

# Alexis Langlois-Rémillard

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## Research interests

Algebra, mathematical physics, representation theory of algebras, diagrammatic algebras, cellular algebras, Lie (super)algebras, Dunkl operators, Temperley–Lieb algebras and complexity theory.

## Education

- 2019–  
exp. **Ph. D. in Mathematics**, Universiteit Gent  
Thesis subject: *The representation theory of the total angular momentum algebra*
- 04–2023 Advisors: Profs Joris Van der Jeugt and Hendrik De Bie, and Dr Roy Oste
- 2017–  
2019 **M. Sc. in Mathematics**, Université de Montréal  
Thesis: *Sur la structure cellulaire et la théorie de la représentation des algèbres de Temperley–Lieb à couture* Advisor: Prof. Yvan Saint-Aubin
- 2014–  
2017 **B.Sc in Mathematics**, Université de Montréal  
*Excellence mention*

## Scholarships

- 2019–2023 **FRQNT<sup>1</sup>** Doctoral Research Scholarship
- 2019–2023 **FWO<sup>2</sup>** EOS PRIMA PhD scholarship
- 2017–2019 **FRQNT** Master’s award
- 2017–2018 Alexander–Graham–Bell **NSERC<sup>3</sup>** Master’s award
- Summer 2016 Undergraduate Research Awards, **NSERC** and **FRQNT**, Yvan Saint-Aubin
- Summer 2015 Undergraduate Research Award, **NSERC**, Matilde Lalín

## Academic work experience

- 2021 **Teaching Assistant** at Ghent University (in Dutch)  
*Mathematics for economics IA*  
Helped animating practical sessions for 60–80 students, invigilated exams.
- 2016–2018 **Teaching Assistant** at Université de Montréal (in French)  
*Discrete Mathematics, Analysis 1 and Fundamental Mathematics*  
Animation of exercises for 20–60 students, office hours, invigilated and corrected exams.

## Publications and preprints

List available at <https://alexisl-r.github.io/publications/>.

### Articles

- (preprint) Langlois-Rémillard, A. and Morin-Duchesne, A. (2023) Uncoiled affine Temperley–Lieb algebras and their Wenzl–Jones projectors. 37p. [arXiv:2302.12782](#)
- (preprint) Langlois-Rémillard, A., Müßig, C., and Roldán-Roa É. (2022) Computational complexity of chess domination problems. 18p. [arXiv:2211.05651](#)
- (accepted preprint) De Bie, H., Langlois-Rémillard, A., Oste, R., and Van der Jeugt, J. (2022) Generalised symmetries and bases for Dunkl monogenics. 18p. Accepted in The Rocky Mountain Journal of Mathematics [arXiv:2203.01204](#)
- De Bie, H., Langlois-Rémillard, A., Oste, R., and Van der Jeugt, J. (2022) Finite-dimensional representations of the symmetry algebra of the dihedral Dunkl–Dirac operator. Journal of Algebra 591, pp. 170–216. [arXiv:2010.03381](#), [DOI:10.1016/j.jalgebra.2021.09.025](#)
- Langlois-Rémillard, A. and Saint-Aubin, Y. (2020) The representation theory of seam algebras. SciPost Physics 8, 019. [doi:10.21468/SciPostPhys.8.2.019](#), [arXiv:1909.03499](#)

### Proceedings

- (accepted preprint) Langlois-Rémillard, A. (2020) Deforming algebras with anti-involution via twisted associativity. *Accepted as contribution for the proceedings of SPAS II, Västerås 2019*, 21p. [arXiv:2106.01855](#)

<sup>1</sup>Fonds de Recherche du Québec – Nature et Technologies (Québec Research Funds on Natural Sciences)

<sup>2</sup>Fonds Wetenschappelijk Onderzoek – Vlaanderen (The Research Foundations – Flanders)

<sup>3</sup>National Science and Engineering Research Council of Canada

2. Langlois-Rémillard, A. (2022) The dihedral Dunkl-Dirac symmetry algebra with negative Clifford signature. 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. Langlois-Rémillard, A. and Oste, R. (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)

## Talks and Workshops

Complete list available at <https://alexisl-r.github.io/talks/>.

