

CONTACT INFORMATION

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RESEARCH INTERESTS

- *Quantum Many-Body Physics:* out-of-equilibrium dynamics, quantum many-body dynamics, quantum simulation, quantum control.
- *Machine Learning in Physics:* reinforcement learning for manipulation of quantum systems, optimization landscapes, interplay between statistical mechanics and machine learning.

OCCUPATION

(2022–) Research group leader (E15, fixed-term contract) Max Planck Institute for the Physics of Complex Systems (MPI-PKS), Germany

(2020–2022) Junior research group leader (R3, established researcher) Sofia University, Bulgaria

(2017–2020) Moore postdoctoral fellow, physics department UC Berkeley, USA
supervisors Prof. Norman Yao, Prof. Ehud Altman

EDUCATION

PhD physics, 2016/17 Boston University, USA
advisor Prof. Anatoli Polkovnikov
thesis "Floquet Engineering in Periodically Driven Closed Quantum Systems: from Dynamical Localisation to Ultracold Topological Matter"

M. Sc. physics, 2013 (*with high distinction*) Ludwig-Maximilians-Universität, Technische Universität München, Germany
 Elite Master Program "Theoretical and Mathematical Physics"
advisors Prof. Lode Pollet, Prof. Immanuel Bloch
thesis "Bose-Fermi Mixtures: a Mean-Field Study"

B. Sc. mathematics, 2011 Ludwig-Maximilians-Universität, Germany
advisor Prof. László Erdős
thesis "Rigorous Approach to Bose-Einstein Condensation"

B. Sc. physics, 2011 Ludwig-Maximilians-Universität, Germany
advisor Prof. Stefan Kehrein
thesis "Periodically Driven Luttinger Liquids"

Abitur Allgemeine Hochschulreife (*Bildungsinländer*), 2008 Galabov-Gymnasium, Bulgaria
Matura Bulgarian state examination, 2008 Galabov-Gymnasium, Bulgaria

SCIENTIFIC RECOGNITIONS*Fellowships*

- Marie Skłodowska-Curie individual fellowship, 2020. Sofia
European Research Executive Agency, European Commission.
- Moore Foundation's independent postdoctoral fellowship, 2017. Berkeley
"special postdoctoral positions offered by six leading US centers for theoretical condensed matter physics"

Prizes and scholarships

- Alvaro Rocco Memorial Prize, 2017. Boston
"in recognition of outstanding achievement overall in physics by a graduate student".

- Gertrude and Maurice Goldhaber Prize, 2015. Boston
"in recognition of outstanding achievement by a first-year graduate student".
- DAAD Prize (German Academic Exchange Service), 2012. Munich
"for the outstanding achievements of a foreign student at German universities".
- Stipendium aus Mitteln des Bayerischen Staates, 2009-13. Munich
Bavarian State Ministry of Sciences Research and the Arts.

Awards

- John V. Atanasoff President Award, 2023. MPI-PKS
"for outstanding contributions to the field of artificial intelligence applied to quantum technologies",
Office of the President of the Republic of Bulgaria.
- Outstanding Editorial Board Member, 2022. MPI-PKS
"selected based on workload, efficiency and quality of manuscript assessments, journal advocacy, and involvement in additional editorial projects", *Communications Physics – Nature*.
- highly commended: International Quantum Technology Emerging Researcher Award Sofia
IOP Publishing, 2020.
- Reviewer of the Month, 2019. Berkeley
"for exceptional contributions to peer review", *Communications Physics – Nature*.

Publications

Bibliometrics: 43 scientific articles *Google scholar*: over 4500 citations, *h-index* 23 (1/1/2024):

- 1 in Nature Physics (co-corresponding author, conceived and supervised the theoretical work)
- 1 in Nature Machine Intelligence (corresponding author, conceived and supervised the research)
- 7 in Physical Review X (three first-author, two second-author, two last author)
- 4 in Physical Review Letters (two first-author, one second-author, one last-author)
- 2 in PRX Quantum (one second, one last and corresponding author)
- 1 in Physical Review Research (last author)
- 8 in Physical Review B (one single-author, three first-author, two second-author, two last author)
- 2 in Physical Review A (first-author)
- 4 in SciPost Physics (one first author, two second-author, one third author)
- 3 in Mathematical and Scientific Machine Learning (one second author, one middle author, one last author)
- 2 in Physics Reports (one second and corresponding author, one second author)
- 1 in Advances in Physics (first and corresponding author)
- 7 preprints under peer review

Invited scientific talks and lectures

Metrics: 76 invited international scientific talks across Europe, North America, and Asia (1/11/2023).

