

Jens Boos

Curriculum Vitae

My interests are the description of space and time; classically, in the framework of General Relativity and more general theories, as well as in the domain of quantum field theory in curved spacetime. I am particularly interested in methods from effective field theory and modern differential geometry, and how they can help us to understand quantum effects and new physics involving gravity.

Education

- 2016–present **Doctor of Philosophy (Ph.D.)**, *University of Alberta*, Canada.
Vanier scholar; expected completion: Sept. 2020
- 2015–2016 **Master of Science**, *University of Waterloo*, Canada.
Perimeter Scholars International, *Perimeter Institute for Theoretical Physics*, Waterloo, Canada.
- 2012–2015 **Master of Science**, *University of Cologne*, Cologne, Germany.
GPA – 1.0 (honor’s branch)*
- 2009–2012 **Bachelor of Science**, *RWTH Aachen University*, Aachen, Germany.
GPA – 1.1 excellent*
- 2000–2009 **Abitur**, *Heinrich-Heine Gymnasium*, Oberhausen, Germany.
*GPA – 1.0**

*German grading system: 1.0 corresponds to the highest possible grade.

Publications

9. Yakov Itin, Yuri N. Obukhov, J.B., and Friedrich W. Hehl, “Premetric teleparallel theory of gravity and its local and linear constitutive law,” *Eur. Phys. J. C* **78** (2018) 907; arXiv:1808.08048 [gr-qc].
8. J.B., Valeri P. Frolov, and Andrei Zelnikov, “Quantum scattering on a delta potential in ghost-free theory,” *Phys. Lett. B* **782** (2018) 688; arXiv:1805.01875 [hep-th].
7. J.B., “Gravitational Friedel oscillations in higher-derivative and infinite-derivative gravity?,” *Int. J. Mod. Phys. D* **27** (2018) 1847022; arXiv:1804.00225 [gr-qc].
6. J.B., Valeri P. Frolov, and Andrei Zelnikov, “The gravitational field of p -branes in linearized ghost-free gravity,” *Phys. Rev. D* **97** (2018) 084021; arXiv:1802.09573 [gr-qc].
5. J.B. and Valeri P. Frolov, “Principal Killing strings in higher-dimensional Kerr–NUT–(A)dS spacetimes,” *Phys. Rev. D* **97** (2018) 084015; arXiv:1801.00122 [gr-qc].
4. J.B. and Valeri P. Frolov, “Stationary black holes with stringy hair,” *Phys. Rev. D* **97** (2018) 024024; arXiv:1711.06357 [gr-qc].

3. J.B. and Alberto Favaro, “Kerr principal null directions from Bel–Robinson and Kummer surfaces,” arXiv:1703.10791 [gr-qc].
2. J.B. and Friedrich W. Hehl, “Gravity-induced four-fermion contact interaction implies gravitational intermediate W and Z type gauge bosons,” *Int. J. Theor. Phys.* **56** (2017) 751; arXiv:1606.09273 [gr-qc].
1. J.B., “Plebański–Demiański solution of general relativity and its expressions quadratic and cubic in curvature: analogies to electromagnetism,” *Int. J. Mod. Phys. D* **24** (2015) 1550079; arXiv:1412.1958 [gr-qc].

Honors and Awards

- 2017–2020 Vanier Canada Graduate Scholarship
Natural Sciences and Engineering Research Council of Canada
President’s Doctoral Prize of Distinction
University of Alberta
- 2018 First prize, Annual Symposium for Graduate Physics Research
Graduate Physics Student Association, University of Alberta
- 2018 Honorable Mention, Essay Competition 2018
Gravity Research Foundation
- 2016–2019 Golden Bell Jar Graduate Scholarship in Physics
University of Alberta
- 2016–2017 Dean’s Excellence Recruitment Scholarship Award
University of Alberta Doctoral Recruitment Scholarship
University of Alberta
- 2015–2016 Perimeter Scholars International Award
Perimeter Institute for Theoretical Physics
- 2013–2015 Member of Bonn–Cologne Graduate School Honor’s Branch
University of Cologne
- 2013 Selected for Dean’s List 2013
RWTH Aachen University
- 2012 becoMINT graduate prize
Robert Bosch corporation
- 2009 State distinction for best Abitur graduates
Patron: prime minister of North Rhine-Westfalia, Germany
- 2009 Manfred Lennings medal for best Abitur grade
Rotary Club Oberhausen

