

David Holmes

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Academic positions

- 2023≤ **Professor**, *University of Leiden*.
2021 - 2023 **Associate Professor (UHD)**, *University of Leiden*.
2014 - 2021 **Assistant Professor (UD)**, *University of Leiden*, (tenured since June 2017).
2012 - 2014 **Postdoc**, *University of Leiden*.
4 - 8/2012 **Visiting researcher**, *University of Hamburg*.
2008 - 2012 **PhD with Samir Siksek**, *University of Warwick*, awarded 10 Dec 2012.
2007 - 2008 **Part III Mathematics**, *Christ's College Cambridge*, Distinction.
2004 - 2007 **BSc Mathematics**, *University of Warwick*, 1st class Hons.

Recent grants and awards

- 2021-2026 **NWO Vidi grant**, '*Degeneration of group structures in families of algebraic varieties*', (800kEuro, individual research grant).
2022-2023 **Van Gogh Programme grant**, '*Spin double ramification cycles and applications*', with Adrien Sauvaget.
2019 **Foundation Composito Mathematica conference grant**, to support a workshop organised with Lenny Taelman and Tim Dokchitser (postponed due to COVID).
2019 **DIAMANT conference grant**, to support a workshop organised with Lenny Taelman and Tim Dokchitser.
2019 **DIAMANT small grant**, to support the Intercity Geometry Seminar, and the visit of Samouil Molcho.

PhDs and postdocs

Postdocs

- 2022-2025 **Leo Herr**, Leiden, funded by NWO Vidi.
2021-2022 **Lawrence Barrott**, Leiden, funded by NWO Vidi.
2021-2022 **Remy van Dobben de Bruyn**, Leiden.

PhD students in progress

- 2023-2027 **Amira Tlemsani**, *Double ramification cycles for surfaces*, Leiden, funded by NWO Vidi.
2022-2026 **George Politopoulos**, *Combinatorics and geometry of moduli of curves*, (cosupervised with Adrien Sauvaget), Leiden/I'Université de Cergy Pontoise, partly funded by NWO Vidi.

- 2020-2024 **Pim Speller**, *Logarithmic geometry and moduli of curves*, Leiden, funded by NWO Vidi.
- 2018-2023 **Rosa Schwarz**, *Gromov Witten theory of Artin Stacks*, Leiden, funded by NWO.
PhD students graduated:
- 2018-2022 **Ruihua Wang**, *Higher-dimensional Arakelov intersection theory*, Leiden, funded by CRC scholarship.
- 2016-2019 **Garnet Akeyr**, *Alignment in families with higher-dimensional fibres*, Leiden, funded by NSERC scholarship.
- 2014-2017 **Raymond van Bommel**, *Distribution of reduction types of abelian varieties*, (cosupervised with F. Pazuki), Leiden/Copenhagen.
- 2014-2017 **Giulio Orecchia**, *Picard functors of curves over high-dimensional base schemes*, (cosupervised with Q. Liu), Leiden/Bordeaux, funded by ALGANT consortium.

Recent service

External

- 2021- **Managing editor for journal *Compositio Mathematica*.**
- 2022, 2023 **Selection committee for NWO 'M' grants.**
- 2020- **Member of Publications Committee of Platform Wiskunde Nederland.**

Within Leiden MI

- 2023 - **Admissions committee bachelor mathematics.**
- 2022 - **Diversity and Inclusion committee of the MI (founding member).**
- 2022 -2023 **Selection committee for full professor in Mathematics of Artificial Intelligence.**
- 2021 -2023 **Institute Council**, *vice-chair from 2022.*
- 2017-2022 **Study advisor**, *master's students in algebra, geometry and number theory.*
- 2017-2022 **Opleidingscommissie Wiskunde**, *member.*

Selected recent seminars and conferences organised

- 2023- **Belgian-Dutch Algebraic Geometry Seminar** (*with B. Moonen, J. Nicaise, L. Taelman, N. Budur, M. Kool*).
- 2022 **Intercity Geometry Seminar on Condensed mathematics** (*with B. Moonen, L. Taelman, R. van Dobben de Bruyn*).
- 2021 **Dutch Algebraic Geometry Seminar** (*online, local organiser for Leiden*).
- 2020-2021 **Differentials and b-Chow seminar** (*online, with Johannes Schmitt (MPI Bonn)*).
- 2019 **Intercity Geometry Seminar: The logarithmic Picard group and its tropicalization** (*national seminar, with Chris Lazda (UvA), Adrien Sauvaget (UU) and Arne Smeets (RUN)*).
- 2019 **DIAMANT meets GQT: Arithmetic and geometry** (*session of the NMC (Dutch Mathematical Congress), with Martijn Kool (UU)*).

