

# NICHOLAS WILLIAMS

<https://nchlswllms.github.io> ♦ [nw480@cam.ac.uk](mailto:nw480@cam.ac.uk)

## PERSONAL INFORMATION

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Full name: Nicholas James Williams  
Date of birth: 11<sup>th</sup> July 1994  
Place of birth: London, UK  
Citizenship: UK

## EDUCATION

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<b>Doctorate in Mathematics</b>	<i>September 2018 – April 2022</i>
University of Cologne	<i>April 2021 – April 2022</i>
Started at University of Leicester	<i>September 2018 – April 2021</i>
Supervisor: Sibylle Schroll	
<i>Summa cum laude</i>	

<b>Graduate Diploma in Quantitative Economics</b>	<i>October 2017 – June 2018</i>
Birkbeck, University of London	
Distinction	

<b>MMathPhil in Mathematics &amp; Philosophy</b>	<i>October 2012 – June 2016</i>
Worcester College, Oxford	
Double First Class Honours	

## EMPLOYMENT

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<b>Research Associate</b>	<i>October 2024 – September 2026</i>
University of Cambridge	
With Ailsa Keating	

<b>Postdoctoral Research Associate</b>	<i>September 2022 – September 2024</i>
Lancaster University	
With David Pauksztello	

<b>JSPS Short Term Postdoctoral Research Fellow</b>	<i>May 2022 – August 2022</i>
University of Tokyo	
With Osamu Iyama	

<b>Graduate Teaching Assistant</b>	<i>September 2021 – December 2021</i>
King's College London	

<b>Guest Teacher</b>	<i>September 2021 – December 2021</i>
London School of Economics	

<b>Feedback Session Leader</b>	<i>January 2019 – December 2020</i>
University of Leicester	

## JOURNAL PUBLICATIONS

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|--|------------------|
| 10. A geometric perspective on the $\tau$ -cluster morphism category<br>With Sibylle Schroll, Aran Tattar, and Hipolito Treffinger<br><i>Mathematische Zeitschrift</i> | <i>To appear</i> |
| 9. The two higher Stasheff–Tamari orders are equal<br><i>Journal of the European Mathematical Society</i>  | <i>To appear</i> |

8. Steenrod operations via higher Bruhat orders  
 With Guillaume Laplante-Anfossi  
*Proceedings of the London Mathematical Society*, Volume 130, no. 2, e70024

2025
7. A survey of congruences and quotients of partially ordered sets  
*EMS Surveys in Mathematical Sciences*, Volume 11, no. 1, pp. 153–203

2024
6. Triangulations of prisms and preprojective algebras of type  $A$   
 With Osamu Iyama  
*International Mathematics Research Notices*, rnae059

2024
5. Stability spaces of string and band modules  
 With Sibylle Schroll, Aran Tattar, Hipolito Treffinger, and Yadira Valdivieso  
*Journal of Pure and Applied Algebra*, Volume 228, no. 4, 107503

2024
4. Quiver combinatorics and triangulations of cyclic polytopes  
*Algebraic Combinatorics*, Volume 6, no. 3, pp. 639–60

2023
3. The first higher Stasheff–Tamari orders are quotients of the higher Bruhat orders  
*Electronic Journal of Combinatorics*, Volume 30, no. 1, P1.29

2023
2. New interpretations of the higher Stasheff–Tamari orders  
*Advances in Mathematics*, Volume 407, 108552

2022
1. The combinatorics of tensor products of higher Auslander algebras of type  $A$   
 With Jordan McMahon  
*Glasgow Mathematical Journal*, 63(3), pp. 526–546

2021

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## PEER-REVIEWED CONFERENCE PROCEEDINGS

4. From higher Bruhat orders to Steenrod cup- $i$  coproducts  
 With Guillaume Laplante-Anfossi  
*Proceedings of the 36th International Conference on Formal Power Series and Algebraic Combinatorics, Séminaire Lotharingien de Combinatoire* 91B, Art. 10

2024
3. The higher Stasheff–Tamari orders in representation theory  
*Representations of Algebras and Related Structures*

2023
2. Studying triangulations of even-dimensional cyclic polytopes via directed graphs  
*Proceedings of the 35th International Conference on Formal Power Series and Algebraic Combinatorics, Séminaire Lotharingien de Combinatoire* 89B, Art. 4

