

Alexis Langlois-Rémillard

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alexisl-r.github.io

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Research interests

Algebra, mathematical physics, representation theory of algebras, diagrammatic algebras, cellular algebras, Lie (super)algebras, Dunkl operators and Temperley–Lieb algebras, 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 **FRQNT¹** 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

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

1. (preprint) 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)
2. (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 Rocky Mountains Journal of Mathematics [arXiv:2203.01204](https://arxiv.org/abs/2203.01204)
3. 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. [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)
4. 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. (2021) The dihedral Dunkl–Dirac symmetry algebra with negative Clifford signature. *Accepted as contribution for the proceedings of Lie Theory and its Applications in Physics. LT-XIV 2021*, 7p.

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

2. (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)
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:

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

Workshops:

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

Contributed seminar and conference talks:

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

Poster:

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| May 2022 | PhD Day meeting of the BMS , Liège |
| | <i>Weavings weights: double dihedral deformation</i> (with Marcelo De Martino and Roy Oste) |

Graduate students advising and evaluation

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/>.

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

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/
- 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/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

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

Other Interests and Activities

- Chess** I am a Canadian and Québécois expert and play with the KGSRL chess club.
- Lifeguard** 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.