Alexis Langlois-Rémillard alexislr@tuta.com

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Professionnal address

HCM, Universität Bonn Endenicher Allee 60 53115 Bonn Germany

Alexis Langlois-Rémillard

Research interestes Algebra; representation theory; mathematical physics; diagrammatic algebras and categories; categorification; centraliser algebras; rational Cherednik algabra; combinatorics and algorythmic complexity.

Professionnal experience

2023/10-present, Hausdorff Postdoc, HCM, Universität Bonn

Mentor: Eveliina Peltola

2023/05-09, Postdoctoral reseracher, ScaDS.AI, Universität Leipzig

Mentor: Érika Roldán-Roa

Education

2019-2023, Universiteit Gent, Ph.D.

PhD in mathematics,

supervised by Hendrik De Bie, Roy Oste and Joris Van der Jeugt

2017-2019, Université de Montréal, M.Sc.

Master of Sciences in mathematics, supervised by Yvan Saint-Aubin

2014-2017, Université de Montréal, B.Sc.

Bachalor of Sciences in pure and applied mathematics

Research stays

Laboratoire mathématiques de Reims

Visit to Loïc Poulain d'Andecy 2024/09-10, Procope-Mobilität grant (2350 Eur)

Max-Planck-Institut für Mathematik in den Naturwissenschaften, Leipzig

Visits to the Stochastic Topology and its Applications group: 2023/10/16–18, 2023/06–09, 2022/08/22–29

Kyoto University, Kyoto

Visit to Julien Gaboriaud: 2023/06/01-21

Grants and Scholarships

2024–2026, FRQNT¹. Postdoctoral research scholarship

Project: Représentations et calculs diagrammatiques des algèbres liées aux dualités de Howe et de Schur–Weyl. Bonn University – 110 000 CAD

2019-2023, FRQNT. PhD research scholarship

Project: Construction des algèbres de symétrie réalisées par des opérateurs de Dunkl. Ghent University – 84 000 CAD

2019–2023, FWO² et FNRS³ initiative Excellence of Science. PhD funding

Four-year PhD funding in the project *Partners in Research on Integrable Models and Applications* – est. 130 000 EUR

2017–2019, FRQNT. Master research scholarship

Project Représentation des algèbres de Temperley–Lieb à frontière soudée – 30 000 CAD (Accepted only for 2018–2019 because of the NSERC)

2017-2018, NSERC⁴Canada Graduate Scholarships - Master

Alexander-Graham-Bell award Project: Représentation des algèbres de Temperley-Lieb à frontière soudée – 17 500 CAD

Summer 2016, NSERC. Undergraduate Student Research Awards

Supplemented by a FRQNT scholarship. Internschip: Les représentations des algèbres de Temperley–Lieb à une frontière. Yvan Saint-Aubin – 7625 CAD

Professional experience

Education

Fundings and

scholarships

Teaching and

supervision

presentation

Conference and

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- ¹Fonds de recherche du Québec Nature et Technologies
- ²Fonds Wettenschappelijke Onderzoek, Vlaanderen, Belgique
- ³Fonds National de la Recherche Scientifique, Belgique
- ⁴Natural Sciences and Engineering Research Council of Canada

seminar organisation

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Summer 2016, NSERC. Undergraduate Student Research Awards

Internschip: *Higher Mahler measure: bounds and other properties.* Matilde Lalín – 5625 CAD

Teaching and supervision

Supervision and evaluation of Master's theses

2023- Mentored Master's thesis at Université Thomas Sankara

Ferdinand Kafando 2022–23 mentor for the thesis *Algèbre des moments cinétiques* de Dunkl: base de polynomes

2021-2023 Master's thesis supervised at UGent

Stijn Dezeure 2022–2023, supervised with Srđan Lazendić, directed by Alexandra Pižurica. Title: *Moving towards practical quantum decoders for the classical-quantum channel*.

Pieter-Jan Vandaele 2021–2022 supervised with Alí Guzmán Adán and Srđan Lazendić, directed by Alexandra Pižurica. Title: *Classical coding approaches to quantum applications*.

2021-23 Jury duty at UGent

Member of 3 Master's thesis evaluation jurys.

Teaching

Teaching assistant UGent (in Dutch) 2021

Course *Wiskunde voor economie 1A* (Mathématiques pour l'économie 1A). Helped animate exercice session for 60–80 students.

Teaching assistant UdeM 2016-18

Courses Mathématiques discrètes, Analyse 1 et Mathématiques fondamentales (twice). Animation of exercice sessions for 20–60 students, helped create and correct exams.