2023
1. The first higher Stasheff–Tamari orders are quotients of the higher Bruhat orders  
*Proceedings of the 33rd International Conference on Formal Power Series and Algebraic Combinatorics, Séminaire Lotharingien de Combinatoire* 85B, Art. 6

2021

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## OTHER CONFERENCE PROCEEDINGS

2. Donaldson–Thomas invariants for the Bridgeland–Smith correspondence  
*Cluster Algebras and Its Applications*  
*Oberwolfach Reports*, No. 2/2024

2024
1. Triangulations of cyclic polytopes and the higher Auslander algebras of type  $A$   
*Various issues on representation theory and related topics*  
*RIMS Kōkyūroku*, No. 2234

2022

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## OTHER PUBLICATIONS

2. Microthesis: Triangulations of cyclic polytopes in representation theory  
*London Mathematical Society Newsletter*, No. 501, 33–34

2022
1. Higher-dimensional combinatorics in representation theory  
 Doctoral thesis, University of Cologne

2022

## PREPRINTS

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4. Oriented matroids and type  $\mathbb{A}$  cluster categories 2025  
arXiv:2509.07883
3. Preorders on maximal chains: 2025  
hyperplane arrangements, Cambrian lattices, and maximal green sequences  
With Mikhail Gorsky  
arXiv:2506.08858
2. Donaldson–Thomas invariants for the Bridgeland–Smith correspondence 2024  
With Omar Kidwai  
arXiv:2401.10093
1. A structural view of maximal green sequences 2023  
With Mikhail Gorsky  
arXiv:2301.08681

## PRIZES AND SCHOLARSHIPS

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- Gibbs prize for Mathematics & Philosophy** 2016  
University of Oxford  
For top performance in Mathematics papers
- Gibbs prize for Mathematics & Philosophy** 2015  
University of Oxford  
For top performance in Mathematics papers
- Academic scholarship** 2013  
Worcester College, Oxford

## INVITED CONFERENCE TALKS (IN PERSON)

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- Donaldson–Thomas invariants for the Bridgeland–Smith correspondence** May 2024  
*Algebraic Geometry Days in Glasgow*  
University of Glasgow
- Triangulations of cyclic polytopes through the lens of reconfiguration** August 2023  
*Minisymposium on Combinatorial Reconfiguration*  
*International Congress on Industrial and Applied Mathematics*  
Waseda University, Tokyo
- A structural view of maximal green sequences** June 2023  
*Cluster structures in the North*  
University of Central Lancashire
- A structural approach to maximal green sequences** September 2022  
*Silting theory, algebras and representations*  
Charles University, Prague

## INVITED CONFERENCE TALKS (VIRTUAL)

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- An algebraic interpretation of the higher Stasheff–Tamari orders** November 2020  
*International Conference on Representations of Algebras*  
Selected to give talk by scientific committee based on research snapshot

## CONTRIBUTED CONFERENCE TALKS (IN PERSON)

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**Donaldson–Thomas invariants for the Bridgeland–Smith correspondence** *August 2024*  
*International Conference on Representations of Algebras*  
Shanghai Jiao Tong University

**Donaldson–Thomas invariants for the Bridgeland–Smith correspondence** *February 2024*  
*Clusters and their Applications in the North*  
University of Glasgow

**Donaldson–Thomas invariants for the Bridgeland–Smith correspondence** *January 2024*  
*Cluster Algebras and Its Applications*  
Mathematisches Forschungsinstitut Oberwolfach

**Triangulations of prisms and preprojective algebras of type  $A$**  *July 2023*  
*Combinatorial representation theory in Leeds*  
University of Leeds

**A structural view of maximal green sequences** *April 2023*  
*Maurice Auslander Distinguished Lectures and International Conference*  
Woods Hole, Massachusetts

**Cyclic polytopes and representation theory** *December 2022*  
*Representation theory of algebras session*  
Canadian Mathematical Society Winter Meeting, Toronto

**Algebraic interpretation of the higher Stasheff–Tamari orders** *July 2022*  
*Various issues on representation theory and related topics*  
Research Institute for Mathematical Sciences, Kyoto University

**Higher analogues of Grassmannian clusters** *April 2019*  
*Maurice Auslander Distinguished Lectures and International Conference*  
Woods Hole, Massachusetts

**Higher analogues of Grassmannian clusters** *April 2019*  
*New Connections and Directions in Representation Theory*  
University of Leeds

