

Curriculum Vitae

Dr. Alexander Schenkel

Professional address

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Research interests

- ▷ Mathematical physics, algebra and topology
 - ▷ Higher categorical structures in quantum field theory
 - ▷ Classical and quantum gauge theory on Lorentzian manifolds
 - ▷ Noncommutative differential geometry, Hopf algebras and deformation quantization
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Scientific positions

- since 08/2019 Associate Professor in Mathematical Physics, School of Mathematical Sciences, University of Nottingham, UK.
- since 10/2016 Royal Society University Research Fellow, School of Mathematical Sciences, University of Nottingham, UK.
- 09/2016-07/2019 Assistant Professor in Mathematical Physics, School of Mathematical Sciences, University of Nottingham, UK.
- 04/2016-08/2016 Postdoctoral Position, Department of Mathematics, University of Regensburg, Germany. Member of the working group of Prof. Dr. Ulrich Bunke.
- 04/2014-03/2016 Postdoctoral Research Fellow, Department of Mathematics, Heriot-Watt University, Edinburgh, UK. Member of the Mathematical Physics Group. Funded by a Research Fellowship of Deutsche Forschungsgemeinschaft (DFG).
- 04/2012-03/2014 Temporary Lecturer (“Lehrbeauftragter”), Faculty of Sciences and Mathematics, University of Wuppertal, Germany.
- 09/2011-03/2014 Postdoctoral Position, Department of Mathematics, University of Wuppertal, Germany. Member of the working group of Prof. Dr. Hanno Gottschalk.

University education

- 06/2008-10/2011 PhD student in Theoretical Physics, University of Würzburg, Germany.
Member of the Research Training Group GRK1147
“Theoretical Astrophysics and Particle Physics”
PhD thesis:
“*Noncommutative gravity and quantum field theory on noncommutative curved spacetimes*”
Referees: Prof. Dr. Thorsten Ohl, Prof. Dr. Haye Hinrichsen, Prof. Dr. Peter Schupp
Submitted: June 14, 2011; PhD Viva: October 24, 2011
(passed with distinction, *summa cum laude*)
- 08/2005-06/2008 Advanced studies in Physics, University of Würzburg, Germany.
Diploma thesis: (Advisor: Prof. Dr. Thorsten Ohl)
“*Pseudo-local Dirac observables in effective theories of quantum gravity*”
Qualification: Diplom (passed with distinction)
- 10/2003-08/2005 Basic studies in Physics, University of Würzburg, Germany.
Qualification: Vordiplom (passed with distinction)

Scholarships and grants

- 03/2020-03/2021 Royal Society Enhancement Award (£14,100.00)
- 12/2017-03/2021 Royal Society Enhancement Award (£79,492.00)
- 03/2017-02/2021 Royal Society Research Grant (£81,312.00)
- 10/2016-09/2021 Royal Society University Research Fellowship (£391,518.76)
- 04/2014-03/2016 Research Fellowship of Deutsche Forschungsgemeinschaft (DFG, Germany)
- 09/2012 Research in Pairs (2 weeks with T.-P. Hack), Mathematisches Forschungsinstitut Oberwolfach (MFO)
- 01/2010 Short Visit Grant (2 weeks with P. Aschieri at the University of Alessandria), ESF Activity “Quantum Geometry and Quantum Gravity”
- 06/2008-05/2011 Full scholarship within the Research Training Group GRK1147 “Theoretical Astrophysics and Particle Physics”, University of Würzburg

Awards

- 05/2012 “Stiftungspreis der Unterfränkischen Gedenkjahrstiftung für Wissenschaft” for an exceptional PhD thesis

- 12/2011 Willhelm-Conrad-Röntgen Award of the Faculty of Physics and Astronomy of the University of Würzburg for one of the year's best PhD theses
- 12/2008 Willhelm-Conrad-Röntgen Award of the Faculty of Physics and Astronomy of the University of Würzburg for one of the year's best Diploma theses

Students

PhD students:

- since 2018 Supervisor of Hans Nguyen (University of Nottingham)
Working Title: "Bundles in noncommutative geometry"
- since 2018 Supervisor of Marco Perin (University of Nottingham)
Working Title: "Comparison between factorization algebras and AQFT"
- since 2017 Supervisor of Simen Bruinsma (University of Nottingham)
Working Title: "Operads for locally covariant quantum field theory"
- 2011-2014 Co-supervisor of Marco Benini (University of Pavia)
Thesis: "Locality in Abelian gauge theories over globally hyperbolic spacetimes"
Now Ricercatore in Mathematics, University of Genova, Italy.