Master’s Theses

Title *Symplectic boundary degrees of freedom in Poincaré gauge theory of gravity*
Supervisors Prof. Lee Smolin & Prof. Laurent Freidel

Title *Quasi-normal modes of the the BTZ black hole solution of (2+1)-dimensional Poincaré gauge theory of gravity*
Supervisors Prof. Friedrich W. Hehl & Prof. Claus Kiefer

Bachelor's Thesis

Title *Physics inside the Schwarzschild radius*
Supervisor Prof. Yvonne Y. Wong

Teaching Experience

- 2018 Gauge Theory Student Meetings (graduate reading class, University of Alberta)
<http://www.spintwo.net/Courses/Gauge-Theory-Student-Meetings/>
- 2017–2018 QFT Student Meetings (graduate reading class, University of Alberta)
<http://www.spintwo.net/Courses/QFT-Student-Meetings/>
- 2015 Geometry in Physics
teaching assistant, graduate course, University of Cologne, Prof. Alexander Altland
- 2014 Advanced Seminar on General Relativity & Cosmology
teaching assistant, graduate course, University of Cologne, Prof. Claus Kiefer
- 2014 General Relativity & Cosmology II
teaching assistant, graduate course, University of Cologne, Prof. Claus Kiefer

Attended Conferences and Schools

- 2018 Hundred Years of Gauge Theory
Physikzentrum German Physical Society, Bad Honnef, Germany
- 2018 Prospects in Theoretical Physics – From Qubits to Spacetime
Institute for Advanced Study, Princeton, USA
- 2018 Joint Canada-Asia Pacific Conf. on General Relativity and Relativistic Astrophysics
University of Alberta, Edmonton, Canada
- 2017 Geometric Foundations of Gravity
University of Tartu, Estonia
- 2017 Mathematical Physics and General Relativity Symposium in Honor of Professor Ivor Robinson
University of Texas at Dallas, USA
- 2016 Time in Cosmology
Perimeter Institute for Theoretical Physics, Waterloo, Canada
- 2016 Black Holes' New Horizons
Casa Matemática Oaxaca, Mexico
- 2015 14th Marcel Grossmann Meeting
University of Rome (La Sapienza), Italy
- 2015 DPG (German Physical Society) Spring Meeting
Technical University Berlin, Germany

- 2014 569th Wilhelm and Else Heraeus Seminar on Quantum Cosmology
Physikzentrum German Physical Society, Bad Honnef, Germany
- 2014 Graduate School “From Classical to Quantum GR: Applications to Cosmology”
University of Sussex, United Kingdom
- 2013 Second Erlangen Fall School on Quantum Geometry
University of Erlangen–Nuremberg, Germany
- 2013 Jürgen Ehlers Spring School “Gravitational Physics”
Max Planck Institute for Gravitational Physics, Potsdam, Germany

Talks and Invited Seminars

- Nov 2018 Quantum-mechanical scattering on a delta potential in ghost-free theory
Gravity seminar, University of Alberta, Canada
- Oct 2018 An exact stationary string configuration attached to a rotating black hole
University of Alberta, Canada
- Jun 2018 Principal Killing strings in higher-dimensional Kerr–NUT–(A)dS spacetimes
JCAPC GRRA 2018, University of Alberta, Canada
- Mar 2018 Linearized short-distance modifications of Einstein’s General Relativity
University of Alberta, Canada
- Jan 2018 Cosmic strings in stationary BH geometries: stringy matter, principal Killing strings
Invited talk, University of Cologne, Germany
- Aug 2017 Curvature tensors in a 4D Riemann–Cartan space: decompositions and superenergy
Geometric Foundations of Gravity, University of Tartu, Estonia
- May 2017 The Bel–Robinson tensor as an irreducible piece of the Bel tensor
Mathematical Physics and General Relativity Symposium in Honor of Professor Ivor Robinson, University of Texas at Dallas, USA
- Sep 2016 Quasi-normal modes: what can ringing black holes tell us about quantum gravity?
Symposium for Graduate Physics Research, University of Alberta, Canada
- May 2016 Quasi-normal modes of the BTZ black hole and (2+1)D Poincaré gauge theory of gravity
Invited talk, Black Holes’ New Horizons, Casa Matemática Oaxaca, Mexico
- Mar 2016 Gauge structures in gravity
Gravity seminar, University of Alberta, Canada
- Dec 2015 Poincaré gauge theory and its deformed Lie algebra – mass-spin classification of elementary particles
PSI seminar, Perimeter Institute for Theoretical Physics, Canada
- Nov 2015 Classical aspects of Poincaré gauge theory of gravity
Quantum gravity seminar, Perimeter Institute for Theoretical Physics, Canada
- Sep 2015 Differential forms: from classical force to the Wilson loop
PSI seminar, Perimeter Institute for Theoretical Physics, Canada

