

Ricardo Buring

Curriculum Vitae

Institut für Mathematik
Johannes Gutenberg-Universität Mainz
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Education

- 2017 – now **Ph.D. in Mathematics**, *Johannes Gutenberg-Universität Mainz*, Germany.
Supervisors: Dr. A.V. Kiselev (Groningen), Prof. dr. D. van Straten (Mainz).
- 2013 – 2017 **Master of Science in Mathematics**, *University of Groningen*, The Netherlands.
Thesis: *Kontsevich graphs and their weights in deformation quantization of Poisson structures*.
Supervisor: Dr. A.V. Kiselev.
- 2010 – 2013 **Bachelor of Science in Mathematics**, *University of Groningen*, The Netherlands.
Thesis: *An explicit algebro-geometric proof of Poncelet's closure theorem*.
Supervisor: Prof. dr. J. Top.
- 2009 – 2010 **Propedeuse in Computer Science**, *Hanzehogeschool Groningen*, The Netherlands.
- 2004 – 2009 **Higher General Secondary Education (HAVO)**, *Zernike College*, The Netherlands.

Experience

Teaching

- 2017 – 2019 **Teaching assistant**, *Johannes Gutenberg-Universität Mainz*, Germany.
Sommersemester 2019: Computeralgebra (mathematics).
Wintersemester 2018: Diskrete Mathematik für Informatiker (discrete mathematics, first year).
Sommersemester 2018: Computeralgebra (mathematics).
Wintersemester 2017: Diskrete Mathematik für Informatiker (discrete mathematics, first year).
- 2013 – 2017 **Teaching assistant**, *University of Groningen*, The Netherlands.
2016 – 2017: Geometry & Differential Equations (mathematics, masters course).
2014 – 2015: Propaedeutic project (mathematics, first year).
2013 – 2014: Propaedeutic project (mathematics, first year).
- 2014 – 2015 **Mentor**, *University of Groningen*, The Netherlands.
Mentoring a group of first year mathematics students.
- 2013 – 2019 **Private tutor** (freelance), The Netherlands and Germany.
Teaching mathematics to students individually and in small groups.
2017 – 2019 at Johannes Gutenberg-Universität Mainz: discrete mathematics, computer algebra.
2013 – 2017 at University of Groningen: group theory, analysis on manifolds.

Software development

- 2018 – now **Freelance software developer**, *rburing* (KvK-nummer: 72761415), The Netherlands.
Developing various software, including a mobile web application.
- 2010 – 2017 **Web application developer** (project-based), *G4S*, The Netherlands.
Developing several web applications.

Awards and honors

- September 22 – 27, 2019 **7th Heidelberg Laureate Forum**, *Heidelberg*, Germany.
Selected as one of 200 young researchers to participate, and as one of 10 to be interviewed.
Interview (online): *From diagrams to formulas via computers – Ricardo Buring loves teaching math*.

Committees

- 2014 – 2016 **Mathematics Programme Committee**, *University of Groningen*, The Netherlands.
Served as a student member 2014 – 2015, and as student chairman 2015 – 2016.
Organized the *Mathematics Pizza Meeting on Motivation*, with ≈ 40 attendees.
- 2014 – 2015 **Mathematics Alumni Day Committee**, *FMF study association*, The Netherlands.
Organized the *Mathematics Alumni Day 2015* at the University of Groningen.

Talks and posters

- July **GQT Graduate School**, Den Dolder, The Netherlands.
1 – 3, 2019 Organized by the Geometry and Quantum Theory (GQT) cluster.
Talk title: *Factorization problems in deformation quantization and Poisson bracket deformations*.
- May 15, 2019 **Informal Seminar on Mathematical Aspects of Scattering Amplitudes**,
Johannes Gutenberg-Universität Mainz, Germany.
Talk title: *A path integral approach to Kontsevich's quantization formula*.
- February **Ph.D. meeting Sonderforschungsbereich/Transregio 45**,
1 – 3, 2019 Universität Duisburg-Essen, Germany.
Talk title: *Why graph cocycles yield deformations of Poisson structures*.
- January 9, **Informal Seminar on Mathematical Aspects of Scattering Amplitudes**,
2019 Johannes Gutenberg-Universität Mainz, Germany.
Talk title: *Introduction to deformation quantization*.
- December **Symmetry and Integrability of Equations of Mathematical Physics**,
22 – 23, 2018 Institute of Mathematics of NAS of Ukraine, Kyiv, Ukraine.
Organized by the Department of Mathematical Physics.
Talk title: *Tetrahedral symmetry of the Jacobi identity for Poisson structures*.
- December 12, **Working group on Grothendieck-Teichmüller groups**,
2018 Max-Planck-Institut für Mathematik (MPIM), Bonn, Germany.
Talk title: *Isomorphism between g_{GT} and the degree 0 cohomology of the graph complex*.
- September **Homotopy algebras, deformation theory and quantization**, Będlewo, Poland.
16 – 22, 2018 Conference supported by Banach Center, Université du Luxembourg and Institute of Mathematics
of the Polish Academy of Sciences.
Poster title: *Deformation quantization: expansion $\star \bmod \bar{o}(\hbar^4)$ via graphs*.
- July **The 32nd International Colloquium on Group Theoretical Methods in Physics**,
9 – 13, 2018 Prague, Czech Republic.
Organized by the Czech Technical University in Prague.
Talk title: *The orientation morphism: from graph cocycles to deformations of Poisson structures*.
- March **Enumerative Invariants from Differential Graded Lie Algebras and Categories**,
25 – 31, 2018 Montegufoni, Italy.
Spring School organized by Helge Ruddat (Johannes Gutenberg-Universität Mainz, Germany).
Talk title: *Feynman diagrams and Kontsevich graphs*.
- January **Ph.D. meeting Sonderforschungsbereich/Transregio 45**,
26 – 29, 2018 Physikzentrum Bad Honnef, Germany.
Talk title: *Deformations of Poisson structures via graphs*.
- July **GQT Graduate School**, Den Dolder, The Netherlands.
3 – 7, 2017 Organized by the Geometry and Quantum Theory (GQT) cluster.
Talk title: *The Kontsevich graph calculus in deformation quantization of Poisson structures*.
- May 3, 2017 **Junior Geometry and Topology seminar**, Oxford, United Kingdom.
Organized by the Mathematical Institute of the University of Oxford.
Talk title: *Integrating without integrating: weights of Kontsevich graphs*.