MSc and MMath students:

- 2019-2020 Supervisor of Cameron Bunney (University of Nottingham)
Thesis: "Principal Bundles, Connections and Gauge Theory"
- 2019 Supervisor of Ferran de Palol Coma (University of Nottingham)
Thesis: "Covariant phase space methods in field theory"
- 2018 Supervisor of Anant Saxena (University of Nottingham)
Thesis: "Quantum Field Theory on spacetimes with time-like boundary"
- 2017 Supervisor of John Shade (University of Nottingham)
Thesis: "Noncommutative Differential Geometry of Yetter-Drinfeld Module Algebras"
- 2015-2016 Co-supervisor of Angelo Cuzzola (University of Bologna)
Thesis: "Aspects of supergeometry in locally covariant quantum field theory"

Project students:

- 2019-2020 Supervisor of Solveig Wittig (University of Würzburg)
Erasmus+ Project: "Higher structures in quantum field theory"
- 2019 Supervisor of Samuel Hannah (University of Nottingham)
Internship Project: "Singularity theorems in general relativity"

Invited conference and workshop talks

- 07/2019 "Higher structures in algebraic quantum field theory" at *Mathematics of interacting QFT models*, York
- 06/2019 "Factorization Algebras vs Algebraic QFT" at *NBMPS 56*, York

- 08/2018 “Higher structures in algebraic quantum field theory” at *Higher Structures in M-Theory*, LMS–EPSRC Durham Symposium
- 06/2018 “Homotopical algebraic quantum field theory” at *Algebraic Quantum Field Theory: Where Operator Algebra meets Microlocal Analysis*, Cortona
- 12/2017 “From Fredenhagen’s universal algebra to homotopy theory and operads” at *Quantum Physics meets Mathematics – A workshop on the occasion of Klaus Fredenhagen’s 70th birthday*, Hamburg
- 11/2017 “Categorical techniques for NC geometry and gravity” at *Mathematical models for noncommutativity in physics and quantum spacetime*, Warsaw
- 09/2017 “The stack of Yang-Mills fields” at *Modern Mathematics of Quantum Theory*, York
- 07/2017 “Towards homotopical algebraic quantum field theory” at *Higher Structures Lisbon 2017*, Instituto Superior Técnico, Lisbon
- 05/2017 “Towards homotopical algebraic quantum field theory” at *Foundational and structural aspects of gauge theories*, MITP Mainz
- 04/2017 “Homotopy Theory + AQFT = Quantum Gauge Theory?” at *Quantum Field Theory: Concepts, Constructions & Curved Spacetimes*, York
- 05/2016 “Mapping spaces and automorphism groups of toric noncommutative spaces” at the *Workshop on Quantum spacetime structures: Dualities and new geometries*, Bayrischzell
- 06/2015 “Nonassociative geometry in quasi-Hopf representation categories” in the *Special Session on Algebraic and Categorical Aspects of Hopf Algebras* at the AMS–EMS–SMP Meeting 2015, Porto
- 09/2014 “On the problem of gauge theories in locally covariant QFT” at the *Workshop on Operator and Geometric Analysis on Quantum Theory*, Levico Terme
- 05/2014 “Abelian quantum gauge theories via differential cohomology” at the *Workshop on Algebraic quantum field theory: its status and its future*, Erwin Schrödinger International Institute for Mathematical Physics (ESI), Vienna
- 07/2013 “Quantized Abelian principal connections on Lorentzian manifolds” at the *Mini-Workshop: New Crossroads between Mathematics and Field Theory*, Mathematisches Forschungsinstitut Oberwolfach (MFO)
- 09/2012 “Quantum field theory on affine bundles” at the *Workshop: Algebraic Quantum Field Theory and Local Symmetries*, Hausdorff Research Institute for Mathematics (HIM) Bonn
- 06/2012 “Product module homomorphisms and connections in twist deformed NC geometry” at the *Workshop on Gauge Theory and Noncommutative Geometry*, Luxembourg
- 09/2011 “Twist deformations of module homomorphisms and connections” at the *Workshop on Noncommutative Field Theory and Gravity*, Corfu
- 09/2010 “Quantum Field Theory on NC Curved Spacetimes” at the *Workshop: Deformation Methods in Mathematics and Physics*, Mathematisches Forschungsinstitut Oberwolfach (MFO)