- Jul 2015 Plebański–Demiański solution of general relativity and its expressions quadratic and cubic in curvature: analogies to electromagnetism
14th Marcel Grossmann Meeting, University of Rome (La Sapienza), Italy
- Mar 2015 Plebański–Demiański solution of general relativity and its expressions quadratic and cubic in curvature: analogies to electromagnetism
DPG (German Physical Society) Spring Meeting, Berlin, Germany
- Apr 2015 Poincaré gauge theory of gravity — an introduction
Invited talk, BCGS seminar, Physikzentrum German Physical Society, Bad Honnef, Germany
- Feb 2015 Quasi-normal modes of the BTZ black hole with torsion
Gravitation and Relativity seminar, University of Cologne, Germany
- Nov 2014 Second order curvature invariants for the Plebański–Demiański solution
Gravitation and Relativity seminar, University of Cologne, Germany
- Jun 2014 Poincaré gauge theory of gravity
Gravitation and Relativity seminar, University of Cologne, Germany
- Jun 2014 Exterior calculus and Einstein–Cartan theory
Gravitation and Relativity seminar, University of Cologne, Germany

Memberships

- 2014–present DPG (German Physical Society), Division of Gravitation and Relativity
- 2018–present CAP (Canadian Association of Physicists), Division of Theoretical Physics
- 2018–present APS (American Physical Society), Division of Gravitation, Division of Astrophysics
- 2014–present WWF (World Wide Fund for Nature)
- 2014–present Welthungerhilfe Germany (NGO for development cooperation and emergency aid)

Computer Skills

- algebra Reduce with Excalc, Maple, Mathematica
- data analysis ROOT data analysis framework
- media \LaTeX , GIMP, Inkscape, Adobe InDesign, Adobe Premiere Pro
- programming BASIC, C, Java, Python
- web HTML, CSS, PHP, JavaScript, Ajax, MySQL, Typo3, webdesign

Work Experience

- 2014–2015 teaching assistant for various graduate-level courses
Institute for Theoretical Physics, University of Cologne
- 2014 Development and implementation of registration interface for the conference “569th Wilhelm and Else Heraeus Seminar on Quantum Cosmology” (see above)
Institute for Theoretical Physics, University of Cologne, Prof. Claus Kiefer
- 2013–2014 Development of website content management system (www.loosdrecht.net)

Theoretical Physics Institute, University of Alberta
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II. Physical Institute, University of Cologne, Prof. Paul van Loosdrecht

2013–2014 Graphic design and poster supervision for the Physical Colloquium

Department of Physics, University of Cologne

2013 Supervision of physics department website (physik.uni-koeln.de)

Department of Physics, University of Cologne

Other Interests

electronics, programming, and collecting Nixie tubes (see personal website www.jb-electronics.de), webdesign, piano (Boogie Woogie, Rock'n'Roll), ballroom dancing

Other Projects

2012 Development of data analysis software optoScale, RWTH Aachen University

2011–2012 Undergraduate Fund Project, RWTH Aachen University

Study and construction of gas discharge electron tubes at the I. Physical Institute B, Prof. Lutz Feld

Languages

English (fluent), German (native), French (basic), Latin (basic)

References

Prof. Valeri P. Frolov

University of Alberta, Canada

Prof. David Kubiznak

Perimeter Institute for Theoretical Physics, Canada

Prof. Friedrich W. Hehl

Institute for Theoretical Physics, University of Cologne, Germany

Further information available upon request. Last update: November 2018

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