Yannic VARGAS L.

▬ Languages

Spanish	Mothertongue
English	Advanced
French	Advanced
German	Beginner

▬ Research interests

Algebraic and enumerative combinatorics related to: algebra, non-commutative probability, mathematical physics, combinatorics on words, combinatorial Hopf algebras, combinatorial species, lattices and polytopes, operads.

▬ Employment

2022 - 2024   **Postdoctoral position**, *ANR-FWF International Cooperation Project PAGCAP (Beyond Permutahedra and Associahedra: Geometry, Combinatorics, Algebra, and Probability)*, Tu Graz, Graz.
Mentors: Cesar CEBALLOS and Franz LEHNER.

Education

2015	**Ph.D. in Mathematics**, *Université du Québec à Montréal*, Montréal. Mention "Excellent".
Title	*Algèbres de Hopf de mots tassés et de fonctions motifs*
Supervisors	Christophe REUTENAUER & Franco SALIOLA
Description	In this work we unravel some properties of the Hopf algebra of packed words (originally defined as a generalization of the hopf algebra of quasi-symmetric functions), considering it as an extension of the Hopf algebra of permutations of Malvenuto and Reutenauer. This allows to obtain a novel combinatorial description of the space of primitives and the antipode. Finally, we describes a commutative Hopf algebra of permutations as an analog of subword space for permutations.
2010	**Master in Mathematics**, *Université du Québec à Montréal*, Montréal. Mention "Excellent".
Title	*Aspects algébriques des polynômes de Macdonald*
Supervisors	François BERGERON & Christophe HOHLWEG
Description	This mémoire is an algebraic introduction to Macdonald polynomials and their properties.
2006	**Bachelor in Mathematics**, *Universidad Central de Venezuela*, Caracas.
Title	*C-monoides y especies combinatorias lineales*
Supervisor	Miguel A. MÉNDEZ
Description	In this undergraduate project we describe the notion of Möbius species on linearly ordered sets.

Previous positions

2022 - 2023	**Managing Editor**. Communications in Mathematical Physics.
2022	**Postdoctoral position**, *Weierstrass Institute for Applied Analysis and Stochastics*, Berlin. Mentor: Peter FRIZ.
2021	**Postdoctoral position**, *Universität Potsdam*, Potsdam. Mentor: Sylvie PAYCHA.
2016 - 2021	**Postdoctoral position/Associated Researcher**, *Instituto Venezolano de Investigaciones Científicas*, Caracas. Mentor: Stella BRASSESCO.
2015	**Postdoctoral position**, *York University and Fields Institute*, Toronto. Mentor: Nantel BERGERON.

Short-term visiting positions

March 2023 **Visiting research**, *Department of Mathematics, University of Kentucky*, Lexington.
Host: Martha YIP.

March 2023 **Visiting research**, *Laboratoire d'Algèbre, de Combinatoire et d'Informatique Mathématique (LACIM), Université du Québec à Montréal*, Montréal.
Host: Samuele GIRAUDO.

August 2022 **Visiting research**, *Institut de Mathématiques de Jussieu - Paris Rive Gauche, Sorbonne Université*, Paris.
Host: Elba GARCÍA.

July 2022 **Visiting research**, *Laboratoire de Mathématiques Blaise Pascal, Université Clermont-Auvergne*, Clermont-Ferrand.
Host: Dominique MANCHON.

July 2022 **Visiting research**, *University of Greifswald*, Greifswald.
Host: Joscha DIEHL.

May 2022 **Visiting research**, *Perimeter Institute for Theoretical Physics*, Waterloo.
Host: Sylvie PAYCHA.

August 2019 **Visiting research**, *Université du Littoral Côte d'Opale*, Calais.
Host: Loïc FOISSY.

January 2019 **Visiting research**, *Universidad de Talca*, Talca.
Host: Maria RONCO.

Research leave / time off

2016-2020 During this period, I partially stopped my research activity due to parental leave in Venezuela. Also, I had two other jobs outside academy (Instructor at Universidad Central de Venezuela and Data Analysis).

Publications and submitted articles

2024 "On the free commutative monoid over a positive operad ", joint with Dominique Manchon, Hedi Regeiba and Imen Rjaiba, submitted.

2023 "Schröder trees, antipode formulas and non-commutative probability", joint with Adrián Celestino, submitted.

2023 "Antipode formulas for pattern Hopf algebras", joint with Raúl Penaguião , submitted.

2023 "Structure of the Hopf algebra of packed words", submitted.