- 05/2010 “Field theory on curved NC spacetimes” at the *Workshop on Noncommutativity and Physics: Spacetime Quantum Geometry*, Bayrischzell
- 05/2009 “Noncommutative Symmetry Reduction: Backgrounds and Quantum Fields” at the *Workshop on Noncommutativity and physics: Quantum Geometries and Gravity*, Bayrischzell

Seminar talks

- 01/2020 “2-algebraic quantum field theory”, Mathematical Physics Seminar, University of York
- 10/2019 “Higher categorical structures in algebraic quantum field theory”, Topology Seminar, University of Sheffield
- 09/2019 “Boundaries and edge modes in gauge theories”, London Relativity and Cosmology Seminar, Queen Mary University of London
- 09/2019 “Boundaries and edge modes in gauge theories”, Mathematics Seminar, University of Genova
- 05/2019 “Higher structures in algebraic quantum field theory”, Quantum Algebra Seminar, Queen Mary University of London
- 04/2019 “An introduction to algebraic quantum field theory” & “Higher structures in algebraic quantum field theory”, Topology Seminar, Notre Dame University
- 04/2018 “Homotopical algebraic quantum field theory”, Quantum Field Theory Seminar, University of Oxford
- 04/2018 “Homotopical algebraic quantum field theory”, Pure Mathematics Colloquium, University of Hamburg
- 11/2017 “Homotopical algebraic quantum field theory”, Séminaire de Physique Mathématique, Institut Camille Jordan, Lyon
- 10/2017 “The stack of Yang-Mills fields”, Fields, Strings and Geometry Seminar, University of Surrey
- 11/2016 “Mapping spaces and automorphism groups in toric NC geometry”, Algebra and Topology Seminar, Swansea University
- 10/2016 “Towards homotopical algebraic quantum field theory”, Geometry, Algebra, Mathematical Physics & Topology Seminar, Cardiff University
- 01/2016 “Abelian S -duality: An algebraic perspective”, Mathematical Physics Seminar, University of York
- 07/2015 “On gauge theories in LCQFT and why we need more homotopical algebra”, Seminar on Quantum Field Theory, Gravitation, and Elementary Particles, University of Leipzig
- 04/2015 “Gauge theories in locally covariant quantum field theory”, Mathematics Seminar, University of Regensburg
- 04/2015 “Gauge theories in locally covariant quantum field theory”, Mathematical Physics Seminar, University of Würzburg

- 04/2015 “Gauge theories in locally covariant quantum field theory”, Mathematical Physics Seminar, University of York
- 01/2015 “Supergeometry in locally covariant quantum field theory”, Mathematics Seminar, University of Genova
- 05/2014 “Differential cohomology and locally covariant quantum field theory”, Differential Geometry Seminar, University of Potsdam
- 12/2013 “The inhomogeneous Klein-Gordon field: A new standard model for LCQFT”, Mathematical Physics Seminar, University of Pavia
- 10/2013 “Algebraic quantum field theory and gauge theory”, Mathematics Seminar, Charles University Prague
- 09/2013 “Topological aspects of Abelian gauge theories in algebraic quantum field theory”, Mathematical Physics Seminar, University of York
- 04/2013 “Quantized Abelian principal connections on Lorentzian manifolds”, Differential Geometry Seminar, University of Potsdam
- 02/2013 “Category theoretical description of matter and gauge QFTs”, Center for Quantum Spacetime (CQUeST) Seminar, Seoul
- 03/2012 “Parallel transport on modules and application to fuzzy gauge theory”, Edinburgh Mathematical Physics Group Seminar
- 11/2011 “The Maxwell field on curved spacetimes: A projective module approach”, Algebraic Quantum Field Theory Seminar, University of Hamburg
- 01/2011 “Quantum Field Theory on Noncommutative Curved Spacetimes”, Center for Quantum Spacetime (CQUeST) Seminar, Seoul
- 11/2010 “QFT on noncommutative curved spacetimes”, Algebraic Quantum Field Theory Seminar, University of Hamburg
- 02/2010 “Algebraic approach to quantum field theory on noncommutative curved spacetimes”, Mathematical Physics Seminar, University of Vienna
- 01/2010 “Algebraic approach to quantum field theory on noncommutative curved spacetimes”, Mathematical Physics Seminar, University of Alessandria

