

# Matthew Habermann

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## Personal Information

Citizenship Australia & UK.

## Employment

Feb 2025– Present **Senior Research Associate and EPSRC Fellow**, *Lancaster University*.

Oct 2021– Oct 2024 **Research assistant (Post-doc)**, *Quantum Universe Cluster of Excellence, the University of Hamburg*.

## Education

2017-2021 **PhD in Mathematics**, *University College London, as part of the London School of Geometry and Number Theory*.

Advisor: Yankı Lekili.

Thesis title: Homological mirror symmetry for invertible curve singularities.

Degree awarded: 28-10-2021.

2016 **Bachelor of Science in Mathematics with Honours Class I**, *University of Queensland*, Brisbane.

Thesis title: Gauge construction and the Yang–Mills heat flow over real four-manifolds.

Advisor: Huy The Nguyen.

2011-2015 **Bachelor of Science with an Extended Major in Mathematics**, *University of Queensland*, Brisbane.

Includes an exchange year studying at the Technical University of Munich.

2011-2016 **Diploma of Languages (German)**, *University of Queensland*, Brisbane.

## Research Fellowships

- EPSRC Postdoctoral fellowship, 2024 (£397,623).

## Academic honours

- Fully funded position at the London School of Geometry and Number Theory, including international fees.
- Robert T. Seeley Visiting Assistant Professorship, University of Massachusetts, Boston, 2024 (declined).

## Research interests

- Symplectic topology, algebraic geometry, representation theory, homological mirror symmetry, (quantum) singularity theory.

## Publications

- Homological Berglund-Hübsch mirror symmetry for curve singularities, Joint with Jack Smith. *J. Symplectic Geom.* Volume 18 (2020), no. 6, 1515-1574. arXiv: 1903.01351.
- Homological mirror symmetry for invertible polynomials in two variables. *Quantum Topol.*, 13 (2022), no. 2, pp. 207253. arXiv: 2003.01106.
- Homological mirror symmetry for nodal stacky curves. Accepted for publication at *Math. Res. Lett.* arXiv:2101.12178.
- A note on Homological Berglund-Hübsch-Henningson mirror symmetry for curve singularities. Accepted for publication at *Math. Proc. Camb. Phil. Soc.* (2024). arXiv: 2205.12947.

## Invited talks

Jun 2024 Homological Berglund-Hübsch-Henningson mirror symmetry for curve singularities, algebra seminar, Charles University Prague, Czech Republic.

- Jul 2023 On the symplectic cohomology of Milnor fibres of compound  $A_n$  singularities, conference on mirror symmetry and differential equations, Boğaziçi University, Istanbul, Türkiye.
- Jul 2023 On the symplectic cohomology of Milnor fibres of compound  $A_n$  singularities, special session on symplectic and contact topology and connections to physics, 29<sup>th</sup> Nordic congress of mathematicians, Aalborg, Denmark.
- Apr 2023 Homological Berglund-Hübsch-Henningson mirror symmetry for curve singularities, Symplectic geometry, gauge theory and categorification seminar, Columbia University, New York City, USA.
- Oct 2022 Homological Berglund-Hübsch-Henningson mirror symmetry for curve singularities, Geometry seminar, Uppsala university, Sweden.
- May 2022 Homological Berglund-Hübsch-Henningson mirror symmetry for curve singularities, 3CinG conference, Warwick, UK.
- Apr 2021 Homological mirror symmetry nodal stacky curves, Korean Institute of Advanced Study Geometry Seminar (virtual).
- Mar 2021 Homological mirror symmetry nodal stacky curves, UCGEN seminar (virtual).
- Feb 2021 Homological mirror symmetry nodal stacky curves, Higher structures seminar (virtual).
- Feb 2021 Homological mirror symmetry nodal stacky curves, Freemath seminar (virtual).
- Oct 2020 Homological mirror symmetry for two variable invertible polynomials, FD-Seminar, University of Bonn (virtual).
- Jul 2020 Homological mirror symmetry for invertible polynomials in two variables, Fanosearch research group, Imperial College London (virtual).
- Jan 2020 Homological mirror symmetry for invertible polynomials in two variables, Junior geometry at the University of Cambridge.