Organisation of conferences and seminars

Conference organisation

2025 CIMPA school Théorie des représentations et applications en physique

Two-week CIMPA school at Université Thomas Sankara, Burkina Faso, in July 2025. Expected attendance 60 people, budget: 40 000 EUR. *External coordinator*.

2023 Mini-cours de l'école doctorale UGent

Mini-course on *p*-Kazhdan–Lusztig combinatorics given by Chris Bowman and Maud De Visscher for the graduate students of UGent. 10 participants, budget: 4500 EUR. https://sites.google.com/view/kleine-seminar-mini-course. *Co-organisator*.

2019 SAMARI

One-day conference on the avenues for work after graduation in mathematics at UdeM. 40 participants, budget: 4000 CAD. *Co-initiator*.

2016-2018 Seminar in Undergraduate Mathematics in Montreal

Yearly three-day conferences for the undergraduate students in mathematics of Montreal. 130 participants, budget: 10 000 CAD. *President of the organising committee in 2016–2017 and normal member in 2018.*

2018 SAPhARI

One-day conference on the avenues for work after graduation in mathematics and physics at UdeM. 80 participants, budget: 8000 CAD. *Organisator of the mathematics session*.

2017 Canadian Undergradute Mathematical Congress

Yearly one-week conference for mathematics students in Canada. 130 participants, budget: 30 000 CAD. *President of the organising committee*.

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Seminar organisation

2023- Oberseminar Mathematische Physik, UniBonn

Co-organisator of the math-phys seminar in Bonn.

2019-2023 Kleine seminar

Organisator of a graduate seminar at UGent on various subjects in algebra and representation theory Subjects covered: *Iwahori–Hecke algebras*; *DAHA*; *categorification*; *category O*; *tensor categories*; *crystal bases*; *Soergel bimodules*

2017–2018 Poster session AARMS-STUDC

Co-organisator of the student poster sessions to the meetins of the CMS in 2018, University of New-Brunswick, Frederiction and 2017, University of Waterloo, Waterloo.

2017-2018 Séminaire étudiant en mathématiques

Co-organisator of the graduate seminar in mathematics at l'UdeM.

2015-2017 Club mathématique

Co-organisator for the weekly seminar in mathematics for the students of UdeM.

Implication

Refereeing and reviewing

Referee

Referee for: Adv. Appl. Clifford Alg.

Scientific review

2020–present zbMATH Open zbMATH:langlois-remillard.alexis 2023–present MathReview MR1408521

Communauty service

2016-2019 StudC

Student committee of the Canadian Mathematical Society. French translation and edition of French articles of the publication *Notes of the margin*.

2017-2019 AECSMS

Student association of graduate students in mathematics and statistics of UdeM. President (2018-2019) and treasurer (2017-2018).

Scientific outreach activities

2021-present Chess and maths

Creation of mathematical activities around chess puzzles. Multiple talks and creation of material in French, English, Dutch and German. One example is a video game (created with Mia Müßig and Érika Roldán-Roa) *Queens and rooks domination* https://www.erikaroldan.net/queensrooksdomination

2016–2018 Institut des sciences mathématiques

Creation of an activity on tatami-perfect pavings in 2016 for the *MathFest* and cocreation of the activity *Le carréousel du géomètre* for the festival *Eureka!* 2018 at the Science centre of Montréal.

2015-2019 Student publishing

From 2015 to 2017 creation and edition of the student journal JÉMUM to present student research at UdeM and from 2018 to 2019, corrector and writer for the student journal L'Axiomatique

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Publications and preprints

Theses

2023 Thèse de doctorat, Universiteit Gent

Topics in representation theory of the Dunkl total angular momentum algebra. (Sujets en théorie des représentations de l'algèbre des moments cinétiques de Dunkl) https://alexisl-r.github.io/papers/LR_PhD_Thesis.pdf

Supervisée par Hendrik De Bie, Roy Oste et Joris Van der Jeugt. Soutenue le 24 avril 2023. Jury: Martina Balagović (Newcastle University), Kieran Calvert (University of Manchester), Bart De Bruyn (UGent), Marcelo De Martino (UGent) et Hennie De Schepper (UGent)

2019 Mémoire de maîtrise, Université de Montréal

Sur la structure cellulaire et la théorie de la représentation des algèbres de Temperley—Lieb à couture. doi:1866/22160

Supervisé par Yvan Saint-Aubin. Déposé en décembre 2018, accepté janvier 2019.

