

NICHOLAS WILLIAMS

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EDUCATION

Doctorate in Mathematics

University of Cologne
Started at University of Leicester
Supervisor: Sibylle Schroll
Summa cum laude

September 2018 – April 2022

April 2021 – April 2022

September 2018 – April 2021

Graduate Diploma in Quantitative Economics

Birkbeck, University of London
Distinction

October 2017 – June 2018

MMathPhil in Mathematics & Philosophy

Worcester College, Oxford
Double First Class Honours

October 2012 – June 2016

EMPLOYMENT

Research Associate

University of Cambridge
With Ailsa Keating

October 2024 – September 2026

Postdoctoral Research Associate

Lancaster University
With David Pauksztello

September 2022 – September 2024

JSPS Short Term Postdoctoral Research Fellow

University of Tokyo
With Osamu Iyama

May 2022 – August 2022

Graduate Teaching Assistant

King's College London

September 2021 – December 2021

Guest Teacher

London School of Economics

September 2021 – December 2021

Feedback Session Leader

University of Leicester

January 2019 – December 2020

JOURNAL PUBLICATIONS

9. The two higher Stasheff–Tamari orders are equal
Journal of the European Mathematical Society To appear
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 2024
With Sibylle Schroll, Aran Tattar, Hipolito Treffinger, and Yadira Valdivieso
Journal of Pure and Applied Algebra, Volume 228, no. 4, 107503
4. Quiver combinatorics and triangulations of cyclic polytopes 2023
Algebraic Combinatorics, Volume 6, no. 3, pp. 639–60
3. The first higher Stasheff–Tamari orders are quotients of the higher Bruhat orders 2023
Electronic Journal of Combinatorics, Volume 30, no. 1, P1.29
2. New interpretations of the higher Stasheff–Tamari orders 2022
Advances in Mathematics, Volume 407, 108552
1. The combinatorics of tensor products of higher Auslander algebras of type A 2021
With Jordan McMahon
Glasgow Mathematical Journal, 63(3), pp. 526–546

PEER-REVIEWED CONFERENCE PROCEEDINGS

4. From higher Bruhat orders to Steenrod cup- i coproducts 2024
With Guillaume Laplante-Anfossi
Proceedings of the 36th International Conference on Formal Power Series and Algebraic Combinatorics, Séminaire Lotharingien de Combinatoire 91B, Art. 10
3. The higher Stasheff–Tamari orders in representation theory 2023
Representations of Algebras and Related Structures
2. Studying triangulations of even-dimensional cyclic polytopes via directed graphs 2023
Proceedings of the 35th International Conference on Formal Power Series and Algebraic Combinatorics, Séminaire Lotharingien de Combinatoire 89B, Art. 4
1. The first higher Stasheff–Tamari orders are quotients of the higher Bruhat orders 2021
Proceedings of the 33rd International Conference on Formal Power Series and Algebraic Combinatorics, Séminaire Lotharingien de Combinatoire 85B, Art. 6

OTHER CONFERENCE PROCEEDINGS

2. Donaldson–Thomas invariants for the Bridgeland–Smith correspondence 2024
Cluster Algebras and Its Applications
Oberwolfach Reports, No. 2/2024
1. Triangulations of cyclic polytopes and the higher Auslander algebras of type A 2022
Various issues on representation theory and related topics
RIMS Kōkyūroku, No. 2234

OTHER PUBLICATIONS

2. Microthesis: Triangulations of cyclic polytopes in representation theory 2022
London Mathematical Society Newsletter, No. 501, 33–34
1. Higher-dimensional combinatorics in representation theory 2022
Doctoral thesis, University of Cologne

PREPRINTS

5. Oriented matroids and type \mathbb{A} cluster categories 2025
[arXiv:2509.07883](https://arxiv.org/abs/2509.07883)
4. Preorders on maximal chains:
hyperplane arrangements, Cambrian lattices, and maximal green sequences 2025
With Mikhail Gorsky
[arXiv:2506.08858](https://arxiv.org/abs/2506.08858)

