

Alexis  
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# Alexis Langlois-Rémillard

**Research interestes** Algebra; representation theory; mathematical physics; diagrammatic algebras and categories; categorification; centraliser algebras; rational Cherednik algebra; combinatorics and algorithmic complexity.

## Professional 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.

Bachelor of Sciences in pure and applied mathematics

## Research stays

**Laboratoire mathématiques de Reims**

Visit to Loïc Poulain d’Andecy 2024/09–10, Procope-Mobilité 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, **FRQNT<sup>1</sup>**. 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, **FWO<sup>2</sup> et FNRS<sup>3</sup>** 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, **NSERC<sup>4</sup>** Canada 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. Internship: *Les représentations des algèbres de Temperley–Lieb à une frontière*. Yvan Saint-Aubin – 7625 CAD

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<sup>1</sup>Fonds de recherche du Québec – Nature et Technologies

<sup>2</sup>Fonds Wettenschappelijke Onderzoek, Vlaanderen, Belgique

<sup>3</sup>Fonds National de la Recherche Scientifique, Belgique

<sup>4</sup>Natural Sciences and Engineering Research Council of Canada

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## Summer 2016, NSERC. Undergraduate Student Research Awards

Internship: *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 polynômes*

#### 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 juries.

## Teaching

#### Teaching assistant UGent (in Dutch) 2021

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

#### Teaching assistant UdeM 2016–18

Courses Mathématiques discrètes, Analyse 1 et Mathématiques fondamentales (twice). Animation of exercise 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 Undergraduate 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  $\mathcal{O}$* ; *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, Fredericton 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](https://zbmath.org/authors/?id=langlois-remillard.alexis)

2023–present MathReview [MR1408521](https://mathreview.org/author/MR1408521)

### Communaute 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 co-creation of the activity *Le carrérousel 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](https://jémum.org) to present student research at UdeM and from 2018 to 2019, corrector and writer for the student journal [L’Axiomatique](https://laxiomatique.org)

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**Publications and preprints****Theses****2023 PhD Thesis, Universiteit Gent**

Topics in representation theory of the Dunkl total angular momentum algebra.

[https://alexisl-r.github.io/papers/LR\\_PhD\\_Thesis.pdf](https://alexisl-r.github.io/papers/LR_PhD_Thesis.pdf)

Supervised by Hendrik De Bie, Roy Oste and Joris Van der Jeugt. Defended 24th April 2023.

Jury : Martina Balagović (Newcastle University), Kieran Calvert (University of Manchester),

Bart De Bruyn (UGent), Marcelo De Martino (UGent) and Hennie De Schepper (UGent)

**2019 Master's Thesis, Université de Montréal**Sur la structure cellulaire et la théorie de la représentation des algèbres de Temperley–Lieb à couture. [doi:1866/22160](https://doi.org/10.1866/22160)

Supervised by Yvan Saint-Aubin. Submitted December 2018, accepted January 2019.

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

Québec à Montréal)

**2017 Bachelor's Thesis, Université de Montréal**

Algèbres de Temperley–Lieb à frontière soudée

Supervised by 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](https://doi.org/10.1216/rmj.2023.53.397) [arXiv:2203.01204](https://arxiv.org/abs/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](https://doi.org/10.1016/j.jalgebra.2021.09.025), [arXiv:2010.03381](https://arxiv.org/abs/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](https://doi.org/10.21468/SciPostPhys.8.2.019), [arXiv:1909.03499](https://arxiv.org/abs/1909.03499)

**Proceedings**

1. 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](https://doi.org/10.1007/978-3-031-32009-5_21), [arXiv:2106.01855](https://arxiv.org/abs/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](https://doi.org/10.1007/978-981-19-4751-3_50), [arXiv:2209.06599](https://arxiv.org/abs/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](https://doi.org/10.1007/978-981-15-7775-8_30), [arXiv:2009.13904](https://arxiv.org/abs/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](https://arxiv.org/abs/2308.16366)
2. A. Langlois-Rémillard, A. Morin-Duchesne. (2023) Uncoiled affine Temperley–Lieb algebras and their Wenzl–Jones projectors. 37p. [arXiv:2302.12782](https://arxiv.org/abs/2302.12782)
3. A. Langlois-Rémillard, C. Müßig, É. Roldán-Roa. (2022) Computational complexity of chess domination problems. 19p. [arXiv:2211.05651](https://arxiv.org/abs/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, November 2022.
2. A. Langlois-Rémillard, M. Müßig, É. Roldán-Roa. *Extremal fence problems*.

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## Outreach articles

1. 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/>
3. A. Langlois-Rémillard. (2021) Geraldine A. Coon. *Femmes en maths*. Biographical blog post <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/>
5. 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/margin-fall2016>

## 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 **QTM**, 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 mathématiques**, UdeM. *Colorier une carte, une approche par dessin*
16. September 2018 **XXX<sup>th</sup> 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<sup>e</sup> 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*, [video](#).
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 Spiel, Games, Cheatcodes und mehr: Schach und Pentominos*.
6. November 2022 **Imaginary**, Ghent, Belgium *Wiskunde en schaak: Koninginnen en rare borden*.
7. September 2022 **Club mathématique**, UdeM *La domination, une histoire d’échecs*, [video](#).
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*, [video](#).
10. November 2018 **Club mathématique**, UdeM. *Huit dames pour un échiquier*, [video](#).
11. July 2018 **Camp mathématique de l’AMQ**, Dawson College, Montréal. *Le carrérousel du géomètre*.
12. November 2017 **Club mathématique**, UdeM. *Excursion typographique : la matrice des fontes*, [video](#).

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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, England
2. 2023-06 Algebraic structures and special functions in theoretical physics. Atelier en l'honneur de Luc Vinet, Ghent, Belgium
3. 2023-06 Representation theory of Hecke algebras and categorification, OIST, Okinawa, Japan.
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

## Interests and others

### Languages

- French Mother tongue (C2)
- English Bilingual, professional practice (C2)
- Dutch Fluent, professional practice (B2 CEFRL 2021-05)
- German Intermediate, daily practice (B1 CEFRL 2023-06)

### Programming languages used

- Python
- Mathematica
- GAP
- SageMath
- Maple
- FORM

### Other prizes and distinctions

- Lifeguard Commonwealth service citation for my volunteer work in between 2013–2017 at the Société de sauvetage du Québec.
- Philosophy 4th place prize (2012–13) and finalist (2014) at the Philosopher contest, an essay competition on philosophy.
- Literature Finalist short story (top 28 of 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

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