### Invited talks:

- February 2023 **Glasgow algebra seminar**, University of Glasgow, Glasgow  
*Representations of the Dunkl total angular momentum algebra*
- January 2023 **Manchester algebra seminar**, University of Manchester, Manchester  
*Representations of the Dunkl total angular momentum algebra*
- October 2022 **Dartmouth combinatorics seminar**, Dartmouth College, Hanover.  
*Sandwich cellularity and constructing idempotents in quotients of the affine Temperley-Lieb algebras*
- October 2022 **Integrable systems, exactly solvable models and algebras**, CRM Montréal.  
*Representations and Wenzl-Jones elements of quotients of the affine Temperley-Lieb algebra*
- May 2021 **EOS meeting**, online  
*Finite-dimensional representations of the 3D dihedral Dunkl-Dirac symmetry algebra*
- November 2018 **Seminar: representation theory of algebras**, Université de Sherbrooke  
*Idempotence, cellularité et algèbres diagrammatiques*
- October 2018 **Mathematical physics seminar**, Université de Montréal  
*Roots of unity and the representation theory of boundary seam algebras*

### Workshops:

- October 2022 **Let's talk about outreach**, Les Diablerets  
*Gamification of research* (with Érika Roldán-Roa, Christoph Müßig and Peter Voran)
- June 2018 **Canadian Mathematical Society Summer Meeting**, Fredericton  
*Atelier d'enseignement actif* (with Marie-Andrée B. Langlois)

### Contributed seminar and conference talks:

- March 2023 **Clifford research seminar**, Universiteit Gent  
*Uncoiled affine Temperley-Lieb algebras, their Wenzl-Jones projectors and how to construct them*
- July 2022 **Group34**, Strasbourg  
*Monogenic representations of the algebra of symmetries of the generalised Dirac operator*
- May 2022 **Symmetries, algebras and physics** CRM, Montréal  
*On the representation theory of a symmetry algebra associated to a generalised Dirac operator*
- February 2022 **Clifford research seminar**, Universiteit Gent, Online  
*Bases for Dunkl monogenics by generalised symmetries*
- June 2021 **Lie Theory and its applications to physics XIV**, Online  
*Finite-dimensional Representations of the 3D dihedral Dunkl-Dirac symmetry algebra*
- April 2021 **Clifford research seminar**, Universiteit Gent, Online  
*Generalizing the Deligne category, Khovanov's and Szazdanovic's approach*
- December 2020 **CMS Winter meeting**, Canada, online  
*The symmetry algebra of the Dunkl-Dirac operator: the dihedral cases*
- March 2020 **Clifford research seminar**, Universiteit Gent  
*The symmetry algebra of the 3D dihedral Dunkl-Dirac equation.*
- November 2019 **SPAS**, Västerås  
*Cellular structure of seam algebras and avenues for deformations*
- June 2019 **Clifford research seminar**, Universiteit Gent  
*Representation theory and cellular structure of seam algebras*
- September 2018 **XXX<sup>th</sup> Meeting on representation theory of algebras**, Sherbrooke  
*Cellular structure of boundary seam Temperley-Lieb algebras*
- June 2018 **Canadian Mathematical Society Summer Meeting**, Fredericton  
*Bratteli and the morphisms of boundary seam algebras*

### Poster:

- May 2022 **PhD Day meeting of the BMS**, Liège  
*Weavings weights: double dihedral deformation* (with Marcelo De Martino and Roy Oste)

# Graduate students advising and evaluation

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## Current master students

2022-2023 Stijn Dezeure. **Mentor** with S. Lazendic (UGent under Prof. A. Pizurica)  
Subject: *Quantum computing with applications to image processing*

## Past master students

2021-2022 Pieter-Jan Vandaele. **Mentored** with S. Lazendic and A. Guzmán Adán (UGent under Prof. A. Pizurica)  
Thesis title: *Classical coding approaches to quantum applications*  
Spring 2021 Bert Christiaens. **Jury member** (UGent under Prof. A. Pizurica)  
Thesis title: *Network explainability via content based image retrieval*

## Outreach

More available at <https://alexisl-r.github.io/popularization/>.

