hermitian stochastic evolution operators*, manuscript in preparation.

Stochastic matrix method application towards spin models, project in development

Exceptional Points and Relaxation Dynamics in Tridiagonal Random Hamiltonians, project in development

Flux fluctuations in photonic networks, project in development

Theoretical study of finite rate thermophotonic engines and cooling devices, project in development

Teaching Experience

Introductory and General Physics (Mechanics, Electricity and Magnetism, Thermodynamics) Lectured in both calculus-based and algebra-based introductory physics courses for science, engineering, and life-science majors. Designed syllabi, led lectures and recitations, and developed homework and examination materials. Taught in hybrid (in-person and online) format at Ben-Gurion University of the Negev (2024–2025) and in person at Wesleyan University (2023–2024), and currently at Holon Institute of Technology.

Mathematical Physics Designed and taught an advanced graduate-level course covering complex analysis, differential equations, and linear algebra applications in theoretical physics. Wesleyan University, 2024.

General and Physical Chemistry Laboratories Supervised laboratory sections for undergraduate courses in general and physical chemistry. Emphasized experimental design, data analysis, and scientific reporting. Tulane University, 2009–2016.

Thermodynamics and Statistical Mechanics Served as a Teaching Assistant for an upper-level undergraduate course. Led problem-solving sessions. Lomonosov Moscow State University, 2004–2005.

Physics and Astronomy (High School Level) Taught advanced physics and astronomy courses at a specialized STEM high school ("Lyceum Vtoraya Shkola") in Moscow, Russia. Designed and conducted laboratory demonstrations and problem-solving sessions for gifted students preparing for university-level studies in science and engineering. 2005–2009.

Selected Research Projects

Information Scrambling and Quantum Chaos on Discrete Graphs *Weizmann Institute, HIT*
Statistical signatures of quantum chaos and information scrambling in graph-based systems. Aims to connect spectral correlations, localization, and transport in quantum networks.
(https://arxiv.org/abs/2608.22571v1)

Optical Kinetic Theory of Nonlinear Multimode Photonic Networks *Wesleyan University*
Developed a kinetic framework for non-equilibrium transport in nonlinear photonic circuits. Demonstrated single-parametric scaling behavior and performed dynamical simulations validated by experiments (Phys. Rev. Lett. 132, 193802, 2024).

Reconfigurable Enhancement of Actuation Forces by Engineered Losses *Wesleyan University*
Proposed and analyzed a viscoelastic metamaterial model exhibiting force amplification via exceptional point degeneracies. Linked classical actuation enhancement to the Purcell effect in quantum electrodynamics (Extreme Mech. Lett. 59, 101979, 2023).

Adiabatic Monoparametric Autonomous Motors *Wesleyan University*
Developed an analytical model of optomechanical self-sustained oscillators driven by nonconservative photonic forces. Predicted robust autonomous energy conversion and frequency downconversion mechanisms (Phys. Rev. Applied 18, 064041, 2022).

Microscopic Mechanism of Electrical Conduction in Glassy Semiconductors *University of Houston*
Formulated a microscopic theory of thermally activated conduction in amorphous solids, linking polaron transport to glass transition phenomena (PNAS 122, e2414650122, 2025).

Earlier work (Tulane University): Theoretical studies of vibrational and electronic energy transport in molecular systems and disordered media, combining quantum Liouville formalism, DFT, and semiclassical methods to describe ballistic and diffusive regimes.

Conference Presentations

A. Kurnosov, *Characterization of Chaotic Evolution in Quantum Systems Induced by Random Hamiltonians*, Random Matrices and Random Graphs in Quantum Systems, ISF Research Workshop in Honor of Uzy Smilansky, Yad HaShmona, Israel, Dec 2026 (invited talk).

A. Kurnosov, L. J. Fernández-Alcázar, R. Bustos-Marún, T. Kottos, *Adiabatic monoparametric autonomous motors enabled by self-induced nonconservative forces*, Simons Collaboration on Extreme Wave Phenomena Annual Meeting, New York, NY, 2022.

A. Kurnosov, A. Gupta, R. Thevamaran, T. Kottos, *Reconfigurable enhancement of forces by engineered losses*, Simons Collaboration on Extreme Wave Phenomena Annual Meeting, New York, NY, 2021.

L. Qasim, **A. Kurnosov**, Y. Yue, A. Burin, I. Rubtsov, *Characterization of fast energy transport mechanisms in PEG oligomers*, APS March Meeting, New Orleans, LA, 2017.

A. Kurnosov, I. Rubtsov, A. Burin, *Fast transport of vibrational energy in polymer chains*, LA-SiGMA Symposium, Baton Rouge, LA, 2015.

Awards and Honors

IBM Graduate Fellowship Award 2010–2011
Competitive international fellowship supporting outstanding graduate research in physical and computational sciences.

"Dynasty" Foundation Grant for Young Teachers in Mathematics and Physics 2007, 2009
Awarded by the Russian Science Support Foundation for excellence in teaching and early-career research in physics.