**Higher analogues of Grassmannian clusters** *April 2019*  
*Tropical Geometry meets Representation Theory*  
University of Leicester

## CONTRIBUTED CONFERENCE TALKS (VIRTUAL)

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**The first higher Stasheff–Tamari orders are quotients of the higher Bruhat orders** *January 2022*  
*Formal Power Series and Algebraic Combinatorics*  
Bar-Ilan University

## SEMINAR TALKS (IN PERSON)

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**Mutation des carquois et groupes de tresses** *December 2025*  
Séminaire de géométrie, représentations, algèbre, analyse, logique  
Université de Caen Normandie

**Steenrod operations via higher Bruhat orders** *December 2024*  
Algebra, Number Theory, Logic and Representation theory seminar  
University of East Anglia

- Donaldson–Thomas invariants for the Bridgeland–Smith correspondence** *October 2024*  
 Algebraic Geometry Seminar  
 University of Cambridge
- Donaldson–Thomas invariants for the Bridgeland–Smith correspondence** *June 2024*  
 Geometric, Algebraic, and Physical structures around the moduli of Meromorphic  
 Quadratic Differentials  
 Simons Center for Geometry and Physics  
 Stony Brook University
- Donaldson–Thomas invariants for the Bridgeland–Smith correspondence** *April 2024*  
 Leeds Algebra Seminar  
 University of Leeds
- Donaldson–Thomas invariants for the Bridgeland–Smith correspondence** *April 2024*  
 Algebra and Number Theory Seminar  
 University of Vienna
- Donaldson–Thomas invariants for the Bridgeland–Smith correspondence** *March 2024*  
 Paris Algebra Seminar  
 Institut de Mathématiques de Jussieu-Paris Rive Gauche
- Donaldson–Thomas invariants for the Bridgeland–Smith correspondence** *October 2023*  
 Sheffield Geometry and Physics seminar  
 University of Sheffield
- Donaldson–Thomas invariants for the Bridgeland–Smith correspondence** *October 2023*  
 EGRET seminar  
 University of Edinburgh
- Donaldson–Thomas theory of quivers with potential** *September 2023*  
 Exact Asymptotics Theoretical Sciences Visiting Program  
 Okinawa Institute of Science and Technology
- Higher-dimensional cluster combinatorics and representation theory** *August 2023*  
 OIST Representation Theory Seminar  
 Okinawa Institute of Science and Technology
- Combinatorics of KP solitons** *August 2023*  
 Exact Asymptotics Theoretical Sciences Visiting Program  
 Okinawa Institute of Science and Technology
- A structural view of maximal green sequences** *February 2023*  
 Algebra Group Seminar  
 University of Cologne
- The higher Stasheff–Tamari orders on triangulations of cyclic polytopes** *November 2022*  
 Séminaire du LaCIM  
 Université du Québec à Montréal
- Cyclic polytopes and representation theory** *November 2022*  
 Geometry and Mathematical Physics Seminar  
 University of Birmingham
- Cyclic polytopes and representation theory** *October 2022*  
 Pure Mathematics Seminar  
 Lancaster University

**Mutation in higher cluster categories***October 2022*

Seminar@Aarhus

Aarhus University

**Equivalence of maximal green sequences***April 2022*

Working Seminar in Algebra and Geometry

University of Cologne

**Equivalence of maximal green sequences***February 2022*

Paris Algebra Seminar

Institut de Mathématiques de Jussieu-Paris Rive Gauche

**An algebraic interpretation of the higher Stasheff–Tamari orders***November 2019*

Pure Mathematics Seminar

University of East Anglia

**Higher analogues of Grassmannian clusters***April 2019*

Algebra and Number Theory Seminar

University of Graz

**SEMINAR TALKS (VIRTUAL)**

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**Oriented matroids and maximal green sequences  
of type A cluster algebras***October 2025*

Combinatorics and Representation Theory seminar

Korea Institute for Advanced Study

**Steenrod operations via higher Bruhat orders***May 2025*

Longitudinal Algebra &amp; Geometry Open Online Seminar (LAGOON)

