

# 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 – March 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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|---|------------------|
| 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<br><i>Advances in Mathematics</i> , Volume 407, 108552  | <i>2022</i>      |

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

## CONFERENCE PROCEEDINGS

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4. The higher Stasheff–Tamari orders in representation theory To appear  
*Proceedings of the 2020 International Conference on Representations of Algebras*
3. 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
2. 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*
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 PUBLICATIONS

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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

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3. A geometric perspective on the  $\tau$ -cluster morphism category 2023  
 With Sibylle Schroll, Aran Tattar, and Hipolito Treffinger  
[arXiv:2302.12217](https://arxiv.org/abs/2302.12217)
2. A structural view of maximal green sequences 2023  
 With Mikhail Gorsky  
[arXiv:2301.08681](https://arxiv.org/abs/2301.08681)
1. Triangulations of prisms and preprojective algebras of type  $A$  2022  
 With Osamu Iyama  
[arXiv:2208.12957](https://arxiv.org/abs/2208.12957)

## 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 |
| <b>Academic scholarship</b><br>Worcester College, Oxford   | 2013 |
| <b>Honorary scholarship</b><br>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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- 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
- 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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### **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

<b>An algebraic interpretation of the higher Stasheff–Tamari orders</b> Aachen–Bochum–Cologne Darstellungstheorie Seminar RWTH Aachen University, Ruhr-University Bochum, and University of Cologne	<i>January 2022</i>
<b>Cyclic polytopes and higher Auslander–Reiten theory</b> Tokyo–Nagoya algebra seminar University of Tokyo and Nagoya University	<i>December 2021</i>
<b>The two higher Stasheff–Tamari orders are equal</b> Working seminar in algebra and geometry University of Cologne	<i>May 2021</i>
<b>The higher Stasheff–Tamari orders in representation theory</b> Paris algebra seminar Institut de Mathématiques de Jussieu-Paris Rive Gauche	<i>April 2021</i>
<b>New interpretations of the higher Stasheff–Tamari orders</b> Diskrete Mathematik / Geometrie Forschungsseminar TU Berlin	<i>March 2021</i>

## POSTERS

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<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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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> conference organised with Aran Tattar GBP 2,500	<i>April 2020</i>

## ORGANISATION

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### **Köln Algebra and Representation Theory seminar**

*April 2021 – May 2022*

Co-organised with Daniel Schaefer

University of Cologne

Online

### **Categorifications in Representation Theory conference**

*September 2020*

Co-organised with Aran Tattar

Online

### **Mathematics PhD seminar**

*September 2019 – August 2020*

University of Leicester

### **Representation theory and mirror symmetry conference**

*May 2019*

Local organising committee

University of Leicester

## RESEARCH STAYS

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Max Planck Institute for Mathematics, Bonn

*February 2023*

Visiting: Guillaume Laplante-Anfossi

1 week

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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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*

3 reviews written

zbMATH

*September 2020 – present*

10 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