3. Donaldson–Thomas invariants for the Bridgeland–Smith correspondence 2024
With Omar Kidwai
[arXiv:2401.10093](https://arxiv.org/abs/2401.10093)
2. A geometric perspective on the τ -cluster morphism category 2023
With Sibylle Schroll, Aran Tattar, and Hipolito Treffinger
[arXiv:2302.12217](https://arxiv.org/abs/2302.12217)
1. A structural view of maximal green sequences 2023
With Mikhail Gorsky
[arXiv:2301.08681](https://arxiv.org/abs/2301.08681)

PRIZES AND SCHOLARSHIPS

- 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)

- 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)

- 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)

- 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)

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)

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

SEMINAR TALKS (VIRTUAL)

Oriented matroids and maximal green sequences of type A cluster algebras Combinatorics and Representation Theory seminar Korea Institute for Advanced Study	<i>October 2025</i>
Steenrod operations via higher Bruhat orders Longitudinal Algebra & Geometry Open Online Seminar (LAGOON)	<i>May 2025</i>
Oriented matroids from cluster-tilting objects in type A cluster categories New Directions in Group Theory & Triangulated Categories	<i>March 2025</i>
Donaldson–Thomas invariants for the barbell quiver with potential Cologne algebra seminar University of Cologne	<i>June 2024</i>
Mutating cluster-tilting objects in $(d+2)$-angulated cluster categories FD seminar	<i>June 2022</i>
An algebraic interpretation of the higher Stasheff–Tamari orders Aachen–Bochum–Cologne Darstellungstheorie Seminar RWTH Aachen University, Ruhr-University Bochum, and University of Cologne	<i>January 2022</i>
Cyclic polytopes and higher Auslander–Reiten theory Tokyo–Nagoya algebra seminar University of Tokyo and Nagoya University	<i>December 2021</i>
The two higher Stasheff–Tamari orders are equal Working seminar in algebra and geometry University of Cologne	<i>May 2021</i>
The higher Stasheff–Tamari orders in representation theory Paris algebra seminar Institut de Mathématiques de Jussieu-Paris Rive Gauche	<i>April 2021</i>
New interpretations of the higher Stasheff–Tamari orders Diskrete Mathematik / Geometrie Forschungsseminar TU Berlin	<i>March 2021</i>

LECTURE SERIES (IN PERSON)

Introduction to Donaldson–Thomas theory for quivers with potential Lancaster University 12 lectures	<i>October 2023 – February 2024</i>
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LECTURE SERIES (VIRTUAL)

Cyclic polytopes and higher Auslander–Reiten theory Tokyo–Nagoya algebra seminar University of Tokyo and Nagoya University 3 lectures	<i>June – July 2022</i>
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POSTERS

From higher Bruhat orders to Steenrod cup-<i>i</i> coproducts <i>Formal Power Series and Algebraic Combinatorics</i> Ruhr-Universität Bochum	<i>July 2024</i>
Studying triangulations of even-dimensional cyclic polytopes via directed graphs <i>Formal Power Series and Algebraic Combinatorics</i> University of California, Davis	<i>July 2023</i>
An algebraic interpretation of the higher Stasheff–Tamari orders <i>Young Researchers in Mathematics</i> Online Winner of 1 st prize in poster competition	<i>June 2021</i>
An algebraic interpretation of the higher Stasheff–Tamari orders <i>Advances in Representation Theory of Algebras</i> Online	<i>May 2021</i>
New interpretations of the higher Stasheff–Tamari orders <i>Combinatorial algebra meets algebraic combinatorics</i> Université du Québec à Montréal Online	<i>January 2021</i>
An algebraic interpretation of the higher Stasheff–Tamari orders <i>International Conference on Representations of Algebras</i> “Research snapshot” Online	<i>November 2020</i>
New interpretations of the higher Stasheff–Tamari orders <i>Virtual Heidelberg Laureate Forum</i> Online	<i>September 2020</i>
Representation theory and Grassmannians <i>STEM for Britain</i> Poster competition at UK Parliament	<i>March 2019</i>

