

# Alexis Langlois-Rémillard

[alexis.langloisremillard@ugent.be](mailto:alexis.langloisremillard@ugent.be)  
[alexisl-r.github.io](https://github.com/alexisl-r)

Krijgslaan 281, S9  
9000, Gent, Belgium

## 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 **NSREC Research internship** with Prof. Yvan Saint-Aubin at UdeM  
Summer 2015 **NSREC Research internship** with Prof. Matilde Lalín at UdeM

## Publications and preprints

### Articles

1. (preprint) De Bie, H., Langlois-Rémillard, A., Oste, R., and Van der Jeugt, J. (2022) Generalised symmetries and bases for Dunkl monogenics. [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, 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)

<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

3. 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)

## 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

### 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 <i>Idempotence, cellularité et algèbres diagrammatiques</i>   |
| October 2018  | <b>Mathematical physics seminar</b> , Université de Montréal <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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| February 2022  | <b>Clifford research seminar</b> , Universiteit Gent, Online<br><i>Bases for Dunkl monogenics by generalised symmetries</i>                                 |
| June 2021      | <b>Lie Theory and its applications to physics XIV</b> , Online<br><i>Finite-dimensional representations of the 3D dihedral Dunkl-Dirac symmetry algebra</i> |
| April 2021     | <b>Clifford research seminar</b> , Universiteit Gent, Online<br><i>Generalizing the Deligne category, Khovanov's and Sazdanovic's approach</i>              |
| December 2020  | <b>CMS Winter meeting</b> , Canada, online<br><i>The symmetry algebra of the Dunkl-Dirac operator: the dihedral cases</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, Västerås</b><br><i>Cellular structure of seam algebras and avenues for deformations</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. (2022) Huit dames et un échiquier. *Accromath*, 17, pp. 8–13. <https://accromath.uqam.ca/2022/02/huit-dames-et-un-echiquier/>
2. Langlois-Rémillard, A. (2021) Geraldine A. Coon. *Femmes en maths*. <https://femmesenmaths.org/geraldine-coon/>
3. Boutet, V., Godin, J. and Langlois-Rémillard, A. (2017) Excursion typographique : La matrice des fontes. *Accromath*, 12, pp. 26–29. <https://accromath.uqam.ca/archives/>
4. 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

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|----------------|--|
| November 2021  | <b>PRIME problem-solving avond</b> , UGent<br><i>Koninginnen en (bijzondere) borden</i>                                |
| September 2020 | <b>Club mathématique</b> , Université de Montréal<br><i>Des pentagones aux heptagones, une infinité de différences</i> |
| November 2018  | <b>Club mathématique</b> , Université de Montréal<br><i>Huit dames pour un échiquier</i>                               |
| July 2018      | <b>Camp mathématique de l'AMQ</b> , Dawson College, Montréal<br><i>Le carréousel du géomètre</i>                       |
| November 2017  | <b>Club mathématique</b> , Université de Montréal<br><i>Excursion typographique: la matrice des fontes</i>             |

### Outreach activities

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| 2021      | <b>Chess and mathematics</b> . 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 <b>PRIME</b> . |
| 2016-2018 | <b>Institut des sciences mathématiques</b> . I created an activity on tatami tiling in 2016 for the <i>MathFest</i> and co-created the activity <i>Le carréousel du géomètre</i> for the festival <i>Eureka!</i> 2018 at the Science center of Montréal.   |
| 2018-2019 | <b>L'Axiomatique</b> . <i>Corrector-in-chief and writer</i> for a mathematics student journal at Université de Montréal.   |
| 2015-2017 | <b>JÉMUM</b> . <i>Co-created and co-edited</i> a student mathematical journal to showcase summer research by undergraduate students.   |

## Leadership and implication

### Conference organizer

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| 2019      | <b>SAMARI</b> . One-day conference on possibilities after graduation in mathematics. <i>Co-initiator and co-organizer</i>  |
| 2016-2018 | <b>Seminars in Undergraduate Mathematics in Montréal</b> . Annual provincial undergraduate weekend conference. <i>President for 2016–2017 and member of the organizing committee in 2018</i> |
| 2018      | <b>SAPHARI</b> . One-day conference on possibilities after graduation in physics. <i>Organizer of the mathematics session</i>  |
| 2017      | <b>Canadian Undergraduate Mathematics Conference</b> Annual national undergraduate one-week conference. <i>President for the Montréal 2017 edition</i>                                       |

## 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.