

# PHILIP K. SCHWARTZ

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## POSITIONS

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SINCE OCT 2020	LEIBNIZ UNIVERSITY HANNOVER Postdoctoral researcher (Wissenschaftlicher Mitarbeiter)
AUG 2016 – SEP 2020	LEIBNIZ UNIVERSITY HANNOVER Doctoral researcher (Wissenschaftlicher Mitarbeiter)

## EDUCATION

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2016 – 2020	LEIBNIZ UNIVERSITY HANNOVER Doctoral Studies Member of CRC 1227 Designed Quantum States of Matter (DQ-mat)
SEP 2020	Dr rer nat in Physics Thesis: <i>Post-Newtonian Description of Quantum Systems in Gravitational Fields</i> Advisor: Domenico Giulini Mark: <i>summa cum laude</i>
2015 – 2016	UNIVERSITY OF CAMBRIDGE and TRINITY COLLEGE CAMBRIDGE Part III of the Mathematical Tripos
JUN 2016	Master of Advanced Study (MASt) in Applied Mathematics Part III essay: <i>The Cauchy Problem in General Relativity</i> Mark: <i>Distinction</i>
2011 – 2015	LEIBNIZ UNIVERSITY HANNOVER Studies of Physics and Mathematics
Nov 2014	Bachelor of Science (BSc) in Physics Thesis: <i>Kaluza-Klein-Geometrie stationärer Raumzeiten</i> Advisor: Domenico Giulini Mark: <i>1.0</i> (very good)

## SCHOLARSHIPS

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2015 – 2016	TRINITY COLLEGE CAMBRIDGE <i>Trinity Studentship in Mathematics</i>
2014 – 2016	GERMAN ACADEMIC SCHOLARSHIP FOUNDATION <i>Scholarship</i>

## AWARDS

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- 2022 LEIBNIZ UNIVERSITY HANNOVER, FACULTY OF MATHEMATICS AND PHYSICS  
*Wilhelm und Else Heraeus Young Physicists Award*
- 2022 LEIBNIZ UNIVERSITY HANNOVER, FACULTY OF MATHEMATICS AND PHYSICS  
*Prize for the best teaching*
- 2016 TRINITY COLLEGE CAMBRIDGE  
Elected to a *Senior Scholarship*
- 2016 TRINITY COLLEGE CAMBRIDGE  
*Examination Prize* for excellent performance
- 2015 LEIBNIZ UNIVERSITY HANNOVER  
*Preis des Präsidiums* for outstanding academic achievements

## PUBLICATIONS

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- M Werner, P K Schwartz, J-N Kirsten-Siemß, N Gaaloul, D Giulini, K Hammerer, *Atom interferometers in weakly curved spacetimes using Bragg diffraction and Bloch oscillations*, *Physical Review D* (in press) (2023), [arXiv:2310.03719](#)
- A Alibabaei, P K Schwartz, D Giulini, *Geometric post-Newtonian description of massive spin-half particles in curved spacetime*, *Classical and Quantum Gravity* **40**, 235014 (2023), [arXiv:2307.04743](#)
- P K Schwartz, *Teleparallel Newton–Cartan gravity*, *Classical and Quantum Gravity* **40**, 105008 (2023), [arXiv:2211.11796](#)
- D Giulini, A Großardt, P K Schwartz, *Coupling Quantum Matter and Gravity*, in: C Pfeifer, C Lämmerzahl (eds.), *Modified and Quantum Gravity*, *Lecture Notes in Physics* **1017** (Springer, Cham, 2023), [arXiv:2207.05029](#)
- P K Schwartz, D Giulini, *Classical perspectives on the Newton–Wigner position observable*, *International Journal of Geometric Methods in Modern Physics* **17**, 2050176 (2020), [arXiv:2004.09723](#)
- P K Schwartz, D Giulini, *Post-Newtonian Hamiltonian description of an atom in a weak gravitational field*, *Physical Review A* **100**, 052116 (2019), [arXiv:1908.06929](#)
- P K Schwartz, D Giulini, *Post-Newtonian corrections to Schrödinger equations in gravitational fields*, *Classical and Quantum Gravity* **36**, 095016 (2019), [arXiv:1812.05181](#)