Jury: Abraham Broer (UdeM), Yvan Saint-Aubin (UdeM) et Franco Saliola (Université du Québec à Montréal)

2017 Mémoire de fin d'étude, Université de Montréal

Algèbres de Temperley-Lieb à frontière soudée Supervisé par Yvan Saint-Aubin

Published articles

- 1. H. De Bie, A. Langlois-Rémillard, R. Oste, J. Van der Jeugt. (2023) Generalised symmetries and bases for Dunkl monogenics. Rocky Mountain J. Math. 53 (2) 397–415 doi:10.1216/rmj.2023.53.397 arXiv:2203.01204
- 2. H. De Bie, A. Langlois-Rémillard, R. Oste, J. Van der Jeugt. (2022) Finite-dimensional representations of the symmetry algebra of the dihedral Dunkl–Dirac operator. J. Algebra 591, pp. 170–216. doi:10.1016/j.jalgebra.2021.09.025, arXiv:2010.03381
- 3. A. Langlois-Rémillard, Y. Saint-Aubin. (2020) The representation theory of seam algebras. SciPost Phys. 8, 019. 34p. doi:10.21468/SciPostPhys.8.2.019, arXiv:1909.03499

Proceedings

- A. Langlois-Rémillard. (2023) Deforming algebras with anti-involution via twisted associativity. In: Silvestrov, S., Malyarenko, A. (eds) Non-commutative and Non-associative Algebra and Analysis Structures SPAS 2019, Västerås 2019, Springer Proceedings in Mathematics & Statistics, vol 426. Springer Cham. pp. 591–612 doi:10.1007/978-3-031-32009-5_21, arXiv:2106.01855
- 2. A. Langlois-Rémillard. (2022) The dihedral Dunkl–Dirac symmetry algebra with negative Clifford signature. In: Dobrev V. (ed) Lie Theory and its Applications in Physics. LT-XIV 2021. Springer Proceedings in Mathematics & Statistics, vol 396. Springer, Singapore. pp. 515–521. doi:10.1007/978-981-19-4751-3_50, arXiv:2209.06599
- 3. A. Langlois-Rémillard, R. Oste. (2020) An Exceptional Symmetry Algebra for the 3D Dirac–Dunkl Operator. In: Dobrev V. (ed) Lie Theory and its Applications in Physics. LT Varna 2019. Springer Proceedings in Mathematics & Statistics, vol 335. Springer, Singapore. pp 399–405 doi:10.1007/978-981-15-7775-8_30, arXiv:2009.13904

Submitted articles and preprints

- 1. M. De Martino, A. Langlois-Rémillard, R. Oste. (2023) The double dihedral Dunkl total angular momentum algebra. 34p. arXiv:2308.16366
- A. Langlois-Rémillard, A. Morin-Duchesne. (2023) Uncoiled affine Temperley–Lieb algebras and their Wenzl–Jones projectors. 37p. arXiv:2302.12782
- 3. A. Langlois-Rémillard, C. Müßig, É. Roldán-Roa. (2022) Computational complexity of chess domination problems. 19p. arXiv:2211.05651

In preparation

- 1. A. Langlois-Rémillard, É. Raphael, É. Roldán-Roa. Fences with polyforms: a case study of gamification of mathematical research, 21 p. Contribution aux actes de la conférence Let's talk about outreach! Les Diablerets, novembre 2022. Brouillon en relecture finale (soumission attendue en mars 2024)
- 2. A. Langlois-Rémillard, M. Müßig, É. Roldán-Roa. Extremal fence problems.

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Outreach articles

- A. Langlois-Rémillard, C. Senécal. (2022) Des dames sur d'étranges échiquiers. Accromath, 17, 2. pp. 2–7 https://accromath.uqam.ca/2022/09/des-dames-sur-detranges-echiquiers/
- 2. A. Langlois-Rémillard. (2022) Huit dames et un échiquier. *Accromath*, 17, 1. pp. 8–13. https://accromath.uqam.ca/2022/02/huit-dames-et-un-echiquier/
- A. Langlois-Rémillard. (2021) Geraldine A. Coon. Femmes en maths. Billet de blogue biographique https://femmesenmaths.org/geraldine-coon/
- 4. V. Boutet, J. Godin, A. Langlois-Rémillard. (2017) Excursion typographique: La matrice des fontes. *Accromath*, 12, pp. 26–29. https://accromath.uqam.ca/2017/09/la-matrice-des-fontes/
- A. Langlois-Rémillard. (2016) Le Petit Prince et l'algèbre, Notes from the Margin, Canadian Mathematical Society, Vol XII, p.4. https://issuu.com/cms-studc/docs/marginfall2016

