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, Temperley–Lieb algebras and complexity theory.

Current position

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

Past positions and research visits

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

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	**FRQNT**[1] Postdoctoral Research Scholarship
2019–2023	**FRQNT** Doctoral Research Scholarship
2019–2023	**FWO**[2] EOS PRIMA PhD scholarship
2017–2019	**FRQNT** Master's award
2017–2018	Alexander–Graham–Bell **NSERC**[3] 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. **Mentored** with S. Lazendic (UGent under Prof. A. Pizurica) Thesis title: *Moving towards practical quantum decoders for the classical-quantum channel*
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 ($2\times$)Fundamental Mathematics* Animation of exercises for 20-60 students, office hours, invigilated and corrected exams.

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

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

[3]National 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. 10 participants, 4500 EUR budget. https://sites.google.com/view/kleine-seminar-mini-course. *Co-organiser*.

2019   **SAMARI**. One-day conference on possibilities after graduation in mathematics at UdeM. 60 participants, 5000 CAD budget *Co-initiator and co-organiser*.

2016–2018   **Seminars in Undergraduate Mathematics in Montréal**. Annual provincial undergraduate weekend conference. 140 participants, 10 000 CAD budget *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. 40 participants, 4000 CAD budget *Organiser of the mathematics session*.

2017   **Canadian Undergraduate Mathematics Conference** Annual national undergraduate one-week conference. 150 participants, 30 000 CAD budget *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, Frederiction 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

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

2. Langlois-Rémillard, A. and Morin-Duchesne, A. (2023) Uncoiled affine Temperley–Lieb algebras and their Wenzl–Jones projectors. 37p. arXiv:2302.12782

3. Langlois-Rémillard, A., Müßig, C., and Roldán-Roa É. (2022) Computational complexity of chess domination problems. 18p. arXiv: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 arXiv: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, DOI: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, arXiv:1909.03499

Proceedings

1. Langlois-Rémillard, A. (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. Langlois-Rémillard, A. (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. 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, arXiv: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	**QTMC**, 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

September 2023	**Bureau des questions importantes**, Nyon *La complexité des labyrinthes*
June 2023	**Lange Nacht der Wissenschaften**, MPI-MiS Leipzig *Mach dein Speil, 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 carréousel 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 carréousel 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

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

Other interests and activities

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 2014 and 2015.
Literature	I greatly enjoy reading, writing and discussing literary works.

Alexis Langlois-Rémillard, Ph.D., Bonn October 23, 2023