

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

Postdoctoral Research Associate

Lancaster University

With David Pauksztello

September 2022 – June 2025

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

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 8. A survey of congruences and quotients of partially ordered sets <i>EMS Surveys in Mathematical Sciences</i> | <i>To appear</i> |
| 7. The two higher Stasheff–Tamari orders are equal <i>Journal of the European Mathematical Society</i> | <i>To appear</i> |
| 6. Triangulations of prisms and preprojective algebras of type A With Osamu Iyama <i>International Mathematics Research Notices</i> , rnae059 | <i>2024</i> |
| 5. Stability spaces of string and band modules With Sibylle Schroll, Aran Tattar, Hipolito Treffinger, and Yadira Valdivieso <i>Journal of Pure and Applied Algebra</i> , Volume 228, no. 4, 107503 | <i>2024</i> |
| 4. Quiver combinatorics and triangulations of cyclic polytopes <i>Algebraic Combinatorics</i> , Volume 6, no. 3, pp. 639–60 | <i>2023</i> |
| 3. The first higher Stasheff–Tamari orders are quotients of the higher Bruhat orders <i>Electronic Journal of Combinatorics</i> , Volume 30, no. 1, P1.29 | <i>2023</i> |

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 To appear
Proceedings of the 36th International Conference on Formal Power Series and Algebraic Combinatorics
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

4. Donaldson–Thomas invariants for the Bridgeland–Smith correspondence 2024
 With Omar Kidwai
[arXiv:2401.10093](https://arxiv.org/abs/2401.10093)
3. Steenrod operations via higher Bruhat orders 2023
 With Guillaume Laplante-Anfossi
[arXiv:2309.16481](https://arxiv.org/abs/2309.16481)
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

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|--------------------------------------------------------------------------------------------------------------------------|------|
| Gibbs prize for Mathematics & Philosophy University of Oxford For top performance in Mathematics papers | 2016 |
| Gibbs prize for Mathematics & Philosophy University of Oxford For top performance in Mathematics papers | 2015 |
| Academic scholarship Worcester College, Oxford | 2013 |
| Honorary scholarship Westminster School | 2007 |

INVITED CONFERENCE TALKS (IN PERSON)

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

INVITED CONFERENCE TALKS (VIRTUAL)

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| An algebraic interpretation of the higher Stasheff–Tamari orders <i>International Conference on Representations of Algebras</i> Selected to give talk by scientific committee based on research snapshot | November 2020 |
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CONTRIBUTED CONFERENCE TALKS (IN PERSON)

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| Donaldson–Thomas invariants for the Bridgeland–Smith correspondence <i>Clusters and their Applications in the North</i> University of Glasgow | February 2024 |
| Donaldson–Thomas invariants for the Bridgeland–Smith correspondence <i>Cluster Algebras and Its Applications</i> Mathematisches Forschungsinstitut Oberwolfach | January 2024 |
| Triangulations of prisms and preprojective algebras of type A <i>Combinatorial representation theory in Leeds</i> University of Leeds | July 2023 |
| A structural view of maximal green sequences <i>Maurice Auslander Distinguished Lectures and International Conference</i> Woods Hole, Massachusetts | April 2023 |

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

December 2022

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

July 2022

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

April 2019

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

April 2019

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

April 2019

CONTRIBUTED CONFERENCE TALKS (VIRTUAL)

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

January 2022

SEMINAR TALKS (IN PERSON)

Donaldson–Thomas invariants for the Bridgeland–Smith correspondence
Leeds Algebra Seminar
University of Leeds

April 2024

Donaldson–Thomas invariants for the Bridgeland–Smith correspondence
Algebra and Number Theory Seminar
University of Vienna

April 2024

Donaldson–Thomas invariants for the Bridgeland–Smith correspondence
Paris Algebra Seminar
Institut de Mathématiques de Jussieu-Paris Rive Gauche

March 2024

Donaldson–Thomas invariants for the Bridgeland–Smith correspondence
Sheffield Geometry and Physics seminar
University of Sheffield

October 2023

Donaldson–Thomas invariants for the Bridgeland–Smith correspondence
EGRET seminar
University of Edinburgh

October 2023

Donaldson–Thomas theory of quivers with potential
Exact Asymptotics Theoretical Sciences Visiting Program
Okinawa Institute of Science and Technology

