

REINIER KRAMER

Curriculum Vitae

✉ [reinier\[at\]ualberta\[dot\]ca](mailto:reinier[at]ualberta[dot]ca)
🌐 <https://sites.ualberta.ca/~reinier>

Employment

- Oct 2021 – present POSTDOCTORAL FELLOW, *University of Alberta*, Edmonton, Canada
A three-year postdoc position, partially funded by a Postdoctoral Fellowship of the Pacific Institute for the Mathematical Sciences, worth \$ 50.000 CAD. Co-organiser of weekly seminar ‘Aspects of Physical Mathematics’ in November 2021 - April 2022 and January - April 2024. Winter 2022 & Winter 2023 primary instructor for ‘MA PH 464: Group theory in physics’. Winter 2024 instructor for ‘MATH 146: Calculus for the Mathematical and Physical Sciences II’. Participated in an Equality, Diversity, and Inclusion training in April 2022.
- Oct 2019 – Sep 2021 POSTDOCTORAL FELLOW, *Max-Planck-Institut für Mathematik*, Bonn, Germany
A two-year postdoc position, without teaching duties. Organised an online reading group ‘Intersection theory on stacks’ from July 2020 to January 2021.
- July 2015 – June 2019 PROMOVENDUS (PHD CANDIDATE), *Universiteit van Amsterdam*, Amsterdam, Netherlands
Obtained a PhD in mathematical physics under prof. dr. Sergey Shadrin, including teaching duties as a teaching assistant for two courses a year: in order ‘Mathematics for Physicists 3’, ‘Riemann Surfaces’, ‘Representation Theory’, ‘Lie Groups and Lie Algebras’, ‘Workshop wiskunde’ (a presentation course), ‘Modules and Categories’, and ‘Linear Algebra’.
- Sep 2012 – Jan 2013, Sep 2014 – May 2015 TEACHING ASSISTANT, *Universiteit van Amsterdam*, Amsterdam
Led weekly exercise classes of courses ‘Basic Mathematics’, ‘Stochastics 2’, ‘Function Theory’, and ‘Representation Theory’ and correcting homework and exams.
- Nov 2012 – Apr 2013 STUDENT ASSISTANT, *Universiteit van Amsterdam*, Amsterdam
Assistant preparing documents for accreditation of the mathematical master degrees at the Universiteit van Amsterdam.

Education

- Sep 2012 – Aug 2013, Sep 2014 MASTER OF SCIENCE IN MATHEMATICAL PHYSICS, *Universiteit van Amsterdam*, Amsterdam, Netherlands, *GPA: 8.7/10*
– June 2015 Cum laude. Suspended studies between first and second year to pursue another degree.
- Oct 2013 – June 2014 MASTER OF ADVANCED STUDIES IN MATHEMATICS, *University of Cambridge*, Cambridge, UK, *GPA: 73 %*
Merit.
- Sep 2009 – Aug 2012 BACHELOR OF SCIENCE IN MATHEMATICS, *Universiteit van Amsterdam*, Amsterdam, Netherlands, *GPA: 8.9/10*
Honours and cum laude.

Sep 2009 – Aug 2012 BACHELOR OF SCIENCE IN PHYSICS, *Universiteit van Amsterdam*, Amsterdam, Netherlands, GPA: 8.9/10
Honours and cum laude.