**Oriented matroids from cluster-tilting objects in type A cluster categories***March 2025*

New Directions in Group Theory &amp; Triangulated Categories

**Donaldson–Thomas invariants for the barbell quiver with potential***June 2024*

Cologne algebra seminar

University of Cologne

**Mutating cluster-tilting objects in  $(d + 2)$ -angulated cluster categories***June 2022*

FD seminar

**An algebraic interpretation of the higher Stasheff–Tamari orders***January 2022*

Aachen–Bochum–Cologne Darstellungstheorie Seminar

RWTH Aachen University, Ruhr-University Bochum, and University of Cologne

**Cyclic polytopes and higher Auslander–Reiten theory***December 2021*

Tokyo–Nagoya algebra seminar

University of Tokyo and Nagoya University

**The two higher Stasheff–Tamari orders are equal***May 2021*

Working seminar in algebra and geometry

University of Cologne

**The higher Stasheff–Tamari orders in representation theory***April 2021*

Paris algebra seminar

Institut de Mathématiques de Jussieu-Paris Rive Gauche

**New interpretations of the higher Stasheff–Tamari orders***March 2021*

Diskrete Mathematik / Geometrie Forschungsseminar

TU Berlin

## LECTURE SERIES (IN PERSON)

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**Introduction to Donaldson–Thomas theory  
for quivers with potential**  
Lancaster University  
12 lectures

*October 2023 – February 2024*

## LECTURE SERIES (VIRTUAL)

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**Cyclic polytopes and higher Auslander–Reiten theory**  
Tokyo–Nagoya algebra seminar  
University of Tokyo and Nagoya University  
3 lectures

*June – July 2022*

## POSTERS

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**From higher Bruhat orders to Steenrod cup- $i$  coproducts**  
*Formal Power Series and Algebraic Combinatorics*  
Ruhr-Universität Bochum

*July 2024*

**Studying triangulations of even-dimensional cyclic polytopes  
via directed graphs**  
*Formal Power Series and Algebraic Combinatorics*  
University of California, Davis

*July 2023*

**An algebraic interpretation of the higher Stasheff–Tamari orders**  
*Young Researchers in Mathematics*  
Online  
Winner of 1<sup>st</sup> prize in poster competition

*June 2021*

**An algebraic interpretation of the higher Stasheff–Tamari orders**  
*Advances in Representation Theory of Algebras*  
Online

*May 2021*

**New interpretations of the higher Stasheff–Tamari orders**  
*Combinatorial algebra meets algebraic combinatorics*  
Université du Québec à Montréal  
Online

*January 2021*

**An algebraic interpretation of the higher Stasheff–Tamari orders**  
*International Conference on Representations of Algebras*  
“Research snapshot”  
Online

*November 2020*

**New interpretations of the higher Stasheff–Tamari orders**  
*Virtual Heidelberg Laureate Forum*  
Online

*September 2020*

**Representation theory and Grassmannians**  
*STEM for Britain*  
Poster competition at UK Parliament

*March 2019*

## GRANTS AND AWARDS

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London Mathematical Society Scheme 1 Conference grants <i>Silting, simple-minded, and stability</i> Co-organised with Raquel Coelho Simões and David Pauksztello GBP 4,000	<i>October 2023</i>
Japan Society for the Promotion of Science Short Term Postdoctoral Research Fellowship JPY 5,384,000 12 months awarded but 3 months taken	<i>December 2021</i>
London Mathematical Society Scheme 8 Postgraduate research conference grants <i>Categorifications in Representation Theory</i> Co-organised with Aran Tattar GBP 2,500	<i>April 2020</i>

## ORGANISATION

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<i>Simple-mindedness, silting, and stability</i> Co-organising with Raquel Coelho Simões and David Pauksztello Ambleside Campus, University of Cumbria	<i>July 2024</i>
<i>Köln Algebra and Representation Theory seminar</i> Co-organised with Daniel Schaefer University of Cologne Online	<i>April 2021 – May 2022</i>
<i>Categorifications in Representation Theory</i> Co-organised with Aran Tattar Online	<i>September 2020</i>
<i>Mathematics PhD seminar</i> University of Leicester	<i>September 2019 – August 2020</i>
<i>Interactions between Representation Theory and Homological Mirror Symmetry</i> Local organising committee University of Leicester	<i>May 2019</i>

## RESEARCH STAYS

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Université de Caen Normandie Visiting: Matthew Pressland 1 week	<i>December 2025</i>
Simons Center for Geometry and Physics Stony Brook University <i>Geometric, Algebraic, and Physical structures around the moduli of Meromorphic Quadratic Differentials</i> Invited participant 2 weeks	<i>June 2024</i>
University of Copenhagen Visiting: Guillaume Laplante-Anfossi Host: Nathalie Wahl 1 week	<i>January 2024</i>

