

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.

Current positions

- 05/2023–09/2023 **Postdoctoral researcher**, ScaDS.IA, Universität Leipzig, Leipzig, Germany
Mentor: Érika Roldán-Roa
- 06/2023–09/2023 **Research visitor**, Max-Planck-Institut für Mathematik in den Naturwissenschaften, Leipzig, Germany, visiting Érika Roldán-Roa

Future position

- 10/2023–2025 **Hausdorff Postdoc**, Hausdorff Center for Mathematics, Bonn, Germany
Mentor: Eveliina Peltola

Education

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

Scholarships

- 2024–2026 **FRQNT¹** Postdoctoral Research Scholarship
- 2019–2023 **FRQNT** Doctoral Research Scholarship
- 2019–2023 **FWO²** EOS PRIMA PhD scholarship
- 2017–2019 **FRQNT** Master’s award
- 2017–2018 Alexander–Graham–Bell **NSERC³** Master’s award
- Summer 2016 Undergraduate Research Awards, **NSERC** and **FRQNT**, Yvan Saint-Aubin
- Summer 2015 Undergraduate Research Award, **NSERC**, Matilde Lalín

Leadership and implication

Graduate student advising and evaluation

- 2022–2023 **Stijn Dezeure**. **Mentor** with S. Lazendic (UGent under Prof. A. Pizurica)
Subject: *Quantum computing with applications to image processing*
- 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*
- 2021 **Jury member** for 1 Master’s thesis.

Teaching

- 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 (2×)Fundamental Mathematics
Animation of exercises for 20–60 students, office hours, invigilated and corrected exams.

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

²Fonds Wetenschappelijk Onderzoek – Vlaanderen (The Research Foundations – Flanders)

³National Science and Engineering Research Council of Canada

Conference organiser

- 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-organiser.*
- 2019 **SAMARI.** One-day conference on possibilities after graduation in mathematics at UdeM. *Co-initiator and co-organiser.*
- 2016–2018 **Seminars in Undergraduate Mathematics in Montréal.** Annual provincial undergraduate weekend conference. *President for 2016–2017 and member of the organising committee in 2018.*
- 2018 **SAPHARI.** One-day conference on possibilities after graduation in physics at UdeM. *Organiser 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

- 2019–2023 **Kleine seminar.** Organiser for a postgraduate seminar at UGent on various algebraic subjects related to representation theory, https://alexisl-r.github.io/kleine_seminar/
- 2017–2018 **AARMS-STUDC student poster session.** Co-organiser 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-organiser for the graduate students mathematics seminar at Université de Montréal
- 2015–2017 **Club mathématique.** Co-organiser for a weekly seminar of talks aimed at undergraduate students at Université de Montréal

Community service

- 2020– **Reviewer** for zbMATH Open. [zbMATH:langlois-remillard.alexis](https://zbmath.org/authors/?lang=eng&from=alexisl-r.github.io)
- 2016–2019 **Student committee** of the Canadian Mathematical Society. *Committee member:* involved in the French translation of 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.

Publications and preprints

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

Preprints

1. De Martino, M., Langlois-Rémillard, A., and Oste, R. (2023) The double dihedral Dunkl total angular momentum algebra. 34p. [arXiv:2308.16366](https://arxiv.org/abs/2308.16366)
2. Langlois-Rémillard, A. and Morin-Duchesne, A. (2023) Uncoiled affine Temperley-Lieb algebras and their Wenzl-Jones projectors. 37p. [arXiv:2302.12782](https://arxiv.org/abs/2302.12782)
3. Langlois-Rémillard, A., Müßig, C., and Roldán-Roa É. (2022) Computational complexity of chess domination problems. 18p. [arXiv:2211.05651](https://arxiv.org/abs/2211.05651)

Articles

1. De Bie, H., Langlois-Rémillard, A., Oste, R., and Van der Jeugt, J. (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. 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](https://arxiv.org/abs/2010.03381), [DOI:10.1016/j.jalgebra.2021.09.025](https://doi.org/10.1016/j.jalgebra.2021.09.025)
3. Langlois-Rémillard, A. and Saint-Aubin, Y. (2020) The representation theory of seam algebras. SciPost Physics 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. (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](https://arxiv.org/abs/2106.01855)
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

Since 2020: complete list available at <https://alexisl-r.github.io/talks/>.

Invited talks:

- June 2023 **Kyoto Graduate school in informatics seminar**, Kyoto University
Computational complexity of domination problems on polycubes: easy as a chess puzzle
- April 2023 **Seminar on Quantum groups, Hopf algebras and monoidal categories**, UCLouvain
Uncoiled affine and periodic Temperley-Lieb algebras and their Wenzl-Jones idempotents
- 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

Workshops:

- October 2022 **Let's talk about outreach**, Les Diablerets
Gamification of research (with Érika Roldán-Roa, Christoph Müßig and Peter Voran)

Contributed seminar and conference talks:

- June 2023 **QTM**, Queen Mary University London
Computational complexity of chess domination problems on polycubes
- April 2023 **CAAGT research seminar**, Universiteit Gent
Computational complexity of chess domination problems on polycubes
- 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 Sazdanovic'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.

Poster:

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

Outreach

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

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*. Blog post <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 and animations

- June 2023 **Lange Nacht der Wissenschaften**, MPI-MiS Leipzig
Mach dein Spiel, Games, Cheatcodes und mehr: Schach und Pentominos
- 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 *columnist* 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.

Languages

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- Français :** Native language
English: Fluent
Nederlands: Proficient (B2 CEFRL 2021-05)
Deutsch: Basic (A2 course 2023-08)

Other interests and activities

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- Chess** I am a Canadian and Québécois expert and still try to play in some tournaments.
- 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.



Alexis Langlois-Rémillard, Ph.D., Leipzig September 3, 2023