2018 **Intercity Geometry Seminar: Mirror Symmetry and moduli spaces of Higgs bundles** (*national seminar, with Chris Lazda (UvA) and Arne Smeets (RUN)*).

Publications (peer reviewed international journals)

- 2022 **Rings of Siegel-Jacobi forms of bounded relative index are not finitely generated** (*with A. M. Botero, J. I. Burgos Gil, R. de Jong*),
arXiv:2203.14583, to appear in Duke Math.
- 2023 **Pixton's formula and Abel-Jacobi theory on the Picard stack** (*with Y. Bae, R. Pandharipande, J. Schmitt, and R. Schwarz*),
arXiv:2004.08676, Acta Mathematica 230:2, 205–319 (2023).
- 2023 **Models of Jacobians of curves** (*with S. Molcho, G. Orecchia, T. Poiret*),
arXiv:2007.10792, J. Reine Angew. Math. (Crelle's Journal), vol. 2023, no. 801, 2023, pp. 115-159.
- 2023 **Logarithmic moduli of roots of line bundles on curves** (*with G. Orecchia*),
arXiv:2201.06869, Expo. Math. 41, No. 3, 577–602, special edition in memory of Bas Edixhoven.
- 2022 **Logarithmic intersections of double ramification cycles** (*with R. Schwarz*),
arXiv:2104.11450, Algebraic Geometry 9 (5)(2022), doi: 10.14231/AG-2022-017.
- 2022 **Chern-Weil and Hilbert-Samuel formulae for singular hermitian line bundles** (*with A. M. Botero, J. I. Burgos Gil, R. de Jong*),
arXiv:2112.09007, Doc. Math. 27, 2563–2623.
- 2022 **Improving estimations of life history parameters of small animals in mesocosm experiments: A case study on mosquitoes** (*with M. Dellar, S. P. Boerlijst*),
<https://doi.org/10.1111/2041-210X.13814>, Methods in Ecology and Evolution.
- 2021 **A Néron model of the universal jacobian**,
arXiv:1412.2243, Ann. Henri Lebesgue 4, 1727–1766 (2021).
- 2021 **Infinitesimal structure of the pluricanonical double ramification locus** (*with Johannes Schmitt*),
arXiv:1909.11981, Compositio Mathematica, Vol. 157, No. 10 (2021), pp. 2280 - 2337.
- 2020 **Fine compactified moduli of enriched structures on stable curves** (*with Owen Biesel*),
arXiv:1607.08835, Memoirs of the AMS vol. 1416.
- 2020 **Fields of definition of curves of a given degree** (*with Nick Rome*),
arXiv:1901.11294, Journal de Théorie des Nombres de Bordeaux, Vol. 32, No. 1 (2020), pp. 291-310, <https://www.jstor.org/stable/26939664>.
- 2020 **The norm of the saturation of a binomial ideal, and applications to Markov bases**,
arxiv:1907.10268, Algebraic Statistics, Vol. 11 (2020), No. 2, 169–187 DOI: 10.2140/astat.2020.11.169.
- 2019 **Extending the double ramification cycle by resolving the Abel-Jacobi map**,
arXiv:1707.02261, , <https://doi.org/10.1017/S1474748019000252>, J. Inst. Math. Jussieu 20, No. 1, 331–359 (2021).

