

# 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

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?,” 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 Honorable Mention, Essay Competition 2018  
*Gravity Research Foundation*
- 2016–2018 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

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## Bachelor's Thesis

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

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## Teaching Experience

- 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*

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## 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 14<sup>th</sup> Marcel Grossmann Meeting  
*University of Rome (La Sapienza), Italy*
- 2015 DPG (German Physical Society) Spring Meeting  
*Technical University Berlin, Germany*
- 2014 569<sup>th</sup> 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”

## Talks and Invited Seminars

- Jun 2018 Principal Killing strings in higher-dimensional Kerr–NUT–(a)dS spacetimes  
*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  
*14<sup>th</sup> 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*

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## 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

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## Computer Skills

algebra Reduce with Excalc, Maple, Mathematica

data analysis ROOT data analysis framework

media  $\text{\LaTeX}$ , GIMP, Inkscape, Adobe InDesign, Adobe Premiere Pro

programming BASIC, C, Java, Python

web HTML, CSS, PHP, JavaScript, Ajax, MySQL, Typo3, webdesign

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## 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](http://www.loosdrecht.net))

*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](http://physik.uni-koeln.de))

*Department of Physics, University of Cologne*

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## Other Interests

electronics & programming (see personal website [www.jb-electronics.de](http://www.jb-electronics.de)), webdesign, piano (Boogie Woogie, Rock’n’Roll), ballroom dancing

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## 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

*Department of Physics, University of Alberta*  
4-181 CCIS, Edmonton, Alberta T6G 2E1, Canada  
✉ [boos@ualberta.ca](mailto:boos@ualberta.ca) • 🌐 [www.spintwo.net](http://www.spintwo.net)

## 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*

*Department of Physics and Astronomy, University of Missouri, Columbia, United States*

Further information available upon request. Last update: June 2018