GRANTS AND AWARDS

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

Simple-mindedness, silting, and stability

July 2024

Co-organising with Raquel Coelho Simões and David Pauksztello

Ambleside Campus, University of Cumbria

Köln Algebra and Representation Theory seminar

April 2021 – May 2022

Co-organised with Daniel Schaefer

University of Cologne

Online

Categorifications in Representation Theory

September 2020

Co-organised with Aran Tattar

Online

Mathematics PhD seminar

September 2019 – August 2020

University of Leicester

*Interactions between Representation Theory
and Homological Mirror Symmetry*

May 2019

Local organising committee

University of Leicester

RESEARCH STAYS

Simons Center for Geometry and Physics

June 2024

Stony Brook University

*Geometric, Algebraic, and Physical structures around the moduli of Meromorphic
Quadratic Differentials*

Invited participant

2 weeks

University of Copenhagen

January 2024

Visiting: Guillaume Laplante-Anfossi

Host: Nathalie Wahl

1 week

Okinawa Institute of Science and Technology

August – October 2023

Exact Asymptotics: From Fluid Dynamics to Quantum Geometry

Theoretical Sciences Visiting Program

Invited participant

2 months

Université du Québec à Montréal

November 2022

Visiting: Hugh Thomas

2 weeks

University of Aarhus

October 2022

Visiting: Raphael Bennett-Tennenhaus and Amit Shah

1 week

University of Cologne

April 2021

Visiting: Sibylle Schroll and Aran Tattar

1 week

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

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

AMS MathSciNet October 2022 – present
13 reviews written

zbMATH September 2020 – present
15 reviews written

TEACHING

Part III Commutative Algebra October 2025 – July 2026
Lecturer for 24-lecture course taken by ~50 students
Other duties: teaching problem sheet classes and setting examination
University of Cambridge

Part IB Groups, Rings, and Modules February 2025
Lecture cover: 1 lecture
University of Cambridge

Part IB Groups, Rings, and Modules February 2025
Lecture cover: 1 lecture
University of Cambridge

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	<i>January 2020 – April 2020</i>
Class teacher	
University of Leicester	
Calculus & analysis	<i>October 2019 – April 2020</i>
Class teacher	
University of Leicester	
Elements of number theory	<i>October 2019 – December 2019</i>
Class teacher	
University of Leicester	
Calculus & analysis	<i>January 2019 – March 2019</i>
Class teacher	
University of Leicester	

STUDENT SUPERVISION

Cambridge Summer Research in Mathematics	<i>2025</i>
Project: <i>Combinatorics of KP solitons</i>	
Students: Lilian Contius, Chris Yuzhen Yang	

COMMITTEE ROLES

Mathematics & Philosophy Representative	<i>2015 – 2016</i>
Joint Consultative Committee with Undergraduates	
University of Oxford	
Undergraduate Representative	<i>2015 – 2016</i>
Joint Committee for Mathematics and Philosophy	
University of Oxford	
Undergraduate Representative	<i>2015 – 2016</i>
Mathematics Department Art Committee	
University of Oxford	

OUTREACH

University of Leicester Representative	<i>November 2018, 2019, 2020</i>
<i>Research in the UK afternoon</i>	
University of Cambridge	
Student Helper	<i>March 2013, 2014, 2015</i>
<i>Oxford and Cambridge Student Conferences</i>	

MEMBERSHIPS

London Mathematical Society	<i>June 2019 – present</i>
Associate member	
3 reports on conferences written for the LMS newsletter	
Trinity College Postdoctoral Society	<i>January 2025 – present</i>

OTHER

Programming	Python, Sage, Maple, node.js, Haskell Git \LaTeX
Languages	(CEFR levels)
English	Native
French	B1
German	B1
Japanese	B1