2022 "Hopf algebras of Stirling permutations and planar trees", joint with Amy Pang, Nantel Bergeron, Rafael González and Shu Xiao Li. Advances in Applied Mathematics, 143, 102436.

2022 "Algebraic structures on combinatorial species", joint with Marcelo Aguiar and José Bastidas. Chapter in "Algebraic and Geometric Combinatorics", Cambridge University Press, to appear.

2014 "Hopf algebra of permutation pattern functions", 26th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2014), 839-850, Discrete Math. Theor. Comput. Sci. Proc., AS.

Publications in preparation

"Free and Boolean cumulants on bimonoids of species".

"Asymptotic formulae for the number of coloured partitions of an integer", joint with Stella Brassesco and Arnaud Meyroneinc.

"Species with up/down operators and the Hopf monoid of Connes-Kreimer", joint with Pierre Clavier and Sylvie Paycha.

"Nested Chen Sums and integrals", joint with Diego López and Sylvie Paycha.

"Two associative operads of packed words", joint with Samuele Giraudo.

"On Geometric Realizations of s-Permutahedra via Flow Polytopes", joint with Rafael González D'León, Alejandro Morales, Eva Philippe, Daniel Tamayo Jiménez and Martha Yip.

Teaching experience

2015-2021 **Instructor**, *Universidad Central de Venezuela*, Caracas.
Undergraduate courses:
- Basic mathematics
- Group theory
- Groups, rings and fields
- Linear algebra 1, 2
- Multivariate calculus.

Graduate course:
- Commutative algebra.

2008-2015 **Instructor**, *Université du Québec à Montréal*, Montréal.
Undergraduate courses:
- Algebra 2
- Calculus
- Design and analysis of algorithms
- Integral calculus
- Introduction to analysis (program "Baccalauréat en enseignement des sciences – concentration en mathématiques").
- Linear algebra
- Mathematics for Computer Science
- Multivariate calculus
- Numerical structures (program "Baccalauréat en enseignement des sciences – concentration en mathématiques").

Supervision of students

2019 - 2021 Graduate thesis project: "Álgebras de Hopf de sistemas de tuberías", Ronald RAMÍREZ, Universidad Central de Venezuela.

2017-2018 Undergraduate project: "La integral de Lebesgue desde una perspectiva categórica", Diego HERNÁNDEZ, Universidad Central de Venezuela.

Scientific outreachs activities (upcoming)

2025 **Recent Perspectives on Non-crossing Partitions through Algebra, Combinatorics, and Probability**, *Erwin Schrödinger Institute for Mathematics and Physics*, co-organizer, Vienna.

Scientific outreachs activities (past)

2022 **Rough paths and Algebra Day**, *TU Berlin*, organizer, Berlin.

2022 **Cimpa Research School: Geometric methods in combinatorics**, *VI Encuentro Colombiano de Combinatoria ECCO 2022*, organizing committee member, Bogotá.

2021 **VI Congreso Latinoamericano de matemáticas CLAM 2021**, *Session: "Combinatoria algebraica de funciones simétricas, quasisimétricas y aplicaciones"*, organizer, Montevideo.

2017 **Seminario divulgativo de álgebra**, *XXX Jornadas de Investigación y Extensión de la Facultad de Ciencias de la Universidad Central de Venezuela*, organizer, Caracas.

2017 **XXX Jornadas Venezolanas de Matemáticas**, *Session "Combinatoria", Universidad Central de Venezuela*, organizer, Caracas.

Peer review activities

Journals Combinatorial Theory, Advances in Applied Mathematics, Letters in Mathematical Physics, Semigroup Forum, SIGMA (Symmetry, Integrability and Geometry: Methods and Applications).

Conferences Formal Power Series and Algebraic Combinatorics 2022.

Formal Power Series and Algebraic Combinatorics 2024.

Institutional responsabilities

2021-2022 **Coorganizer**, *Arbeitsgruppenseminar Analysis*, Potsdam University, Potsdam.

Third party funding

2022-2024 French-Latin American MATH Am-Sud project.

Regional Scientific-technological cooperation program.

Funding: 20000 Euros.

Project ALGonCOMB (Algebraic structures supported on families of combinatorial objects).

French team: Pierre-Louis Giscard, Vincent Pilaud, Viviane Pons.

Latin America team: Ana González, Rafael González D'León, Maria Ronco, Yannic Vargas.

2023-2025 French-Latin American MATH Am-Sud project.

Regional Scientific-technological cooperation program.

Funding: 20000 Euros.

Project Probabilistic method in enumerative combinatorics.