Invited lectures

- 09/2020 Higher Structures and Field Theory, Erwin Schrödinger Institute, Austria. (3 one-hour lectures on higher structures in algebraic quantum field theory)
- 02/2013 NIMS Winter School for Quantum Gravity and Cosmology, Daejeon, South Korea. (4 one-hour lectures on noncommutative geometry and gravity)

Seminar and workshop organization

- 12/2016 Organizer of the Mini-Workshop “New interactions between homotopical algebra and quantum field theory”, Mathematisches Forschungsinstitut Oberwolfach (MFO) — with M. Benini, K. Rejzner and C. Schweigert

- 08/2015-03/2016 Organizer of the Edinburgh Mathematical Physics Group (EMPG) Seminar
- 05/2013 Organizer of the 32nd Workshop “Foundations and Constructive Aspects of QFT”, University of Wuppertal — with H. Gottschalk
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Teaching

At the University of Nottingham:

- 01/2020-05/2020 Relativity (4 h/week undergraduate module)
- 01/2019-05/2019 Relativity (4 h/week undergraduate module)
- 01/2018-05/2018 Relativity (4 h/week undergraduate module)
- 01/2017-05/2017 Relativity (4 h/week undergraduate module)

At the University of Regensburg:

- 04/2016-07/2016 Mathematical aspects of quantum field theory (2 h/week master’s lecture)
- 04/2016-07/2016 Probability theory (tutorials)

At Heriot-Watt University, Edinburgh:

- 04/2014-03/2016 Due to the regulations of my Research Fellowship of the Deutsche Forschungsgemeinschaft (DFG) I was not permitted to teach during this period.

At the University of Wuppertal:

- 10/2013-02/2014 Geometric aspects of supergravity and string theory (2 h/week master’s seminar)
- 10/2013-02/2014 Stochastics and probability theory (organization of the tutorials)
- 04/2013-07/2013 Applied statistics (organization of the tutorials)
- 04/2013-07/2013 \mathbb{Z}_2 -graded algebra and supergeometry (2 h/week master’s seminar)
- 10/2012-02/2013 Stochastics and probability theory (organization of the tutorials)
- 04/2012-07/2012 Partial differential equations (4 h/week master’s lecture)
- 10/2011-02/2012 Stochastics and probability theory (organization of the tutorials)

Teaching Assistance at the University of Würzburg:

- 10/2010-02/2011 Theoretical Mechanics (special course for mathematical physics students)
- 10/2009-12/2009 Theoretical Electrodynamics
- 10/2008-02/2009 Statistical Physics
- 04/2008-07/2008 Quantum Mechanics
- 10/2007-02/2008 Theoretical Electrodynamics

Additional activities

- ▷ Member of the Royal Society's International Exchanges Panel (since 01/2019).
- ▷ Grant proposal reviewer: Engineering and Physical Sciences Research Council (EPSRC, UK), Marie Skłodowska Curie Actions (EU), Netherlands Organisation for Scientific Research (NWO, Netherlands), Czech Science Foundation (Czech Republic), National Science Centre (NCN, Poland).
- ▷ Referee for journals: Communications in Mathematical Physics, Annales Henri Poincaré, Letters in Mathematical Physics, Reviews in Mathematical Physics, Journal of Mathematical Physics, Classical and Quantum Gravity, General Relativity and Gravitation, Physical Review D, Nuclear Physics B, International Journal of Geometric Methods in Modern Physics, Central European Journal of Physics.
- ▷ Referee for book publishers: World Scientific Publishing Co.

Nottingham, September 2, 2020