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 and Temperley–Lieb algebras, complexity theory.

Education

2019–exp. 2023	**Ph. D. in Mathematics**, Universiteit Gent Thesis subject: *The representation theory of the total angular momentum algebra* 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**[1] 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

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

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

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, arXiv: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, arXiv: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.

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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

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

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

Invited talks:

October 2022	**Dartmouth combinatorics seminar**, Dartmouth College, Hanover.
	Sandwich cellularity and constructing idempotent 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:

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.
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	**XXXth 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

Current master students

2022-2023	Stijn Dezeure. **Mentor** with S. Lazendic (UGent under Prof. A. Pizurica)
	Subject: *Quantum computing with applications to image processing*
2021-2022	Régis Schulze. **Mentor** with S. Lazendic and A. Guzmán Adán (UGent under Prof. A. Pizurica)
	Thesis title: *Classical and quantum approaches to belief propagation algorithms*

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)
	Thesist 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 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 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

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, Frederiction 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
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.