

# Curriculum Vitae

## Dr. Alexander Schenkel

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### Personal information

Last name: SCHENKEL  
First name: Alexander  
Date of birth: 21/08/1983 in Hardheim, Germany  
Present citizenship: German  
Marital status: Married, no children

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### Professional address

School of Mathematical Sciences  
University of Nottingham  
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### Research interests

- ▷ Mathematical physics, algebra and topology
  - ▷ Category theory and homotopical algebra 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 10/2016 Royal Society University Research Fellow, School of Mathematical Sciences, University of Nottingham, UK.
- since 09/2016 Proleptic 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.

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## 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; Disputation: October 24, 2011  
(passed with distinction, *summa cum laude*)
- 08/2005-06/2008 Advanced study period 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 study period in Physics, University of Würzburg, Germany.  
Qualification: Vordiplom (passed with distinction)

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## Scholarships and grants

- 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

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## Awards

- 05/2012 “Stiftungspreis der Unterfränkischen Gedenkjahrstiftung für Wissenschaft” for my PhD thesis with distinction (*summa cum laude*)
- 12/2011 Wilhelm-Conrad-Röntgen Award of the Faculty of Physics and Astronomy of the University of Würzburg for a PhD thesis with distinction (*summa cum laude*)

12/2008            Willhelm-Conrad-Röntgen Award of the Faculty of Physics and Astronomy of the University of Würzburg for one of the years best Diploma theses

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### Students

since 2017        Supervisor of Simen Bruinsma, PhD student at the University of Nottingham.  
Working Title: “Operads for locally covariant quantum field theory”

2017                Supervisor of John Shade, master student at the University of Nottingham.  
Thesis: “Noncommutative Differential Geometry of Yetter-Drinfeld Module Algebras”

2015-2016        Co-supervisor of Angelo Cuzzola, master student at the University of Bologna.  
Thesis: “Aspects of supergeometry in locally covariant quantum field theory”  
He was supported by a Student Exchange Grant of the University of Bologna.

2011-2014        Co-supervisor of Marco Benini, PhD student at the University of Pavia.  
Thesis: “Locality in Abelian gauge theories over globally hyperbolic spacetimes”  
Now Postdoctoral Researcher in Mathematics, University of Hamburg.

2011-2014        Co-referee for 24 bachelor and 2 master students in Applied Mathematics and Statistics at the University of Wuppertal

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### Conference and workshop talks

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 (*invited*)

11/2017            “Categorical techniques for NC geometry and gravity” at *Mathematical models for noncommutativity in physics and quantum spacetime*, Warsaw (*invited*)

09/2017            “The stack of Yang-Mills fields” at *Modern Mathematics of Quantum Theory*, York (*invited*)

07/2017            “Towards homotopical algebraic quantum field theory” at *Higher Structures Lisbon 2017*, Instituto Superior Técnico, Lisbon (*invited*)

05/2017            “Towards homotopical algebraic quantum field theory” at *Foundational and structural aspects of gauge theories*, MITP Mainz (*invited*)

04/2017            “Homotopy Theory + AQFT = Quantum Gauge Theory?” at *Quantum Field Theory: Concepts, Constructions & Curved Spacetimes*, York (*invited*)

05/2016            “Mapping spaces and automorphism groups of toric noncommutative spaces” at the *Workshop on Quantum spacetime structures: Dualities and new geometries*, Bayrischzell (*invited*)

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 (*invited*)

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 (*invited*)

- 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 (*invited*)
- 11/2013 “Topological aspects of Abelian quantum gauge theories” at the *Workshop: Foundations and Constructive Aspects of QFT*, Göttingen
- 07/2013 “Quantized Abelian principal connections on Lorentzian manifolds” at the *Mini-Workshop: New Crossroads between Mathematics and Field Theory*, Mathematisches Forschungsinstitut Oberwolfach (MFO) (*invited*)
- 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 (*invited*)
- 06/2012 “Linear bosonic and fermionic quantum gauge theories on curved spacetimes” at the *Workshop: Foundations and Constructive Aspects of QFT*, Paderborn
- 06/2012 “Product module homomorphisms and connections in twist deformed NC geometry” at the *Workshop on Gauge Theory and Noncommutative Geometry*, Luxembourg (*invited*)
- 09/2011 “Twist deformations of module homomorphisms and connections” at the *Workshop on Noncommutative Field Theory and Gravity*, Corfu (*invited*)
- 09/2010 “Quantum Field Theory on NC Curved Spacetimes” at the *Workshop: Deformation Methods in Mathematics and Physics*, Mathematisches Forschungsinstitut Oberwolfach (MFO) (*invited*)
- 09/2010 “Quantum Field Theory on NC Curved Spacetimes” at the *Workshop on Quantum Field Theory: Developments and Perspectives*, DESY Hamburg
- 09/2010 “Quantum Field Theory on NC Curved Spacetimes” at the *Workshop on Noncommutative Field Theory and Gravity*, Corfu
- 06/2010 “Algebraic approach to quantum field theory on a class of noncommutative curved spacetimes” at the *Workshop: Foundations and Constructive Aspects of QFT*, Münster
- 05/2010 “Field theory on curved NC spacetimes” at the *Workshop on Noncommutativity and Physics: Spacetime Quantum Geometry*, Bayrischzell (*invited*)
- 03/2010 “Algebraic approach to quantum field theory on a class of noncommutative curved spacetimes” at the *Meeting of the German Physical Society (DPG)*, Bonn
- 06/2009 “Symmetry Reduction and Exact Solutions in Twisted Noncommutative Gravity” at the *49. Cracow School of Theoretical Physics: Non-perturbative Gravity and Quantum Chromodynamics*, Zakopane
- 05/2009 “Noncommutative Symmetry Reduction: Backgrounds and Quantum Fields” at the *Workshop on Noncommutativity and physics: Quantum Geometries and Gravity*, Bayrischzell (*invited*)
- 05/2009 “Noncommutative Cosmological Models” at the *Workshop: 4. Kosmologietag*, Bielefeld
- 03/2009 “Symmetry Reduction in Twisted NC Gravity with Applications to Cosmology and Black Holes” at the *Meeting of the German Physical Society (DPG)*, Munich