Publications

Papers

- [1] G. Borot, R. Kramer, and Y. Schüler. “Higher Airy structures and topological recursion for singular spectral curves.” *Ann. Inst. Henri Poincaré D* (2023). Published online first. DOI: 10.4171/AIHPD/168. arXiv: 2010.03512.
- [2] P. Dunin-Barkowski, R. Kramer, A. Popolitov, and S. Shadrin. “Loop equations and a proof of Zvonkine’s qr -ELSV formula.” *Ann. Sci. Éc. Norm. Supér.* 56.4 (2023), pp. 1199–1229. DOI: 10.24033/asens.2553. arXiv: 1905.04524.
- [3] R. Kramer. “KP hierarchy for Hurwitz-type cohomological field theories.” *Commun. Number Theory Phys.* 17.2 (2023), pp. 249–291. DOI: 10.4310/CNTP.2023.v17.n2.a1. arXiv: 2107.05510.
- [4] R. Kramer, A. Popolitov, and S. Shadrin. “Topological recursion for monotone orbifold Hurwitz numbers: a proof of the Do-Karev conjecture.” *Ann. Sc. Norm. Super. Pisa Cl. Sci. (5)* 23.2 (2022), pp. 809–827. DOI: 10.2422/2036–2145.201909_010. arXiv: 1909.02302.
- [5] G. Borot, R. Kramer, D. Lewanski, A. Popolitov, and S. Shadrin. “Special cases of the orbifold version of Zvonkine’s r -ELSV formula.” *Michigan Math. J.* 70.2 (2021), pp. 368–402. DOI: 10.1307/mmj/1592877614. arXiv: 1705.10811.
- [6] K. Groenland, C. Groenland, and R. Kramer. “Adiabatic transfer of amplitude using STIRAP-like protocols generalizes to many bipartite graphs.” *J. Math. Phys.* 61 (2020), p. 072201. DOI: 10.1063/1.5116655. arXiv: 1904.09915.
- [7] P. Dunin-Barkowski, R. Kramer, A. Popolitov, and S. Shadrin. “Cut-and-join equation for monotone Hurwitz numbers revisited.” *J. Geom. Phys.* 137 (2019), pp. 1–6. DOI: 10.1016/j.geomphys.2018.11.010. arXiv: 1807.04197.
- [8] E. Garcia-Failde, R. Kramer, D. Lewański, and S. Shadrin. “Half-spin tautological relations and Faber’s proportionalities of kappa classes.” *SIGMA Symmetry Integrability Geom. Methods Appl.* 15.80 (2019), pp. 1–27. DOI: 10.3842/SIGMA.2019.080. arXiv: 1902.02742.
- [9] R. Kramer, D. Lewanski, A. Popolitov, and S. Shadrin. “Towards an orbifold generalization of Zvonkine’s r -ELSV formula.” *Trans. Amer. Math. Soc.* 372.6 (2019), pp. 4447–4469. DOI: 10.1090/tran/7793. arXiv: 1703.06725.
- [10] R. Kramer, D. Lewański, and S. Shadrin. “Quasi-polynomiality of monotone orbifold Hurwitz numbers and Grothendieck’s dessins d’enfants.” *Doc. Math.* 24 (2019), pp. 857–898. DOI: 10.25537/dm.2019v24.857–898. arXiv: 1610.08376.
- [11] G. Carlet, R. Kramer, and S. Shadrin. “Central invariants revisited.” *Journal de l’École polytechnique* 5 (2018), pp. 149–175. DOI: 10.5802/jep.66. arXiv: 1611.09134.
- [12] M. A. Hahn, R. Kramer, and D. Lewanski. “Wall-crossing formulae and strong piecewise polynomiality for mixed Grothendieck dessins d’enfant, monotone, and simple double Hurwitz numbers.” *Adv. Math.* 336 (2018), pp. 38–69. DOI: 10.1016/j.aim.2018.07.028. arXiv: 1710.01047.

- [13] R. Kramer, F. Labib, D. Lewanski, and S. Shadrin. “The tautological ring of $\mathcal{M}_{g,n}$ via Pandharipande-Pixton-Zvonkine r -spin relations.” *Algebraic Geometry* 5.6 (2018), pp. 703–727. DOI: 10.14231/AG-2018-019. arXiv: 1703.00681.