September 2023

Higher-dimensional cluster combinatorics and representation theory
OIST Representation Theory Seminar
Okinawa Institute of Science and Technology

August 2023

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)**Cyclic polytopes and higher Auslander–Reiten theory III***July 2022*

Tokyo–Nagoya algebra seminar
 University of Tokyo and Nagoya University

Cyclic polytopes and higher Auslander–Reiten theory II*June 2022*

Tokyo–Nagoya algebra seminar
 University of Tokyo and Nagoya University

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

FD seminar

Cyclic polytopes and higher Auslander–Reiten theory I*June 2022*

Tokyo–Nagoya algebra seminar
 University of Tokyo and Nagoya University

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

POSTERS

**Studying triangulations of even-dimensional cyclic polytopes
via directed graphs***July 2023**Formal Power Series and Algebraic Combinatorics*

University of California, Davis

An algebraic interpretation of the higher Stasheff–Tamari orders*June 2021**Young Researchers in Mathematics*

Online

Winner of 1st prize in poster competition**An algebraic interpretation of the higher Stasheff–Tamari orders***May 2021**Advances in Representation Theory of Algebras*

Online

New interpretations of the higher Stasheff–Tamari orders*January 2021**Combinatorial algebra meets algebraic combinatorics*

Université du Québec à Montréal

Online

An algebraic interpretation of the higher Stasheff–Tamari orders*November 2020**International Conference on Representations of Algebras*

“Research snapshot”

Online

New interpretations of the higher Stasheff–Tamari orders*September 2020**Virtual Heidelberg Laureate Forum*

Online

Representation theory and Grassmannians*March 2019**STEM for Britain*

Poster competition at UK Parliament

GRANTS AND AWARDS

London Mathematical Society Scheme 1

October 2023

Conference grants

Silting, simple-minded, and stability

Co-organised with Raquel Coelho Simões and David Pauksztello

GBP 4,000

Japan Society for the Promotion of Science
Short Term Postdoctoral Research Fellowship
JPY 5,384,000
12 months awarded but 3 months taken

December 2021

London Mathematical Society Scheme 8
Postgraduate research conference grants
Categorifications in Representation Theory
Co-organised with Aran Tattar
GBP 2,500

April 2020

ORGANISATION

Simple-mindedness, silting, and stability
Co-organising with Raquel Coelho Simões and David Pauksztello
Ambleside Campus, University of Cumbria

July 2024

Köln Algebra and Representation Theory seminar
Co-organised with Daniel Schaefer
University of Cologne
Online

April 2021 – May 2022

Categorifications in Representation Theory
Co-organised with Aran Tattar
Online

September 2020

Mathematics PhD seminar
University of Leicester

September 2019 – August 2020

**Interactions between Representation Theory
and Homological Mirror Symmetry**
Local organising committee
University of Leicester

May 2019

RESEARCH STAYS

University of Copenhagen
Visiting: Guillaume Laplante-Anfossi
Host: Nathalie Wahl
1 week

January 2024

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

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

December 2021

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

April 2019

REFEREEING

Algebraic Geometry and Physics, Communications in Algebra, Discrete Mathematics, Electronic Research Archive, Journal of Algebra, Journal of Algebraic Combinatorics

REVIEWING

AMS MathSciNet
6 reviews written

October 2022 – present

zbMATH
12 reviews written

September 2020 – present

TEACHING

Real analysis
Class teacher (online)
King's College London

September 2021 – December 2021

MA107: Quantitative methods
Class teacher
London School of Economics

September 2021 – December 2021

Calculus & analysis
Class teacher (online)
University of Leicester

October 2020 – December 2020

Second-year algebra
Class teacher
University of Leicester

January 2020 – April 2020

Calculus & analysis
Class teacher
University of Leicester

October 2019 – April 2020

Elements of number theory
Class teacher
University of Leicester

October 2019 – December 2019

Calculus & analysis
Class teacher
University of Leicester

January 2019 – March 2019

COMMITTEE ROLES

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

OUTREACH

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

OTHER

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|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| London Mathematical Society Associate member 3 reports on conferences written for the LMS newsletter | <i>June 2019 – present</i> |
| Programming | Python, Sage, Maple, node.js, Haskell Git L ^A T _E X |
| Languages | (CEFR levels) |
| | English Native |
| | French B1 |
| | German B1 |
| | Japanese B1 |