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## Seminar talks

- 11/2017 “Homotopical algebraic quantum field theory” at the Séminaire de Physique Mathématique, Institut Camille Jordan, Lyon
- 10/2017 “The stack of Yang-Mills fields” at the Fields, Strings and Geometry Seminars, University of Surrey
- 11/2016 “Mapping spaces and automorphism groups in toric NC geometry” at the Algebra and Topology Seminar, Swansea University
- 10/2016 “Towards homotopical algebraic quantum field theory” at the Geometry, Algebra, Mathematical Physics & Topology Group, Cardiff University
- 01/2016 “Abelian  $S$ -duality: An algebraic perspective” at the Mathematical Physics Group, University of York
- 07/2015 “On gauge theories in LCQFT and why we need more homotopical algebra” in the Seminar on Quantum Field Theory, Gravitation, and Elementary Particles, University of Leipzig
- 04/2015 “Gauge theories in locally covariant quantum field theory” at the Department of Mathematics, University of Regensburg
- 04/2015 “Gauge theories in locally covariant quantum field theory” at the Mathematical Physics Group, University of Würzburg
- 04/2015 “Gauge theories in locally covariant quantum field theory” at the Mathematical Physics Group, University of York
- 01/2015 “Supergeometry in locally covariant quantum field theory” at the Department of Mathematics, University of Genova
- 05/2014 “Differential cohomology and locally covariant quantum field theory” at the Differential Geometry Group, University of Potsdam
- 12/2013 “The inhomogeneous Klein-Gordon field: A new standard model for LCQFT” at the Mathematical Physics Group, University of Pavia
- 10/2013 “Algebraic quantum field theory and gauge theory” at the Department of Mathematics, Charles University Prague
- 09/2013 “Topological aspects of Abelian gauge theories in algebraic quantum field theory” at the Mathematical Physics Group, University of York
- 04/2013 “Quantized Abelian principal connections on Lorentzian manifolds” at the Differential Geometry Group, University of Potsdam
- 02/2013 “Category theoretical description of matter and gauge QFTs” at the Center for Quantum Spacetime (CQUeST), Seoul
- 03/2012 “Parallel transport on modules and application to fuzzy gauge theory” at the Edinburgh Mathematical Physics Group
- 11/2011 “The Maxwell field on curved spacetimes: A projective module approach” at the Algebraic Quantum Field Theory Group, University of Hamburg

- 01/2011 “Quantum Field Theory on Noncommutative Curved Spacetimes” at the Center for Quantum Spacetime (CQUeST), Seoul
- 11/2010 “QFT on noncommutative curved spacetimes” at the Algebraic Quantum Field Theory Group, University of Hamburg
- 02/2010 “Algebraic approach to quantum field theory on noncommutative curved spacetimes” at the Mathematical Physics Group, University of Vienna
- 01/2010 “Algebraic approach to quantum field theory on noncommutative curved spacetimes” at the Mathematical Physics Group, University of Alessandria
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### **Invited lectures**

- 02/2013 NIMS Winter School for Quantum Gravity and Cosmology, Daejeon, South Korea. (4 one-hour lectures on noncommutative geometry and gravity)
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### **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 32<sup>nd</sup> Workshop “Foundations and Constructive Aspects of QFT”, University of Wuppertal — with H. Gottschalk
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### **Teaching**

*At the University of Nottingham:*

- 01/2018-05/2018 G13REL Relativity (4 h/week undergraduate module)
- 01/2017-05/2017 G13REL 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 lecture for master students)

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

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### **Additional activities**

- ▷ Referee for the following journals: Communications in Mathematical Physics, Annales Henri Poincaré, Reviews in Mathematical Physics, Journal of Mathematical Physics, Classical and Quantum Gravity, General Relativity and Gravitation, Physical Review D, International Journal of Geometric Methods in Modern Physics, Central European Journal of Physics.
- ▷ Grant proposal reviewer for the following councils: Engineering and Physical Sciences Research Council (EPSRC, UK), National Science Centre (NCN, Poland).

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Nottingham, December 13, 2017