Preprints

- [1] G. Borot, V. Bouchard, N. K. Chidambaram, R. Kramer, and S. Shadrin. *Taking limits in topological recursion*. 2023. arXiv: 2309.01654.
- [2] V. Bouchard, R. Kramer, and Q. Weller. *Topological recursion on transalgebraic spectral curves and Atlantes Hurwitz numbers*. 2023. arXiv: 2304.07433.
- [3] A. Giacchetto, R. Kramer, D. Lewański, and A. Sauvaget. *The Spin Gromov-Witten/Hurwitz correspondence for \mathbb{P}^1* . 2022. arXiv: 2208.03259.
- [4] A. Giacchetto, R. Kramer, and D. Lewański. *A new spin on Hurwitz theory and ELSV via theta characteristics*. 2021. arXiv: 2104.05697.

Talks and presentations

- Jan 2024 ASPECTS OF PHYSICAL MATHEMATICS, *University of Alberta*, Edmonton, Canada, “Hurwitz numbers: counting from cover to cover”
- Sep 2023 SEMINAR MATHEMATICAL PHYSICS, *Universität Munster*, Münster, Germany, “(Spin) Hurwitz numbers and topological recursion”
- Apr 2023 MINI-WORKSHOP ON TOPOLOGICAL RECURSION, *University of Tokyo*, Tokyo, Japan, “Transalgebraic topological recursion and Atlantes Hurwitz numbers”
- Apr 2023 INVITATION TO RECURSION, RESURGENCE AND COMBINATORICS, *Okinawa Institute of Science and Technology*, Okinawa, Japan, “The spin Gromov-Witten/Hurwitz correspondence for \mathbb{P}^1 ”
- Feb 2023 TOPOLOGICAL RECURSION AND INTEGRABILITY SEMINAR, Online, Two-part talk “Global topological recursion & limits”
- Dec 2022 PRIMA CONGRESS, *Pacific Rim Mathematical Association*, Vancouver, Canada, “Atlantes Hurwitz numbers and transalgebraic topological recursion”
- Oct 2022 COMBINATORICS AND GEOMETRY SEMINAR, *University of Washington*, Seattle, WA, USA, “Hurwitz numbers via topological recursion”
- Oct 2022 SEMINAR ALGEBRA, GEOMETRY, AND MATHEMATICAL PHYSICS, *Universiteit van Amsterdam*, Amsterdam, Netherlands, “The spin Gromov-Witten/Hurwitz correspondence for \mathbb{P}^1 ”
- Sep 2022 MATHEMATICAL PHYSICS SEMINAR, *Institute for Basic Science*, Pohang, Korea, “The spin Gromov-Witten/Hurwitz correspondence”
- Sep 2022 WORKSHOP ‘MATHEMATICAL METHODS OF NONLINEAR PHYSICS’, *Istituto Nazionale di Fisica Nucleare*, Otranto, Italy, “KP for CohFTs of Hurwitz type”
- Sep 2022 CONFERENCE ‘TRSALENTO22’, *Université Paris-Saclay*, Otranto, Italy, Four-hour lecture series “Reducible topological recursion”
- May 2022 QUANTUM MATHEMATICS SEMINAR, *Syddansk Universitet*, Odense, Denmark, “Hurwitz numbers and topological recursion, with a spin”
- May 2022 ALGEBRAIC GEOMETRY SEMINAR, *Humboldt-Universität zu Berlin*, Berlin, Germany, “The spin Gromov-Witten/Hurwitz correspondence”

