

NICHOLAS WILLIAMS

<https://nchlswllms.github.io> ♦ nw480@cam.ac.uk

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

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| 8. The two higher Stasheff–Tamari orders are equal
<i>Journal of the European Mathematical Society</i> | <i>To appear</i> |
| 7. A survey of congruences and quotients of partially ordered sets
<i>EMS Surveys in Mathematical Sciences</i> , Volume 11, no. 1, pp. 153–203 | <i>2024</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 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

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

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 <i>Maurice Auslander Distinguished Lectures and International Conference</i> Woods Hole, Massachusetts	<i>April 2023</i>
Cyclic polytopes and representation theory <i>Representation theory of algebras session</i> Canadian Mathematical Society Winter Meeting, Toronto	<i>December 2022</i>
Algebraic interpretation of the higher Stasheff–Tamari orders <i>Various issues on representation theory and related topics</i> Research Institute for Mathematical Sciences, Kyoto University	<i>July 2022</i>
Higher analogues of Grassmannian clusters <i>Maurice Auslander Distinguished Lectures and International Conference</i> Woods Hole, Massachusetts	<i>April 2019</i>
Higher analogues of Grassmannian clusters <i>New Connections and Directions in Representation Theory</i> University of Leeds	<i>April 2019</i>
Higher analogues of Grassmannian clusters <i>Tropical Geometry meets Representation Theory</i> University of Leicester	<i>April 2019</i>

CONTRIBUTED CONFERENCE TALKS (VIRTUAL)

The first higher Stasheff–Tamari orders are quotients of the higher Bruhat orders <i>Formal Power Series and Algebraic Combinatorics</i> Bar-Ilan University	<i>January 2022</i>
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SEMINAR TALKS (IN PERSON)

Donaldson–Thomas invariants for the Bridgeland–Smith correspondence Algebraic Geometry Seminar University of Cambridge	<i>October 2024</i>
Donaldson–Thomas invariants for the Bridgeland–Smith correspondence Geometric, Algebraic, and Physical structures around the moduli of Meromorphic Quadratic Differentials Simons Center for Geometry and Physics Stony Brook University	<i>June 2024</i>
Donaldson–Thomas invariants for the Bridgeland–Smith correspondence Leeds Algebra Seminar University of Leeds	<i>April 2024</i>
Donaldson–Thomas invariants for the Bridgeland–Smith correspondence Algebra and Number Theory Seminar University of Vienna	<i>April 2024</i>
Donaldson–Thomas invariants for the Bridgeland–Smith correspondence Paris Algebra Seminar Institut de Mathématiques de Jussieu-Paris Rive Gauche	<i>March 2024</i>
Donaldson–Thomas invariants for the Bridgeland–Smith correspondence Sheffield Geometry and Physics seminar University of Sheffield	<i>October 2023</i>

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)

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 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 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*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

December 2021

Short Term Postdoctoral Research Fellowship

JPY 5,384,000

12 months awarded but 3 months taken

London Mathematical Society Scheme 8

April 2020

Postgraduate research conference grants

Categorifications in Representation Theory

Co-organised with Aran Tattar

GBP 2,500

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**May 2019**and Homological Mirror Symmetry*

Local organising committee

University of Leicester

RESEARCH STAYS

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 <i>Exact Asymptotics: From Fluid Dynamics to Quantum Geometry</i> Theoretical Sciences Visiting Program Invited participant 2 months	<i>August – October 2023</i>
Université du Québec à Montréal Visiting: Hugh Thomas 2 weeks	<i>November 2022</i>
University of Aarhus Visiting: Raphael Bennett-Tennenhaus and Amit Shah 1 week	<i>October 2022</i>
University of Cologne Visiting: Sibylle Schroll and Aran Tattar 1 week	<i>April 2021</i>
Isaac Newton Institute for Mathematical Sciences University of Cambridge <i>Cluster algebras and representation theory</i> Invited participant 1 week	<i>December 2021</i>
University of Graz Visiting: Jordan McMahon Host: Karin Baur 1 week	<i>April 2019</i>

REFEREEING

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

JSPS Short Term Pre/Postdoctoral Fellowships

REVIEWING

AMS MathSciNet 8 reviews written	<i>October 2022 – present</i>
zbMATH 14 reviews written	<i>September 2020 – present</i>

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

Mathematics & Philosophy Representative
Joint Consultative Committee with Undergraduates
University of Oxford

2015 – 2016

Undergraduate Representative
Joint Committee for Mathematics and Philosophy
University of Oxford

2015 – 2016

Undergraduate Representative
Mathematics Department Art Committee
University of Oxford

2015 – 2016

OUTREACH

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

OTHER

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

June 2019 – present

Programming	Python, Sage, Maple, node.js, Haskell Git L ^A T _E X
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Languages	(CEFR levels)
English	Native
French	B1
German	B1
Japanese	B1