Okinawa Institute of Science and Technology  
*Exact Asymptotics: From Fluid Dynamics to Quantum Geometry*  
Theoretical Sciences Visiting Program  
Invited participant  
2 months

*August – October 2023*

Université du Québec à Montréal  
Visiting: Hugh Thomas  
2 weeks

*November 2022*

University of Aarhus  
Visiting: Raphael Bennett-Tennenhaus and Amit Shah  
1 week

*October 2022*

University of Cologne  
Visiting: Sibylle Schroll and Aran Tattar  
1 week

*April 2021*

Isaac Newton Institute for Mathematical Sciences  
University of Cambridge  
*Cluster algebras and representation theory*  
Invited participant  
1 week

*December 2021*

University of Graz  
Visiting: Jordan McMahon  
Host: Karin Baur  
1 week

*April 2019*

## REFEREEING

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Algebraic Geometry and Physics, Annals of Representation Theory, Communications in Algebra, Compositio Mathematica, Discrete Mathematics (x2), Electronic Journal of Combinatorics, Electronic Research Archive, Indagationes Mathematicae, Journal of Algebra, Journal of Algebraic Combinatorics, Selecta Mathematica

JSPS Short Term Pre/Postdoctoral Fellowships (x7)

Quick opinions: Inventiones Mathematicae, Proceedings of the Edinburgh Mathematical Society

## REVIEWING

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AMS MathSciNet  
13 reviews written

*October 2022 – present*

zbMATH  
15 reviews written

*September 2020 – present*

## TEACHING

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**Part III Commutative Algebra**  
Lecturer for 24-lecture course taken by ~50 students  
Other duties: teaching problem sheet classes and setting examination  
University of Cambridge

*October 2025 – July 2026*

**Part IB Groups, Rings, and Modules**  
Lecture cover: 1 lecture  
University of Cambridge

*February 2025*

**Part II Algebraic Geometry***January 2025 – March 2025*

Supervisor

University of Cambridge

**Real analysis***September 2021 – December 2021*

Class teacher (online)

King's College London

**MA107: Quantitative methods***September 2021 – December 2021*

Class teacher

London School of Economics

**Calculus & analysis***October 2020 – December 2020*

Class teacher (online)

University of Leicester

**Second-year algebra***January 2020 – April 2020*

Class teacher

University of Leicester

**Calculus & analysis***October 2019 – April 2020*

Class teacher

University of Leicester

**Elements of number theory***October 2019 – December 2019*

Class teacher

University of Leicester

**Calculus & analysis***January 2019 – March 2019*

Class teacher

University of Leicester

**STUDENT SUPERVISION**

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Part III essay (Master's project)

*2025 – 2026*

University of Cambridge

Two students

Cambridge Summer Research in Mathematics

*2025*Project: *Combinatorics of KP solitons*

Students: Lilian Contius, Chris Yuzhen Yang

**COMMITTEE ROLES**

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Mathematics &amp; Philosophy Representative

*2015 – 2016*

Joint Consultative Committee with Undergraduates

University of Oxford

Undergraduate Representative

*2015 – 2016*

Joint Committee for Mathematics and Philosophy

University of Oxford

Undergraduate Representative

*2015 – 2016*

Mathematics Department Art Committee

University of Oxford

## OUTREACH

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University of Leicester Representative  
*Research in the UK afternoon*  
University of Cambridge

*November 2018, 2019, 2020*

Student Helper  
*Oxford and Cambridge Student Conferences*

*March 2013, 2014, 2015*

## MEMBERSHIPS

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**London Mathematical Society**  
Associate member  
3 reports on conferences written for the LMS newsletter

*June 2019 – present*

**Trinity College Postdoctoral Society**

*January 2025 – present*

## OTHER

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**Interviewer for undergraduate mathematics admissions**  
Two full days of interviews  
Emmanuel College, Cambridge

*December 2025*

**Programming**      Python, Sage, Maple, node.js, Haskell  
                                 Git  
                                 L<sup>A</sup>T<sub>E</sub>X

**Languages**

	(CEFR levels)
English	Native
French	B1
German	B1
Japanese	B1