- Apr 2022 MATHEMATICAL PHYSICS GROUP SEMINAR, *University of Saskatchewan*, Saskatoon, Canada, “Hurwitz numbers and topological recursion (with a spin?)”
- Nov 2021 PIMS POSTDOCTORAL FELLOW SEMINAR, *PIMS*, American Pacific region, “Hurwitz Numbers via Topological Recursion”
- Nov 2021 & SEMINAR ‘ASPECTS IN PHYSICAL MATHEMATICS’, *University of Alberta*, Edmon-
Mar 2022 ton, Canada, co-organiser, gave talks “Symmetric functions” & “Cohomological field theories and topological recursion”
- Aug 2021 CONFERENCE ‘NONCOMMUTATIVE GEOMETRY MEETS TOPOLOGICAL RECURSION’, *Universität Münster*, Münster, Germany, “KP for Hurwitz-type cohomological field theories”
- June 2021 CONFERENCE ‘INTEGRABLE SYSTEMS IN GEOMETRY AND MATHEMATICAL PHYSICS’, *SISSA*, Trieste, Italy, “KP for Hurwitz-type cohomological field theories”
- Apr 2021 ALGEBRAIC GEOMETRY, PHYSICS, GROMOV-WITTEN THEORY SEMINAR, *Universität Bonn*, Bonn, Germany, “Hurwitz theory and cohomological field theories, with (a) spin”
- July 2020 - Jan ONLINE READING GROUP ‘INTERSECTION THEORY ON STACKS’, *Max-Planck-
2021 Institut für Mathematik*, Bonn, Germany, organiser, gave talks “Category background for stacks”, “Recap of scheme theory”, “Sites and sheaves”, “Algebraic cycles and rational equivalence”, “Defining intersection theory on stacks”, “Properties of obstruction theories and virtual classes”
- Apr 2020 ONLINE READING GROUP ‘DT INVARIANTS, STABILITY CONDITIONS AND GEOMETRY’, *Max-Planck-Institut für Mathematik*, Bonn, Germany, “Category theory for geometers”
- Dec 2019 SEMINAR ALGEBRAIC GEOMETRY, *Max-Planck-Institut für Mathematik*, Bonn, Germany, “The tautological ring of the moduli space of smooth curves via Pandharipande-Pixton-Zvonkine half-spin relations”
- Oct 2019 READING GROUP ON INTEGER POINTS IN POLYHEDRA, *Max-Planck-Institut für Mathematik*, Bonn, Germany, “Lattice points, Ehrhart theory, and the relation to volumes”
- Sep 2019 CONFERENCE ‘CURVE COUNTING THEORIES AND RELATED ALGEBRAIC STRUCTURES’, *University of Leeds*, Leeds, UK, “The KP hierarchy for special triple Hodge integrals”
- May 2019 COMPLEX DYNAMICS AND COMBINATORICS SEMINAR, *Universiteit van Amsterdam*, Amsterdam, Netherlands, “Adiabatic transfer of zero eigenvalues of the adjacency matrix on semi-bipartite graphs”
- May 2019 INFINITY SEMINAR, *Universiteit van Amsterdam*, Amsterdam, Netherlands, “Spectra, classically and infinity-categorically”
- Apr 2019 INTERCITY SEMINAR GEOMETRY ON ‘THE LOGARITHMIC PICARD GROUP AND ITS TROPICALIZATION’, *Universiteit Utrecht*, Utrecht, Netherlands, “Tropical moduli problems”
- Dec 2018 KNOT THEORY SEMINAR, *Universiteit van Amsterdam*, Amsterdam, Netherlands, “Quantum curves and WKB from topological recursion”

- Aug 2018 TOPOLOGICAL RECURSION SUMMER SCHOOL, *Universität Tübingen*, Tübingen, Germany, 5 minute talk “Quasi-polynomiality of Hurwitz numbers”
- Jun 2018 ST. PETERSBURG SEMINAR ON REPRESENTATION THEORY AND DYNAMICAL SYSTEMS, *Steklov Mathematical Institute*, St. Petersburg, Russia, Seminar “Polynomiality behaviour of Hurwitz numbers via the infinite wedge formalism”
- Jan 2018 DIJON MATHEMATICAL PHYSICS SEMINAR, *Université de Bourgogne*, Dijon, France, “Polynomiality of Hurwitz numbers”
- Sep 2017 WORKSHOP ‘MODULI SPACES OF CURVES, INTEGRABLE SYSTEMS AND RELATED SUBJECTS’, *Université de Bourgogne*, Dijon, France, “Deformations of Poisson pencils of hydrodynamic type via bi-Hamiltonian cohomology”
- Dec 2016 CONFERENCE ‘TOPOLOGICAL RECURSION AND MODULARITY’, *University of Melbourne*, Creswick, Australia, “Quasi-polynomiality of monotone orbifold Hurwitz numbers”