- April 7, 2017 **Intercity Number Theory Seminar**, Groningen, The Netherlands.
Organized by the Dutch mathematics cluster DIAMANT.
Talk title: *Relations among Kontsevich graph weight integrals.*
- October 19 – 21, 2016 **Symposium on Advances in Semi-Classical Methods in Mathematics and Physics**, Groningen, The Netherlands.
Organized by the Johann Bernoulli Institute for Mathematics and Computer Science (JBI) and the Van Swinderen Institute for Particle Physics and Gravity (VSI) of the University of Groningen.
Talk title: *The Hunting of the Star-product.*
- June 12 – 17, 2016 **Group Analysis of Differential Equations and Integrable Systems**, Larnaca, Cyprus.
Workshop organized by the Department of Mathematics and Statistics of the University of Cyprus and the Department of Applied Research of the Institute of Mathematics of the NAS of Ukraine.
Talk title: *The explicit associativity mechanism for Kontsevich's \star -product up to orders 3 and 4.*
- August 3 – 7, 2015 **Symmetries of Discrete Systems and Processes III**, Děčín, Czech Republic.
Conference organized by the Czech Technical University in Prague.
Talk title: *Deformation quantization of variational Poisson structures: examples.*

Schools attended

- October 7 – 11, 2019 **Deformations and Rigidity in Algebra, Geometry and Analysis**, Würzburg, Germany.
Organized by the Institute of Mathematics at the Julius Maximilian University Würzburg.
Courses taken:
 - *Deformations of Poisson structures* by I. Marcut,
 - *Deformation Quantization and Symmetries* by S. Gutt,
 - *The Yang-Baxter equation, operator algebras, and braid group characters* by G. Lechner,
 - *An Introduction to Noncommutative Topology* by F. Arici,
 - *Noncommutative Geometry and Differential Calculus* by B. Tsygan.
- July 1 – 3, 2019 **GQT Graduate School**, Den Dolder, The Netherlands.
Organized by the Geometry and Quantum Theory (GQT) cluster.
Courses taken:
 - *D-modules on Riemann surfaces* by C. Lazda,
 - *Curves, jacobians and the double ramification cycle* by D. Holmes,
 - *The stable module category* by S. Sagave.
- September 16 – 22, 2018 **Homotopy algebras, deformation theory and quantization**, Będlewo, Poland.
Conference supported by Banach Center, Université du Luxembourg and Institute of Mathematics of the Polish Academy of Sciences.
Courses taken:
 - *Derived representation schemes and supersymmetric gauge theory* by G. Felder,
 - *Deformation theory and group actions* by S. Gutt,
 - *Graph complexes in algebra and geometry - recent advances* by S. Merkulov,
 - *Dg manifolds, formality theorem and Kontsevich-Shoikhet conjecture* by P. Xu.
- March 25 – 31, 2018 **Enumerative Invariants from Differential Graded Lie Algebras and Categories**, Montegufoni, Italy.
Spring School organized by Helge Ruddat (Johannes Gutenberg-Universität Mainz, Germany).
- July 3 – 7, 2017 **GQT Graduate School**, Den Dolder, The Netherlands.
Organized by the Geometry and Quantum Theory (GQT) cluster.
Courses taken:
 - *Topological field theories* by A. Ros Camacho,
 - *Knot invariants* by R. van der Veen,
 - *Derived categories in algebraic geometry* by M. Shen.