- 2019 **Multiplicativity of the double ramification cycle** (*with Aaron Pixton and Johannes Schmitt*),
arXiv:1711.10341, Doc. Math. 24, 545–562 (2019), DOI: 10.25537/dm.2019v24.545-562.
- 2019 **Empirical and dynamic approaches for modelling the yield and N content of European grasslands** (*with Martha Dellar, Kairsty Topp, Guillermo Pardo, Agustin del Prado, Nuala Fitton, Georgios Banos, Eileen Wall*),
<https://doi.org/10.1016/j.envsoft.2019.104562>, Environmental Modelling and Software.
- 2019 **Explicit arithmetic intersection theory and computation of Néron-Tate heights** (*with Steffen Muller and Raymond van Bommel*),
arXiv:1809.06791, Math. Comput. 89, No. 321, 395–410 (2020) <https://doi.org/10.1090/mcom/3441>.
- 2019 **Torsion points and height jumping in higher-dimensional families of abelian varieties**,
arXiv:1604.04563, <https://doi.org/10.1142/S179304211950101X>, Int. J. Number Theory 15, No. 9, 1801–1826 (2019).
- 2019 **Néron models of jacobians over base schemes of dimension greater than 1**,
J. Reine Angew. Math. 747 (2019), 109–145. DOI 10.1515/crelle-2016-0014, arXiv:1402.0647.
- 2018 **Singularity of the biextension metric for families of abelian varieties** (*with J. Burgos Gil and R. de Jong*),
arXiv:1604.00686, Forum of Mathematics, Sigma, 6, E12. doi:10.1017/fms.2018.13.
- 2018 **Extending the Double Ramification Cycle using Jacobians** (*with J. Kass and N. Pagani*), arXiv:1712.07098, Eur. J. Math. 4, No. 3, 1087–1099 (2018) <https://doi.org/10.1007/s40879-018-0256-7>.
- 2017 **Positivity of the height jump divisor** (*with J. Burgos Gil and R. de Jong*),
arXiv:1701.00370, International Mathematics Research Notices, Vol. 2019, Issue 7, Pages 2044–2068, <https://doi.org/10.1093/imrn/rnx169>.
- 2017 **Néron models and the height jump divisor** (*with O. Biesel and R. de Jong*),
arXiv:1412.8207, Trans. Amer. Math. Soc. 369 (2017), 8685–8723.
- 2016 **Quasi-compactness of Néron models, and an application to torsion points**,
Manuscripta Math doi:10.1007/s00229-016-0887-2, arXiv:1604.01155.
- 2015 **The Brauer-Manin obstruction on Kummer varieties and ranks of twists of abelian varieties** (*with R. Pannekoek*), Bull. London Math. Soc. 47, arXiv:1404.3641.
- 2015 **Asymptotics of the Néron height pairing** (*with R. de Jong*),
Math. Res. Lett. 22, No. 5, arXiv:1304.4768.
- 2014 **An Arakelov-theoretic approach to naïve heights on hyperelliptic jacobians**,
New York J. Math. 20, arXiv:1207.5948.
- 2012 **Computing Néron-Tate heights of points on hyperelliptic jacobians**,
J. Number Theory 132, arXiv:1004.4503.

Other publications

- 2022 **Steps towards openness and fairness in scientific publishing** (with *J. Briët and R.J. Kang*),
<https://ir.cwi.nl/pub/31565>, *Nieuw Archief voor Wiskunde*, 5(23), 53 - 55. ISSN 0028-9825.
- 2012 **Néron-Tate heights on the jacobians of high-genus hyperelliptic curves**,
PhD thesis.

Preprints

- 2023 **Mumford's formula on the universal Picard stack** (with *A. Chiodo*),
arXiv:2309.00315.
- 2023 **Logarithmic cohomological field theories** (with *P. Spelier*),
arXiv:2308.01099, submitted.
- 2022 **Logarithmic double ramification cycles** (with *S. Molcho, R. Pandharipande, A. Pixton, J. Schmitt*),
arXiv:2207.06778, submitted.
- 2022 **Points of non-linearity of functions generated by random neural networks**,
arXiv:2304.09837, submitted.
- 2022 **A tale of two moduli spaces: logarithmic and multi-scale differentials** (with *D. Chen, S. Grushevsky, M. Möller, J. Schmitt*),
arXiv:2212.04704, submitted.
- 2021 **Divisorial and geometric gonality of higher-rank tropical curves** (with *J. van Dobben de Bruyn and D. van der Vorm*),
arXiv:2112.04205.