Poster

1. Weavings weights: double dihedral deformation, presented at the PhD Day of the Belgian Mathematical Society, Liège 2022 (based on work with M. De Martino et R. Oste)

Scientific presentations

Invited talks

- 1. May 2024 **European Quantum Algebra Lectures**, online. Quotients of the affine Temperley-Lieb algebras with a view towards generalised Deligne interpolation categories
- 2. December 2023 **Aalto Mathematical physics seminar**, Aalto University. *Uncoiled affine and periodic Temperley–Lieb algebra, their Wenzl–Jones projectors and their traces*
- 3. December 2023 **Uppsala algebra seminar**, Uppsala University *Uncoiled affine and periodic Temperley*—*Lieb algebra*, *their Wenzl*—*Jones projectors and their traces*
- 4. November 2023 **Junior algebra seminar**, University of Oxford. *Uncoiled affine and periodic Temperley–Lieb algebra and their Wenzl–Jones projectors*
- 5. June 2023 **Kyoto Graduate school in informatics seminar**, Kyoto University. *Computational complexity of domination problems on polycubes: easy as a chess puzzle*
- 6. April 2023 **Seminar on Quantum groups, Hopf algebras and monoidal categories,** UCLouvain. *Uncoiled affine Temperley–Lieb algebras and their Wenzl–Jones idempotents*
- 7. February 2023 **Glasgow algebra seminar**, University of Glasgow, Glasgow. *Representations of the Dunkl total angular momentum algebra*
- 8. January 2023 **Manchester algebra seminar**, University of Manchester, Manchester. *Representations of the Dunkl total angular momentum algebra*
- 9. October 2022 **Dartmouth combinatorics seminar**, Dartmouth College, Hanover. *Sandwich cellularity and constructing idempotents in quotients of the affine Temperley–Lieb algebras*
- 10. October 2022 **Integrable systems, exactly solvable models and algebras**, Montréal. *Representations and Wenzl–Jones elements of quotients of the affine Temperley–Lieb algebra*
- 11. May 2021 **EOS meeting**, UGent, online. Finite-dimensional representations of the 3D dihedral Dunkl–Dirac symmetry algebra
- 12. November 2018 **Seminar: representation theory of algebras**, Université de Sherbrooke. *Idempotence, cellularité et algèbres diagrammatiques*
- 13. October 2017 **Mathematical physics seminar**, UdeM. Roots of unity and the representation theory of boundary seam algebras

Mini-course

1. May 2024 **Théorie des représentations et applications en sciences physiques**, Université Thomas Sankara, Burkina Faso. Mini-cours intitulé *Dualité de Schur–Weyl et algèbres de Temperley–Lieb* (16 hours).

Workshops

- 1. October 2022 **Let's talk about outreach**, Les Diablerets. *Gamification of research* (with É. Roldán-Roa, M. Müßig et P. Voran)
- 2. June 2018 Canadian Mathematical Society Summer Meeting, Fredericton. *Atelier d'enseignement actif* (avec M.-A. B. Langlois)

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Seminars and talks

- 1. May 2024 **Oberseminar Maths-Phys**, Bonn University. *The Dunkl total angular momentum algebra and its representations*
- 2. June 2023 **QTMC**, Queen Mary University London. *Computational complexity of chess domination problems on polycubes*
- 3. April 2023 **CAAGT research seminar**, UGent. Computational complexity of chess domination problems on polycubes
- 4. March 2023 Clifford research seminar, UGent. Uncoiled affine Temperley—Lieb algebras, their Wenzl–Jones projectors and how to construct them
- 5. July 2022 **Group34**, Strasbourg. *Monogenic representations of the algebra of symmetries of the generalised Dirac operator*
- 6. May 2022 **Non-commutative algebras, representation theory and special functions**, CRM, Montréal. *On the representation theory of a symmetry algebra associated to a generalised Dirac operator*
- 7. February 2022. **Clifford research seminar**, UGent, en ligne. *Bases for Dunkl monogenics by generalised symmetries*
- 8. June 2021 Lie Theory and its applications to physics XIV, en ligne. Finite-dimensional representations of the 3D dihedral Dunkl–Dirac symmetry algebra
- 9. April 2021 **Clifford research seminar**, UGent, en ligne. *Generalizing the Deligne category, Khovanov's and Sazdanovic's approach*
- 10. December 2020 **Réunion d'hiver de la société mathématique du Canada**, Canada, en ligne. *The symmetry algebra of the Dunkl–Dirac operator: the dihedral cases*
- 11. August 2020 **Séminaire étudiant en mathématiques**, UdeM. *Cultiver un système de racines dans un champ de dérivées*
- 12. March 2020 **Clifford research seminar**, UGent. *The symmetry algebra of the 3D dihedral Dunkl–Dirac equation*
- 13. November 2019 International Conference on Stochastic Processes and Algebraic Structures, Västerås. Cellular structure of seam algebras and avenues for deformations
- 14. June 2019 **Clifford research seminar**, UGent. Representation theory and cellular structure of seam algebras
- 15. December 2018 **Séminaire étudiant en mathématique**, UdeM. *Colorier une carte, une approche par dessin*
- 16. September 2018 XXXth Meeting on representation theory of algebras, Sherbrooke. Cellular structure of boundary seam Temperley–Lieb algebras
- 17. June 2018 **Réunion d'été de la société mathématique du Canada**, Fredericton. *Bratteli and the morphisms of boundary seam algebras*
- 18. May 2018 XXI^e Colloque ISM, Sherbrooke. Bratteli et les morphismes de Temperley-Lieb
- 19. October 2017 **Séminaire étudiant en mathématiques**, UdeM. *Algèbres de Temperley-Lieb, une approche cellulaire*