## Other talks

- Dec 2022 Homological Berglund-Hübsch-Henningson mirror symmetry for curve singularities, Workshop on Singularities and Mirror Symmetry, Glasgow, UK (Contributed talk).
- Apr 2022 An introduction to homological mirror symmetry, part II. Higher structures seminar, University of Hamburg.
- Apr 2022 An introduction to homological mirror symmetry, part I. Higher structures seminar, University of Hamburg.
- Sep 2020 Homological mirror symmetry for non-commutative deformations of weighted projective planes, Symplectic Cut (virtual).
- Jun 2020 On the immersion classes of nearby Lagrangians, Symplectic Cut (virtual).
- Mar 2020 Homological mirror symmetry for two variable invertible polynomials, Symplectic Cut (virtual).
- Feb 2020 A stability phenomenon for symplectic packing, Symplectic Cut.
- Nov 2019 Bussi's construction of the perverse sheaf of vanishing cycles, Symplectic Cut.
- Jun 2019 Applications of the log PSS map to Lagrangian embeddings and computations of symplectic cohomology, Symplectic Cut.
- May 2019 An introduction to homological mirror symmetry for invertible polynomials, KCL/UCL junior geometry seminary.
- Feb 2019 Refined disk potentials for immersed Lagrangian surfaces, Symplectic Cut.
- Nov 2018 Homotopy groups and Hopf fibrations, ICL junior geometry.
- Oct 2018 Topological Fukaya categories of punctured surfaces, Symplectic Cut.
- Jul 2018 The Fukaya-Seidel category with applications, BIG Workshop, Jersey.
- May 2018 Symplectomorphisms of  $\mathbb{CP}^2$  and  $S^2 \times S^2$ , Symplectic Cut.
- Feb 2018 Invertibles in quantum cohomology and  $\pi_1$  of symplectic automorphism groups, Symplectic Cut.
- Dec 2017 (Non)displaceability of toric fibres via symplectic reduction, Symplectic Cut.
- Aug 2016 The Heisenberg vertex algebra, University of Queensland QFT Seminar.
- Apr 2016 The reverse Poincaré inequality, University of Queensland Analysis Seminar.
- Mar 2016 Higher regularity for harmonic maps, University of Queensland Analysis Seminar.
- Mar 2016 Structure theory for  $\mathfrak{sl}_2$ , University of Queensland QFT Seminar.

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## Service

### Refereeing

Referee for *Compositio Mathematica*, *Advances in Mathematics*, *Annals of Representation Theory*, *Mathematische Annalen*, *Épjournal de Géométrie Algébrique* and *McGill Science Undergraduate Research Journal*.

### Events Organised

Mar 2023 Workshop on higher categorical methods in algebra in geometry, with Tobias Dyckerhoff, Jonte Gödicke and Angush Rush.

### Seminars Organised

Summer semester 2023 Higher structures seminar thematic programme on symplectic cohomology, with Tobias Dyckerhoff, Janko Latschev and Merlin Christ.

Sep 2019 – Symplectic cut seminar, with Yankı Lekili.  
Dec 2020

Sep 2019 – The UCL/KCL junior geometry seminar, with Daniel Platt.  
Jun 2020

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## Conference Attendance

- Jul 2023 Mirror symmetry and differential equations, Boğaziçi University, Istanbul, Türkiye.
- Jul 2023 Special session on symplectic and contact topology and connections to physics, 29<sup>th</sup> Nordic congress of mathematicians, Aalborg, Denmark.
- Sep 2022 Periods in mirror symmetry, Edinburgh, UK.
- Jul 2022 Convexity in contact and symplectic topology, Institute Henri Poincaré, Paris, France.
- May 2022 3CinG conference, Warwick, UK.
- Mar 2022 Recent developments in Lagrangian Floer Theory, Simons Center for Geometry and Physics, Stony Brook, USA.
- Sep 2021 Conference in honour of Sir Michael Atiyah, Isaac Newton Institute, Cambridge.
- Aug 2019 International conference on symplectic topology, IMPA, Rio de Janeiro.
- Mar 2019 Categorical Symplectic Topology, University of Cambridge.

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## Workshop Attendance

- Aug 2023 Workshop on Symplectic Field Theory X, Humboldt Universität zu Berlin.
- Dec 2022 Workshop on Singularities and Mirror Symmetry, Glasgow, UK.
- Aug 2019 School of symplectic topology, IMPA, Rio de Janeiro.
- Jul 2018 British Isles Geometry Conference, Jersey.
- Nov 2016 W-Algebras, University of Melbourne.
- Jan 2016 Calculus of Variations, RMIT University Melbourne.

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## Teaching Experience

- 2022-2024 **Replacement teacher (sporadic)**, *University of Hamburg*.
  - Lecturer, Master's course on algebraic topology, two lectures of 1.5 hours each, 2022,
  - Tutor, Linear algebra and analytic geometry II, one tutorial of 1.5 hours (in German), 2023.
- 2018-2021 **Tutor**, *King's College London*.
  - Algebraic Geometry, 2021
  - Galois Theory, 2021
  - Topology, 2019
  - Linear Algebra and Geometry I, 2019
  - Algebraic Curves, 2018, 2019
  - Linear Algebra and Geometry II, 2019
- 2019 **Summer School Tutor**, *London School of Economics*.
  - ME306: Real Analysis

2017 **Tutor**, *University of Melbourne*.

- MAST10006: Calculus II,
- MAST20029: Engineering Mathematics.

2013-2016 **Tutor**, *University of Queensland*.

- MATH1050: Mathematical Foundations
- MATH1051: Calculus and Linear Algebra I,
- MATH1052: Multivariate Calculus and Ordinary Differential Equations,
- MATH2400: Mathematics Analysis,
- MATH3405: Differential Geometry,
- MATH3403: Partial Differential Equations,
- STAT2201: Analysis of Engineering and Scientific Data (super tutor).

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## Spoken Languages

English **Native.**

German **Fluent (full professional capacity).**

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## Programming Languages

- LaTeX, Python, Mathematica, Singular, Sagemath, C++