November 28 – 30, 2016 **GQT Graduate School**, Den Dolder, The Netherlands.
Organized by the Geometry and Quantum Theory (GQT) cluster.
Courses taken:

- *Toric varieties and equivariant vector bundles* by M. Kool,
- *Noncommutative geometry and gauge theories* by W. van Suijlekom & F. Arici,
- *Modular forms* by G. van der Geer.

September 8 – 12, 2014 **The 3rd Summer School on Geometry of Differential Equations**, Malenovice, CZ.
Organized by the Mathematical Institute of Silesian University in Opava.
Courses taken:

- *Differential Invariants* by V.V. Lychagin,
- *Riemann Surfaces and Soliton Equations* by A.E. Mironov.

Languages

English Fluent.
German Working proficiency.
Dutch Native.

Computer skills

OS Linux (various distributions), FreeBSD, Windows.
Programming Python, C++, C, Java, SQL, PHP, JavaScript, Google Apps Script.
Scientific SageMath, Maple, Mathematica, MATLAB, Excel.
Revision ctrl. Git.
Web design HTML, CSS, JavaScript, jQuery.
Web dev. Django.
Game dev. Godot, Unreal Engine 4.
Video editing Editing HD video using Kdenlive, ffmpeg.
Typesetting \LaTeX .
2D Graphics GIMP.
3D Graphics Blender.

List of publications

Publications

- [1] A. Bouisaghouane, R. Buring, and A.V. Kiselev. The Kontsevich tetrahedral flow revisited. *J. Geom. Phys.*, 119:272–285, 2017. Preprint [arXiv:1608.01710 \[q-alg\]](#) — 29 p.
- [2] R. Buring, A. V. Kiselev, and N. J. Rutten. The heptagon-wheel cocycle in the Kontsevich graph complex. *J. Nonlin. Math. Phys.*, 24:157–173, 2017. Suppl. 1 ‘Local & Nonlocal Symmetries in Mathematical Physics’. Preprint [arXiv:1710.00658 \[math.CO\]](#) — 17 p.
- [3] R. Buring, A. V. Kiselev, and N. J. Rutten. Poisson brackets symmetry from the pentagon-wheel cocycle in the graph complex. *Physics of Particles and Nuclei*, 49(5):924–928, 2018. Supersymmetry and Quantum Symmetries ’2017. Preprint [arXiv:1712.05259 \[math-ph\]](#) — 4 p.
- [4] R. Buring and A.V. Kiselev. The expansion $\star \bmod \bar{o}(\hbar^4)$ and computer-assisted proof schemes in the Kontsevich deformation quantization. *Exp. Math. (in press)*, 2019. Preprint [arXiv:1702.00681 \[math.CO\]](#) — 77 p.

Conference proceedings

- [5] R. Buring, A. V. Kiselev, and N. J. Rutten. Infinitesimal deformations of Poisson bi-vectors using the Kontsevich graph calculus. *J. Phys.: Conf. Ser.*, 965, 2018. Proc. XXV Int. conf. 'Integrable Systems & Quantum Symmetries' (6–10 June 2017, CVUT Prague, Czech Republic), 012010. Preprint [arXiv:1710.02405 \[math.CO\]](https://arxiv.org/abs/1710.02405) — 12 p.
- [6] R. Buring and A.V. Kiselev. The table of weights for graphs with ≤ 3 internal vertices in Kontsevich's deformation quantization formula. (3rd International workshop on symmetries of discrete systems & processes, 3–7 August 2015, CVUT Děčín, Czech Republic) — 3 p.
- [7] R. Buring and A.V. Kiselev. On the Kontsevich \star -product associativity mechanism. *Physics of Particles and Nuclei Letters*, 14(2):403–407, 2017. Preprint [arXiv:1602.09036 \[q-alg\]](https://arxiv.org/abs/1602.09036) — 4 p.
- [8] R. Buring and A.V. Kiselev. Formality morphism as the mechanism of \star -product associativity: how it works. 2019. (Symmetries & integrability of equations of mathematical physics, 22–24 December 2018, IM NASU Kiev, Ukraine) Preprint [arXiv:1907.00639 \[math.QA\]](https://arxiv.org/abs/1907.00639) — 16 p.
- [9] R. Buring and A.V. Kiselev. The orientation morphism: from graph cocycles to deformations of Poisson structures. *J. Phys.: Conf. Ser.*, 1194, Paper 012017:1–10, 2019. (The 32nd International Colloquium on Group Theoretical Methods in Physics, 9–13 July 2018, CVUT Prague, Czech Republic) Preprint [arXiv:1811.07878 \[math.CO\]](https://arxiv.org/abs/1811.07878) — 12 p.

Theses

- [10] R. Buring. An explicit algebro-geometric proof of Poncelet's closure theorem. Bachelor's thesis, University of Groningen, 2013 — 36 p.
- [11] R. Buring. Kontsevich graphs and their weights in deformation quantization of Poisson structures. Master's thesis, University of Groningen, 2017 — 100 p.

Date: November 2, 2019.