## TALKS

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- Nov 2023 *Coupling quantum matter to gravity: a systematic post-Newtonian approach* (invited), RQI Circuit Bremen, Bremen and online
- MAR 2023 *Time in Newtonian physics from a spacetime perspective* (invited), 781<sup>st</sup> WE Heraeus Seminar, Bad Honnef

- NOV 2022 *Coupling quantum matter to gravity: a systematic post-Newtonian approach* (invited), Vienna Central European Seminar on Particle Physics and Quantum Field Theory 2022, Vienna
- JUN 2022 *Teleparallel Newton–Cartan gravity*, Metric-Affine Frameworks for Gravity 2022, Tartu
- APR 2022 *Systematic description of quantum systems under post-Newtonian gravity* (invited), Mini-workshop on wave function reduction via semiclassical gravity, Southampton
- NOV 2021 *Post-Newtonian Hamiltonian description of quantum systems under gravity* (invited), Seminar series on relativistic effects in atomic clocks, Boulder–Innsbruck–Hannover (virtual)
- SEP 2021 *Post-Newtonian Hamiltonians for quantum systems under gravity* (invited), Workshop of the Innsbruck University quantum optics group, Seefeld (virtual)
- SEP 2021 *Teleparallel Newton–Cartan gravity*, DPG meeting of the Matter and Cosmos Section, virtual
- APR 2021 *Geometric characterisations of the Newton–Wigner position observable* (invited), TPI Jena (virtual)
- FEB 2021 *The interface of classical gravity and quantum mechanics* (invited, joint with D Giulini), 740<sup>th</sup> WE Heraeus Seminar, Bad Honnef (virtual)
- MAR 2019 *Post-Newtonian corrections to Schrödinger equations in gravitational fields*, DPG spring meeting of the Matter and Cosmos Section, Munich
- JUL 2018 *A quantum equivalence principle – what could this even mean?*, l’Agape 2018, Mézeyrac

#### CONFERENCES AND WORKSHOPS ATTENDED

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- NOV 2023 RQI Circuit Bremen, Bremen and online, invited talk: see above
- JUL 2023 School of General Relativity, Astrophysics and Cosmology, Warsaw, poster contribution: *Teleparallel Newton–Cartan gravity*
- MAR 2023 781<sup>st</sup> WE Heraeus Seminar ‘Time and Clocks’, Bad Honnef, invited talk: see above
- NOV 2022 Vienna Central European Seminar on Particle Physics and Quantum Field Theory 2022, Vienna, invited talk: see above
- OCT 2022 Quantum Sensors and tests of New Physics, Hannover, poster contribution: *Geometric post-Newtonian description of massive spin-half particles in curved spacetime*
- SEP 2022 Bad Honnef Physics School on Black Holes, Bad Honnef, poster contribution: *Geometric post-Newtonian description of massive spin-half particles in curved spacetime*
- JUN 2022 Metric-Affine Frameworks for Gravity 2022, Tartu, contributed talk: see above

APR 2022	Mini-workshop on wave function reduction via semiclassical gravity, Southampton, invited talk: see above
SEP 2021	DPG meeting of the Matter and Cosmos Section, virtual, contributed talk: see above
FEB 2021	740 <sup>th</sup> WE Heraeus Seminar ‘Experimental Tests and Signatures of Modified and Quantum Gravity’, Bad Honnef (virtual), invited talk: see above
SEP 2020	Vienna Summer School 2020 on Gravitational Quantum Physics, Vienna (virtual), poster contribution: <i>Post-Newtonian description of quantum systems in gravitational fields</i>
JUN 2019	Quantum metrology and physics beyond the Standard Model, Hannover, poster contribution: <i>Post-Newtonian corrections to Schrödinger equations in gravitational fields</i>
MAR 2019	DPG spring meeting of the Matter and Cosmos Section, Munich, contributed talk: see above
OCT 2018	Progress and Visions in Quantum Theory in View of Gravity, Leipzig
JUL 2018	Summer School ‘l’Agape 2018’, Mézèyrac, contributed talk: see above
JUN 2017	646 <sup>th</sup> WE Heraeus Seminar ‘Gravitational decoherence’, Bad Honnef
SEP 2016	DICE2016 Spacetime – Matter – Quantum Mechanics, Castiglioncello
AUG 2016	Gravity in the Lab 2016, Benasque