Recent international conference talks

- 2023 **Measuring when a line bundle on a curve is trivial**,
Global invariants of arithmetic varieties,
CIRM Luminy.
- 2023 **Cohomological field theories for logarithmic curves**,
Curves: Algebraic, Tropical, and Logarithmic,
BIRS Banff.
- 2023 **On the locus where a line bundle on a curve is trivial**,
Recent trends in algebraic geometry,
Oberwolfach.
- 2023 **Coefficients of higher powers of r in Chiodo classes**,
Moduli spaces of curves workshop,
Les Diablerets.
- 2023 **Detecting when a line bundle is (log) trivial**,
Workshop Logarithmic Geometry and Moduli Spaces,
Frankfurt.

- 2022 **Double ramification cycles**,
Recent Advances on Moduli Spaces of Curves,
Leysin.
- 2022 **Formulae for logarithmic double ramification cycles**,
Recent Advances on Moduli Spaces of Curves,
Leysin.
- 2022 **Introduction to LogChow**,
Coding Intersection theory,
Les Diablerets.
- 2021 **Piecewise polynomials on the moduli space of curves**,
Helvetic Algebraic Geometry workshop,
Geneva.

Recent seminar and colloquium talks

- 2023 **The Double ramification Cycle via Riemann-Roch**,
Seminar,
Universiteit van Amsterdam.
- 2022 **Introduction to adic spaces, after Huber**,
Intercity geometry seminar,
Universiteit van Amsterdam.
- 2022 **Spin DR cycles**,
Tropical/algebraic geometry seminar,
Jussieu, Paris.
- 2021 **The double-double ramification cycle**,
Algebraic geometry seminar (online),
HU Berlin.
- 2021 **The double-double ramification cycle**,
Algebraic geometry seminar (online),
Padova.
- 2020 **Geometry of the double ramification cycle**,
Algebraic geometry seminar (online),
Milano.
- 2020 **Geometry of the double ramification cycle**,
Algebraic geometry seminar,
Cambridge University.
- 2019 **The universal double ramification cycle**,
Algebraic geometry and moduli seminar,
ETH Zürich.

Teaching and supervising

Qualifications

- 2015 **Basis kwalificatie onderwijs**, (*basic Dutch university teaching qualification*),
Leiden.

Master's students

- 2021 **Giorgio Spadaccini**, *Algebraic Statistics*, University of Leiden.
- 2017 **Rosa Schwarz**, *Intersection theory on Picard stacks of genus-0 curves*, University of Leiden.
- 2017 **Martin Heemskerck**, *Derived equivalence of singular varieties*, University of Leiden.
- 2017 **Sergej Monavari**, *Line bundles on twisted curves*, University of Leiden.
- 2016 **Arend de Jonge**, *Minimal desingularisations of aligned nodal curves*, University of Leiden.
- 2014 **Raymond van Bommel**, *Almost all hyperelliptic jacobians have a bad semi-abelian prime*, University of Leiden.
- 2014 **Erik Visse**, *Local computations on the Cassels-Tate pairing on an elliptic curve*, (with R. Newton), University of Leiden.
- 2013 **Michele Serra**, *Smooth models of curves*, University of Leiden.

Bachelor students supervised

- 2022 **Jorre The**, *Enriched categories as metric spaces*, University of Leiden.
- 2020 **David van der Vorm**, *Gonalities of metric graphs*, University of Leiden.
- 2018 **Wim Nijgh**, *Differential geometry via sheaves*, University of Leiden.
- 2015 **Floris Ruijter**, *Homotopy types of non-Hausdorff manifolds*, University of Leiden.
- 2014 **Anne Hommelberg**, *Compact non-Hausdorff manifolds*, University of Leiden.

Interns

- 2016 **Noémie Gaveau**, *Origami and constructible numbers*, ENS Rennes.

Recent courses taught

- Autumn 2023 **Commutative Algebra**, *national graduate course*, (with Marta Pieropan).
- Autumn 2023 **Wiskundige Structuren Werkgroep**.
- Spring 2023 **Topics in Algebraic Geometry**, *graduate seminar course*.
- Autumn 2022 **Commutative Algebra**, *national graduate course*, (with Marta Pieropan).
- Spring 2022 **Topics in Algebraic Geometry**, *graduate seminar course*.
- Autumn 2021 **Algebraic Curves**, *bachelor/master's course*.
- Autumn 2021 **Commutative Algebra**, *national graduate course*, (with Simon Pepin Lehalleur).
- Spring 2021 **Topics in Algebraic Geometry**, *graduate seminar course*.