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### Popularization work for a broad audience

1. Langlois-Rémillard, A., and Senécal C. (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. Langlois-Rémillard, A. (2022) Huit dames et un échiquier. *Accromath*, 17, 1. pp. 8-13. <https://accromath.uqam.ca/2022/02/huit-dames-et-un-echiquier/>
3. Langlois-Rémillard, A. (2021) Geraldine A. Coon. *Femmes en maths*. <https://femmesenmaths.org/geraldine-coon/>
4. Boutet, V., Godin, J. and Langlois-Rémillard, A. (2017) Excursion typographique : La matrice des fontes. *Accromath*, 12, pp. 26-29. <https://accromath.uqam.ca/2017/09/la-matrice-des-fontes/>
5. Langlois-Rémillard, A. (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>

### Popularization talks

November 2022 **Imaginary**, Gent  
*Wiskunde en schaak: Koninginnen en rare borden*  
September 2022 **Club mathématique**, Université de Montréal  
*La domination, une histoire d'échecs*  
November 2021 **PRIME problem-solving avond**, UGent  
*Koninginnen en (bijzondere) borden*  
September 2020 **Club mathématique**, Université de Montréal  
*Des pentagones aux heptagones, une infinité de différences*  
November 2018 **Club mathématique**, Université de Montréal  
*Huit dames pour un échiquier*  
July 2018 **Camp mathématique de l'AMQ**, Dawson College, Montréal  
*Le carrérousel du géomètre*  
November 2017 **Club mathématique**, Université de Montréal  
*Excursion typographique: la matrice des fontes*

### Outreach activities

2021– **Chess and mathematics**. I collected a set of chess-inspired mathematical problems and created activities around them, both for general audience and university mathematics students.  
2016-2018 **Institut des sciences mathématiques**. I created an activity on tatami tiling in 2016 for the *MathFest* and co-created the activity *Le carrérousel du géomètre* for the festival *Eureka!* 2018 at the Science center of Montréal.  
2018-2019 **L'Axiomatique**. *Corrector-in-chief and writer* for a mathematics student journal at Université de Montréal.  
2015-2017 **JÉMUM**. *Co-created and co-edited* a student mathematical journal to showcase summer research by undergraduate students.

## Leadership and implication

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### Conference organizer

- 2023 **UGent doctoral school Mini-course**. One-week mini-course on  $p$ -Kazhdan–Lusztig combinatorics for graduate students given by Chris Bowman and Maud De Visscher. <https://sites.google.com/view/kleine-seminar-mini-course> *Co-organizer*
- 2019 **SAMARI**. One-day conference on possibilities after graduation in mathematics. *Co-initiator and co-organizer*
- 2016–2018 **Seminars in Undergraduate Mathematics in Montréal**. Annual provincial undergraduate weekend conference. *President for 2016–2017 and member of the organizing committee in 2018*
- 2018 **SAPHARI**. One-day conference on possibilities after graduation in physics. *Organizer of the mathematics session*
- 2017 **Canadian Undergraduate Mathematics Conference** Annual national undergraduate one-week conference. *President for the Montréal 2017 edition*

### Session and seminar organizer

- 2019–present **Kleine seminar**. Organizing a postgraduate mathematical seminar at UGent on various algebraic subjects related to representation theory, [https://alexisl-r.github.io/kleine\\_seminar/](https://alexisl-r.github.io/kleine_seminar/)
- 2017–2018 **AARMS-STUDC student poster session**. Co-organizer for 2018 CMS Summer Meeting, University of New-Brunswick, Fredericton and 2017 CMS Winter Meeting, University of Waterloo, Waterloo.
- 2017–2018 **Séminaire étudiant en mathématiques**. Co-organizer for the graduate students mathematics seminar at Université de Montréal
- 2015–2017 **Club mathématique**. Co-organizer for a weekly seminar of talks aimed at undergraduate students at Université de Montréal

### Community service

- 2020–present **Reviewer** for zbMATH Open. [zbMATH:langlois-remillard.alexis](https://zbmath.org/authors/zbMATH:langlois-remillard.alexis)
- 2016–2019 **Student committee** of the Canadian Mathematical Society. *Committee member*: involved in the French translation of general activities and in the edition of French articles in the annual publication *Notes from the Margin*.
- 2017–2019 **AECSMS**: Graduate mathematics and statistic students association in Université de Montréal. *President* (2018–2019) and *Treasurer* (2017–2018).
- 2014–2019 **Students representative on the mathematics and statistic departmental assembly** at Université de Montréal: 2014–2016 for undergraduate and 2018–2019 for graduate students.

## Languages

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- Français** : Native language
- English**: Fluent
- Nederlands**: Proficient (B2 CEFRL 2021-05)
- Deutsch**: Basic

## Other Interests and Activities

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- Chess** I am a Canadian and Québécois expert and play with the KGSRL chess club.
- Swimming** I taught swimming lessons and was a lifeguard from 2011 to 2016 and a lifeguard instructor from 2013 to 2016. I received a Commonwealth service citation for my volunteer work in 2015 and 2014.
- Literature** I greatly enjoy reading, writing and discussing literary works.