## TEACHING

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WINTER 2023/24	<i>Theoretical Physics C</i> , Plenary tutorial, Hannover <i>Repetitorium Mathematical Methods of Physics</i> , Lecturer, Hannover <i>Repetitorium Theoretical Physics A</i> , Lecturer, Hannover
SUMMER 2023	<i>Modern developments in Newton–Cartan gravity</i> , Lecturer, Hannover <i>Introduction to Quantum Theory</i> , Assistant, Hannover
WINTER 2022/23	<i>Newton–Cartan gravity</i> , Lecturer, Hannover <i>Analytical Mechanics and Special Relativity</i> , Assistant, Hannover
SUMMER 2022	<i>Modern developments in Newton–Cartan gravity</i> , Lecturer, Hannover <i>Seminar ‘Theory of Fundamental Interactions’</i> , Assistant, Hannover
WINTER 2021/22	<i>Newton–Cartan gravity</i> , Lecturer, Hannover
SUMMER 2021	<i>Repetitorium Theoretical Electrodynamics</i> , Lecturer, Hannover <i>Repetitorium Theoretical Physics B</i> , Lecturer, Hannover <i>Advanced Quantum Theory</i> , Tutor, Hannover
WINTER 2020/21	<i>Repetitorium Mathematical Methods of Physics</i> , Lecturer, Hannover <i>Repetitorium Theoretical Physics A</i> , Lecturer, Hannover
SUMMER 2020	<i>Proseminar Theoretical Physics</i> , Assistant, Hannover
SUMMER 2019	<i>Proseminar Theoretical Physics</i> , Assistant, Hannover
SUMMER 2018	<i>Introduction to General Relativity</i> , Assistant, Hannover

SUMMER 2017     *Introduction to General Relativity*, Assistant, Hannover  
2012–2015     Student teaching assistant at Leibniz University Hannover for  
several courses

COURSES GIVEN AT ACADEMIES OF THE CLUB DER EHEMALIGEN DER DEUTSCHEN  
SCHÜLERAKADEMIEN E. V. (ALUMNI ORGANISATION OF THE *Deutsche SchülerAkademien*)

SUMMER 2022     *Differential Forms and basics of Symplectic Geometry*  
SUMMER 2019     *Introduction to General Relativity*  
WINTER 2018/19     *Introduction to Differential Geometry* (joint with B Haake)  
SUMMER 2018     *Stories of Alice and Bob—an introduction to Quantum Mechanics*  
SUMMER 2014     *Introduction to pure Mathematics* (joint with J Haferkamp)

STUDENT SUPERVISION AND GRADING

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SINCE 2022     Co-supervision of a Master's project with D Giulini: A von Blanckenburg,  
*Variational completion of Newton–Cartan gravity*  
2021–2022     Co-supervision of a Master's project with D Giulini: A Alibabaei, *Geometric*  
*post-Newtonian description of spin-half particles in curved spacetime*  
2021, 2022     2<sup>nd</sup> referee for Bachelor's theses in physics teaching degree programme

ACADEMIC SERVICE

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SINCE 2021     Reviews for Classical and Quantum Gravity, SciPost Physics, International  
Journal of Modern Physics D, Journal of Physics A: Mathematical and  
Theoretical, European Journal of Physics