

# NICHOLAS WILLIAMS

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## EDUCATION

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### Doctorate in Mathematics

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

*September 2018 – May 2022*

*April 2021 – May 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

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### Postdoctoral Research Associate

Lancaster University  
With David Pauksztello

*September 2022 – August 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

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

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

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

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

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## PREPRINTS

4. Donaldson–Thomas invariants for the Bridgeland–Smith correspondence  
 With Omar Kidwai  
 arXiv:2401.10093

2024
3. Steenrod operations via higher Bruhat orders  
 With Guillaume Laplante-Anfossi  
 arXiv:2309.16481

2023
2. A geometric perspective on the  $\tau$ -cluster morphism category  
 With Sibylle Schroll, Aran Tattar, and Hipolito Treffinger  
 arXiv:2302.12217

2023
1. A structural view of maximal green sequences  
 With Mikhail Gorsky  
 arXiv:2301.08681

2023

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## PRIZES AND SCHOLARSHIPS

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| <b>Gibbs prize for Mathematics &amp; Philosophy</b><br>University of Oxford<br>For top performance in Mathematics papers | 2016 |
| <b>Gibbs prize for Mathematics &amp; Philosophy</b><br>University of Oxford<br>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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**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** *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*

**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*

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

## 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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**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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**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**

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

University of California, Davis

<b>An algebraic interpretation of the higher Stasheff–Tamari orders</b> <i>Young Researchers in Mathematics</i> Online Winner of 1 <sup>st</sup> prize in poster competition	<i>June 2021</i>
<b>An algebraic interpretation of the higher Stasheff–Tamari orders</b> <i>Advances in Representation Theory of Algebras</i> Online	<i>May 2021</i>
<b>New interpretations of the higher Stasheff–Tamari orders</b> <i>Combinatorial algebra meets algebraic combinatorics</i> Université du Québec à Montréal Online	<i>January 2021</i>
<b>An algebraic interpretation of the higher Stasheff–Tamari orders</b> <i>International Conference on Representations of Algebras</i> “Research snapshot” Online	<i>November 2020</i>
<b>New interpretations of the higher Stasheff–Tamari orders</b> <i>Virtual Heidelberg Laureate Forum</i> Online	<i>September 2020</i>
<b>Representation theory and Grassmannians</b> <i>STEM for Britain</i> Poster competition at UK Parliament	<i>March 2019</i>

## 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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<b>Silting, simple-mindedness, and stability</b> Co-organising with Raquel Coelho Simões and David Pauksztello Ambleside Campus, University of Cumbria	<i>July 2024</i>
<b>Köln Algebra and Representation Theory seminar</b> Co-organised with Daniel Schaefer University of Cologne Online	<i>April 2021 – May 2022</i>

**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**

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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

University of Cambridge

*December 2021*

Isaac Newton Institute for Mathematical Sciences

Cluster algebras and representation theory programme

Invited participant

1 week

University of Graz

*April 2019*

Visiting: Jordan McMahon

Host: Karin Baur

1 week

**REFEREEING**

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

**REVIEWING**

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AMS MathSciNet

*October 2022 – present*

6 reviews written

zbMATH

*September 2020 – present*

12 reviews written

## TEACHING

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### **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

*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

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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*

## OTHER

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

*June 2019 – present*



<b>Programming</b>	Python, Sage, Maple, node.js, Haskell Git L <sup>A</sup> T <sub>E</sub> X
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<b>Languages</b>	(CEFR levels)
English	Native
French	B1
German	B1
Japanese	B1