

# 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.

## Education

- 2019-  
exp. **Ph. D. in Mathematics**, Universiteit Gent  
2023 Thesis subject: *Algebraic realization of Dunkl operators*  
2023 Advisors: Profs Joris Van der Jeugt and Hendrik De Bie
- 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  
2019-2022 **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 Award, **NSERC** and **FRQNT**  
Summer 2015 Undergraduate Research Award, **NSERC**

## Academic work experience

- 2021- **Teaching Assistant** at Ghent University (in Dutch)  
*Mathematics for economics IA*  
Helped animating exercises sessions for 60-80 students classrooms, invigilated exams.
- 2016-2018 **Teaching Assistant** at Université de Montréal (in French)  
*Discrete Mathematics, Analysis 1 and Fundamental Mathematics*  
Animation of exercises sessions for 20-60 students classrooms, office hours for students, invigilated and corrected exams.
- Summer 2016 **NSERC Research internship** with Prof. Yvan Saint-Aubin at UdeM  
Summer 2015 **NSERC Research internship** with Prof. Matilde Lalín at UdeM

## Publications and preprints

### Articles

1. De Bie, H., Langlois-Rémillard, A., Oste, R., and Van der Jeugt, Joris (2022) Finite-dimensional representations of the symmetry algebra of the dihedral Dunkl-Dirac operator. *Journal of Algebra* 591, 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)
2. Langlois-Rémillard, A. and Saint-Aubin, Y. (2020) The representation theory of seam algebras. *SciPost Physics* 8, 019. 34p. <https://doi.org/10.21468/SciPostPhys.8.2.019>, [arXiv:1909.03499](https://arxiv.org/abs/1909.03499)

<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

## Proceedings

1. (preprint) Langlois-Rémillard, A. (2021) The dihedral Dunkl-Dirac symmetry algebra with negative Clifford signature. *Submitted as contribution for the proceedings of Lie Theory and its Applications in Physics. LT-XIV 2021*
2. (preprint) Langlois-Rémillard, A. (2020) Deforming algebras with anti-involution via twisted associativity. *Submitted 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 Workshop

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### Invited talks:

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| May 2021      | <b>EOS meeting</b> , online <i>Finite-dimensional representations of the 3D dihedral Dunkl-Dirac symmetry algebra</i>                         |
| November 2018 | <b>Seminar: representation theory of algebras</b> , Université de Sherbrooke<br><i>Idempotence, cellularité et algèbres diagrammatiques</i>   |
| October 2018  | <b>Mathematical physics seminar</b> , Université de Montréal<br><i>Roots of unity and the representation theory of boundary seam algebras</i> |

### Workshop:

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| June 2018 | <b>Canadian Mathematical Society Summer Meeting</b> , Fredericton<br><i>Atelier d'enseignement actif</i> (with Marie-Andrée B. Langlois) |
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### Contributed seminar and conference talks:

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|----------------|---|
| November 2021  | <b>Kleine seminar</b> , Online<br><i>Hopf algebras and reconstruction theory for tensor categories</i>  |
| April 2021     | <b>Clifford research seminar</b> , Universiteit Gent, Online<br><i>Generalizing the Deligne category, Khovanov's and Sazdanovic's approach</i>          |
| February 2021  | <b>Kleine seminar</b> , online<br><i>Basics of category <math>\mathcal{O}</math></i>  |
| December 2020  | <b>CMS Winter meeting</b> , Canada, online<br><i>The symmetry algebra of the Dunkl-Dirac operator: the dihedral cases</i>                               |
| November 2020  | <b>Kleine seminar</b> , Online<br><i>The categorification of <math>S_n</math></i>   |
| March 2020     | <b>Clifford research seminar</b> , Universiteit Gent<br><i>The symmetry algebra of the 3D dihedral Dunkl-Dirac equation.</i>                            |
| November 2019  | <b>SPAS</b> , Västerås<br><i>Cellular structure of seam algebras and avenues for deformations</i>   |
| October 2019   | <b>Kleine seminar</b> , Universiteit Gent<br><i>Cellular algebras</i>   |
| June 2019      | <b>Clifford research seminar</b> , Universiteit Gent<br><i>Representation theory and cellular structure of seam algebras</i>                            |
| December 2018  | <b>Séminaire étudiant en mathématique</b> , Université de Montréal<br><i>Colorier une carte, une approche par dessin</i>                                |
| September 2018 | <b>XXX<sup>th</sup> Meeting on representation theory of algebras</b> , Sherbrooke<br><i>Cellular structure of boundary seam Temperley-Lieb algebras</i> |
| June 2018      | <b>Canadian Mathematical Society Summer Meeting</b> , Fredericton<br><i>Bratteli and the morphisms of boundary seam algebras</i>                        |
| May 2018       | <b>XXI<sup>e</sup> Colloque ISM</b> , Université Sherbrooke<br><i>Bratteli et les morphismes (semi-)simples de Temperley-Lieb</i>                       |

## Outreach

### Popularization work for a broad audience

1. Langlois-Rémillard, A. (2021) Geraldine A. Coon. *Femmes en maths*. <https://femmesenmaths.org/geraldine-coon/>
2. Boutet, V., Godin, J. and Langlois-Rémillard, A. (2017) Excursion typographique : La matrice des fontes. *Accromath*, 12, pp. 26–29. <http://accromath.uqam.ca/archives/>
3. Langlois-Rémillard, A. (2016) *Le Petit Prince et l'algèbre*, Notes from the Margin, Mathematical Society of Canada, Vol XII, p.4. <https://issuu.com/cms-studc/docs/margin-fall2016>

### Popularization talks

- 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. A Dutch problem-solving evening was given out of it for the UGent mathematical student organization **PRIME**.
- 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*

## Students advising

- 2021-2022 **Co-mentor** (with S. Lazendic and A. Guzmán Adán) for the master thesis project of Pieter-Jan Vandaele on *Classical coding approaches to quantum applications* (UGent under Prof. A. Pizurica)
- 2021-2022 **Co-mentor** (with S. Lazendic and A. Guzmán Adán) for the master thesis project of Régis Schulze on *Classical and quantum approaches to belief propagation algorithms* (UGent under Prof. A. Pizurica)
- Spring 2021 **Jury member** for the master thesis of Bert Christiaens (UGent under Prof. A. Pizurica)

## Session and seminars 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)

## Other Interests and Activities

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- 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.