- 23 invited conference and workshop talks
- 47 invited talks at academic institutions
- 2 invited talks in industry
- 4 invited guest lectures

Scientific software development

Co-developer of **QuSpin** (with P. Weinberg and M. Schmitt): a **widely used** open-source python library for nonequilibrium quantum dynamics of boson, fermion and spin many-body systems.

downloads: over 14 500, Anaconda Cloud (1/1/2024)

website: <http://quspin.github.io/QuSpin/>

publications: SciPost Phys. 2, 003 (2017) [over 200 citations], SciPost Phys. 7, 020 (2019) [over 150 citations]

Supervision and mentorship

■ Bachelor students:

current: B. Muñoz (Stanford), Y. Sun (Harvard), Z. Fu (Shanghai Jiao Tong University)

past: G. Aleksandrov (2023, Sofia), H. Tonchev (2022, Sofia), H. Gundlach (2021, Berkeley), P. Köttering (2021, Berkeley), O. Howell (2017, Boston)

■ **Master students:**

current: G. Aleksandrov (Sofia)

past: P. Tashev (2022, Sofia)

■ **PhD students:**

current: G. Cemin (MPI-PKS), N. Beato (MPI-PKS), P. M. Schindler (MPI-PKS)

co-supervising: J. Walkling (MPI-PKS, w/ R. Moessner), D. Hahn (MPI-PKS, w/ D. Luitz), H. N. Nguyen (Berkeley, w/ B. Whaley)

past: A. McRoberts (MPI-PKS, w/ R. Moessner), J. Yao (Berkeley, w/ L. Lin), F. Metz (2020-22, OIST, w/ T. Busch)

■ **Postdocs:**

current: P. Lenggenhager (MPI-PKS)

past: P. Patil (MPI-PKS), C. Fleckenstein (2021-23, Stockholm w/ J. Bardarson)

International teaching experience

Lecturer

2023-24	Many-Body Quantum Dynamics (lecture course, 5 ECTS)	TU Dresden
2020-21	Introduction to Deep Reinforcement Learning (lecture course, 6 ECTS)	Sofia
2020-21	Applications of Reinforcement Learning in the Physical Sciences (seminar, 3 ECTS)	Sofia

Teaching assistant

2013-15	General Physics I, General Physics II, Physics of Health.	Boston
2009-12	Mathematical Methods for Physics, Theoretical Mechanics, Electrodynamics, Quantum Mechanics 1, Physics Laboratory Course for Chemistry Students.	Munich

International research experience

2022-	Condensed Matter Division		MPI-PKS
2020-22	Department of Theoretical and Mathematical Physics		Sofia
2017-20	Condensed Matter Theory Center		Berkeley
2016-17	Statistical Physics and Biophysics Group	<i>Prof. Pankaj Mehta</i>	Boston
2014-15	Condensed Matter Theory Group	<i>Prof. Eugene Demler</i>	Harvard
2013-17	Nonequilibrium Dynamics Group	<i>Prof. Anatoli Polkovnikov</i>	Boston
2011-13	Quantum Many-Body Systems Group	<i>Prof. Lode Pollet</i>	Munich
2010-11	Condensed Matter Theory Group	<i>Prof. Stefan Kehrein</i>	Munich

Institutional responsibilities

2021-	Member of the Scientific Committee	MPI-PKS
2021-	Organizer, Condensed Matter Division Seminar Series	MPI-PKS
2018-20	Co-organizer, Moore Foundation Bay Area Young Investigator Network Events	Berkeley
2015-17	Organizer, Condensed Matter Theory Seminar	BU
2014-17	Member of the Graduate Student Council	BU

Service to the community

Editorial board member

- Communications Physics – Nature (2021-present), responsible for machine learning in physics submissions.

Reviewer

- *Scientific grant review:* ERC-StG (ERCEA), QuantERA (Agence Nationale de la Recherche, France), Mitacs Accelerate (Canada), Israeli Science Foundation (Israel), Fondecyt-Chile.
- *Referee/reviewer for scientific journals:* Science, Nature Machine Intelligence, Nature Communications, NPJ Quantum Information, Communications Physics, Physical Review X, Physical Review Letters, Physical

Review X Quantum, Physical Review A, Physical Review B, Physical Review E, Physical Review Applied, SciPost, New Journal of Physics, Annalen der Physik, Annals of Physics, Computer Physics Communications, Quantum Machine Intelligence, and others.

PhD defense committee member / external reader

- Rajat Panda (SISSA, 2023), Lorenzo Correale (SISSA, 2023), Francesco Preti (Jülich/Cologne 2023–)

Conference, workshop & school co-organization

- Quantum Physics & Machine Learning track at Machine Learning Days 2022 (EPFL, Lausanne)
- quant22 school for MSc students: From quantum matter to quantum computers (MPI-PKS, Dresden 2022)
- quant23 school for MSc students: Quantum Dynamics – Fundamentals and Realizations (MPI-PKS, Dresden 2023)

Public engagement

Mentor

- Sofia University’s EURAXESS Mentoring Program for last-year master’s and PhD students (2022).

External adviser

- Bulgarian Ministry of Education and Science, Directorate for Science (2022–).

Research funding

Project title	Funding source	Amount	Years	Role	Host institution
Nonequilibrium Many Body Control of Quantum Simulators	ERC Starting Grant, European Research Council	EUR 1 500 000	2023-2028	principal investigator	MPI-PKS
Phase Transitions of Quantum Control	Marie Skłodowska-Curie Actions, European Research Executive Agency	EUR 121 814	2021-2022	principal investigator	Sofia University
Reinforcement Learning to Control Quantum Matter away from Equilibrium	VIHREN frontier research grant, Bulgarian Science Fund	EUR 526 580	2020-2021	principal investigator	Sofia University