Work groups

- 1. 2023 Khovanov arc algebra seminar, UBonn. 1 presentation.
- 2. 2019–2023 Kleine seminar, UGent. 8 presentations.

Outreach talks

- 1. January 2024 **Club mathématique**, UdeM. *Mon algèbre linéaire ne rentre plus dans mes (co)pantalons*, vidéo.
- 2. January 2024 **High school presentations** (10 times 60 min), Saint-Jean-sur-Richelieu, Québec, Canada. *Maths en échecs*.
- 3. October 2023 Schaakweekend Chess and Learn, Ostende, Belgium. Schaak en wiskunde.
- 4. September 2023. Bureau des questions importantes, Nyon. La complexité des labyrinthes.
- 5. June 2023 Lange Nacht der Wissenschaften, MPI-MiS Leipzig Mach dein Speil, Games, Cheatcodes und mehr: Schach und Pentominos.
- 6. November 2022 **Imaginary**, Ghent, Beligum *Wiskunde en schaak: Koninginnen en rare borden*.
- 7. September 2022 Club mathématique, UdeM La domination, une histoire d'échecs, vidéo.
- 8. November 2021 **PRIME avond**, UGent. Koninginnen en (bijzondere) borden.
- 9. September 2020 **Club mathématique**, UdeM, online. *Des pentagones aux heptagones, une infinité de différences*, vidéo.
- 10. November 2018 Club mathématique, UdeM. Huit dames pour un échiquier, vidéo.
- July 2018 Camp mathématique de l'AMQ, Dawson College, Montréal. Le carréousel du géomètre.
- 12. November 2017 **Club mathématique**, UdeM. *Excursion typographique: la matrice des fontes*, vidéo.

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Participation at workshops and courses (since 2021)

- 1. 2023-08 LMS Bath Summer school and Symposium on Geometric and Categorical Representation theory, Bath, Angleterre
- 2. 2023-06 Algebraic structures and special functions in theoretical physics. Atelier en l'honneur de Luc Vinet, Gand, Belgique
- 3. 2023-06 Representation theory of Hecke algebras and categorification, OIST, Okinawa, Japon.
- 4. 2023-02-03 Applications of Hecke and related algebras: Representations, Integrability and Physics, École de physique des Houches, France
- 5. 2021-10 Modern analysis on root systems and applications, CIRM Luminy, France

Intérêts et divers

Languages

 French Mother tongue (C2)

o English Bilingual, professional practice (C2)

 Dutch Fluent, professional practice (B2 CEFRL 2021-05) Intermediate, daily practice (B1 CEFRL 2023-06) German

Programming languages used

 Pvthon Mathematica o GAP SageMath Maple o FORM

Other prices and distinctions

 Lifeguard Commonwealth service citation for my volunteer work in between

2013-2017 at the Société de sauvetage du Québec.

4th place prize (2012-13) and finalist (2014) at the Philosopher Philosophy

 Literature Finalist short story (top 28 on 512 texts) at the Prix du jeune écrivain

de la francophonie 2021.

Personal interests

Chess, literature, epistolary art, swimming, cooking, jewelry-making and analog photography

Alexis Langlois-Rémillard, Ph.D., Bonn, June 14, 2024

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