# NICHOLAS WILLIAMS

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## EDUCATION

**Doctorate in Mathematics**                                     *September 2018 – May 2022*
University of Cologne                                            *April 2021 – May 2022*
Started at University of Leicester                               *September 2018 – April 2021*
Supervisor: Sibylle Schroll
*Summa cum laude*

**Graduate Diploma in Quantitative Economics**                  *October 2017 – June 2018*
Birkbeck, University of London
Distinction

**MMathPhil in Mathematics & Philosophy**                       *October 2012 – June 2016*
Worcester College, Oxford
Double First Class Honours

## EMPLOYMENT

**Postdoctoral Research Associate**                             *September 2022 – March 2025*
Lancaster University
With David Pauksztello

**JSPS Short Term Postdoctoral Research Fellow**                *May 2022 – August 2022*
University of Tokyo
With Osamu Iyama

**Graduate Teaching Assistant**                                 *September 2021 – December 2021*
King's College London

**Guest Teacher**                                               *September 2021 – December 2021*
London School of Economics

**Feedback Session Leader**                                     *January 2019 – December 2020*
University of Leicester

## JOURNAL PUBLICATIONS

7. A survey of congruences and quotients of partially ordered sets          *To appear*
   *EMS Surveys in Mathematical Sciences*

6. The two higher Stasheff–Tamari orders are equal                          *To appear*
   *Journal of the European Mathematical Society*

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

## CONFERENCE PROCEEDINGS

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

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

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

2. A structural view of maximal green sequences      *2023*
   With Mikhail Gorsky
   `arXiv:2301.08681`

1. Triangulations of prisms and preprojective algebras of type $A$      *2022*
   With Osamu Iyama
   `arXiv:2208.12957`

## 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

**Honorary scholarship**      *2007*
Westminster School

## INVITED CONFERENCE TALKS (IN PERSON)

**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)

**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)

**The first higher Stasheff–Tamari orders are quotients of**  *January 2022*
**the higher Bruhat orders**
*Formal Power Series and Algebraic Combinatorics*
Bar-Ilan University

## SEMINAR TALKS (IN PERSON)

**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)

**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

**An algebraic interpretation of the higher Stasheff–Tamari orders**  *June 2021*
*Young Researchers in Mathematics*
Online
Winner of 1$^{\text{st}}$ 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

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* conference organised with Aran Tattar
GBP 2,500

## ORGANISATION

**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

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

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

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

## REVIEWING

AMS MathSciNet       *October 2022 – present*
3 reviews written

zbMATH       *September 2020 – present*
10 reviews written

## TEACHING

**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**       *January 2020 – April 2020*
Class teacher
University of Leicester

**Calculus & analysis**       *October 2019 – April 2020*
Class teacher
University of Leicester

**Elements of number theory**       *October 2019 – December 2019*
Class teacher
University of Leicester

**Calculus & analysis**       *January 2019 – March 2019*
Class teacher
University of Leicester

## COMMITTEE ROLES

Mathematics & Philosophy Representative       *2015 – 2016*
Joint Consultative Committee with Undergraduates
University of Oxford

Undergraduate Representative       *2015 – 2016*
Joint Committee for Mathematics and Philosophy
University of Oxford

Undergraduate Representative       *2015 – 2016*
Mathematics Department Art Committee
University of Oxford

## OUTREACH

University of Leicester Representative                    *November 2018, 2019, 2020*
*Research in the UK afternoon*
University of Cambridge

Student Helper                                            *March 2013, 2014, 2015*
*Oxford and Cambridge Student Conferences*

## OTHER

London Mathematical Society                              *June 2019 – present*
Associate member
3 reports on conferences written for the LMS newsletter

**Programming**          Python, Sage, Maple, node.js, Haskell
                         Git
                         LaTeX

**Languages**

|          | (CEFR levels) |
|----------|---------------|
| English  | Native        |
| French   | B1            |
| German   | B1            |
| Japanese | B1            |