Theses

- PhD CYCLES OF CURVES, COVER COUNTS, AND CENTRAL INVARIANTS, *under prof. dr. Sergey Shadrin*, Amsterdam, 2019
 Mostly a composition of my papers written during my PhD. It is split into three parts: tautological relations on the moduli spaces of curves, topological recursion for different kinds of Hurwitz numbers, and results on integrable hierarchies. Its first part contains a non-technical introduction, as well as comprehensive prerequisites.
- MSc THE MADSEN-WEISS THEOREM, *under prof. dr. Sergey Shadrin*, Amsterdam, 2015
 An introduction to and proof of the Madsen-Weiss theorem, identifying the stable homotopy type of the mapping class group of bounded Riemann surfaces as a certain infinite loop space. It covers Teichmüller theory, Harer stability, Quillen’s plus construction, the group completion theorem, and infinite loop spaces.
- MASt KÄHLER-EINSTEIN METRICS (FOLLOWING BERMAN), *under dr. Julius Ross*, Cambridge, 2014
 An exposition of the theory of Kähler-Einstein metrics on complex manifolds, and proving one direction of the Yau-Tian-Donaldson conjecture on the equivalence of K-stability and admittance of a Kähler-Einstein metric on Fano varieties, following Berman’s original proof.
- BSc THE EQUALITY OF TWO APPROACHES TO CHERN CLASSES OF COMPLEX VECTOR BUNDLES, *under prof. dr. Eric Opdam*, Amsterdam, 2012
 Contains two constructions of Chern classes, via curvatures of connections and via the Euler class of sphere bundles, and proves their equality.

Awards

- 2021-2023 POSTDOCTORAL FELLOWSHIP, *Pacific Institute for the Mathematical Sciences*, Vancouver, Canada
 Two-year partial funding for a postdoctoral fellowship at a western Canadian or US university of \$ 25,000 CAD per annum.
- 2014 M T MEYER SCHOLARSHIP, *Girton College*, Cambridge, UK
 Annual scholarship for the best mathematics students of Girton College.

- 2014 GERTRUDE MATHER JACKSON PRIZE, *Girton College*, Cambridge, UK
Annual prize for the best mathematics students of Girton College.
- 2010 JONG TALENT AANMOEDIGINGSPRIJS VOOR WISKUNDE, *Thomas Stieltjes Institute for Mathematics*, Haarlem, the Netherlands
Annual prize for the best first-year mathematics students at a Dutch university.

Academic service

- Co-organiser SEMINAR 'ASPECTS IN PHYSICAL MATHEMATICS, *University of Alberta*, Edmonton, Canada, Winter 2021-22 and Winter 2024
- Organiser READING GROUP 'INTERSECTION THEORY ON STACKS, *Max-Planck-Institut für Mathematik*, Bonn, Germany, 2020-2021
- Co-organiser READING GROUP 'DT INVARIANTS, STABILITY CONDITIONS AND GEOMETRY', *Max-Planck-Institut für Mathematik*, Bonn, Germany, 2019
- Referee FOR THE JOURNALS, *Advances in Mathematics*, *Communications in Mathematical Physics*, *SIGMA. Symmetry, Integrability and Geometry. Methods and Applications*, *Communications in Number Theory and Physics*
- Reviewer MATHSciNET, *American Mathematical Society*, Providence, RI, USA

Languages

Dutch	Native	
English	Fluent	
German	Advanced	<i>Level B2</i>
French	Basic	<i>Three years of high school</i>
Russian	Basic	<i>Level A2.1</i>