French team: Arnaldo Nogueira, Sandro Vaienti.

Latin America team: Stella Brassesco, Arnaud Meyroneinc, Yannic Vargas.

Courses (given for an international school)

2024 **Algebraic, analytic, geometric structures emerging from quantum field theory**, *"Introduction to combinatorial species through algebraic combinatorics, geometry and physics"*, Sichuan University, Chengdu.

Talks

2024 **Séminaire Lotharingien de Combinatoire 91**, *"Schröder trees, antipode formulas and non-commutative probability"*, Salobreña, Spain.

2024 **Algebraic, analytic, geometric structures emerging from quantum field theory**, *"From combinatorial species to spaces of generalized independences"*, Sichuan University, Chengdu.

2023 **Non-commutative Geometry meets Topological Recursion**, *"Hopf algebras, species and free probability"*, Erwin Schrödinger International Institute for Mathematics and Physics (ESI), Vienna.

2023 **Discrete CATS seminar**, *"Hopf algebras, species and free probability"*, University of Kentucky, Lexington.

2023 **Séminaire du Laboratoire d'Algèbre, de Combinatoire et d'Informatique Mathématique (LACIM)**, *"Hopf algebras, species and free probability"*, Université du Québec à Montréal, Montréal.

2022 **Séminaire du Laboratoire d'Informatique Gaspard-Monge**, *"Structure de bigèbre infinitésimal de $\mathfrak{S}$Sym et nouvelle base de $Prim(\mathfrak{S}$Sym$)$"*, Université Gustave Eiffel, Paris.

2022 **Seminar: Advanced Topics in Discrete Mathematics**, *"Algebraic and coalgebraic structures on permutations"*, TU Graz, Graz.

2022 **Workshop: Calcul moulien et algèbres de Hopf combinatoires**, *"Combinatorial formulas in free probability"*, Besse.

2022 **XXXII Jornadas Venezolanas de Matemáticas (virtual)**, *"Factorizaciń del espectro de incidencia y Laplaciano de un grafo usando operadores ineales"*, joint with *Jean Carlos Liendo*, Valencia.

2021 **Higher Structures emerging from Renormalisation**, *"New cumulant-to-moment formulas"*, Erwin Schrödinger International Institute for Mathematics and Physics (ESI), Vienna.

2021 **Noncommutative algebra, probability and analysis in action**, *"New cumulant-to-moment formulas"*, Univesität Greifswald, Greifswald.

2021 **Algebraic and Combinatorial Perspectives in the Mathematical Sciences (virtual seminar)**, *"Monomial bases for combinatorial Hopf algebras"*.

2021 **Dartmouth Combinatorics Seminar (virtual seminar)**, *"Monomial bases for combinatorial Hopf algebras"*.

2021 **Arbeitsgruppenseminar Analysis**, *"Cointeracting bialgebras of permutations and set partitions"*, Institut für Mathematik Potsdam Universität, Potsdam.

2020 **KU (virtual) Combinatorics seminar**, *"Hadamard product of free monoids and universals Hopf monoid"*.

2020 **Workshop "Higher Structures Emerging from Renormalisation" (virtual)**, *"Primitive elements of combinatorial Hopf algebras"*.

2019 **Rencontres du GdR "Renormalisation"**, *"Hadamard product of free monoids and universals Hopf monoid"*, Laboratoire de Mathématiques Pures et Appliquées Joseph Liouville, Université du Littoral Côte d'Opale. Calais.

2019 **XXIII Coloquio Latinoamericano de Álgebra**, *"Hadamard product of free monoids and universals Hopf monoid"*, session "Hopf algebras and tensor categories", Mexico City.

2019 **Coloquium on Algebras and Representations Quantum 2019**, *"Noncommutative character theory and the Heisenberg product"*, celebrating the 70th anniversary of Walter Ferrer, Facultad de Ingeniería de la Universidad de la República, Montevideo.

2018 **XVII Encuentro Rioplatense de Álgebra y Geometría (ERAG) 2018**, *"Álgebra de Hopf de árboles ordenados bicoloreados"*, Facultad de Ingeniería de la Universidad de la República, Montevideo.

2018 **Rencontres du GdR "Renormalisation"**, *"A Hopf algebra of painted ordered trees"*, Laboratoire de Mathématiques Blaise Pascal, Clermont-Ferrand.

2018 **Encuentro Colombiano de Combinatoria (ECCO) 2018**, *"An operad on the coalgebra of Malvenuto-Reutenauer"*, Universidad del Norte, Barranquilla.

2017 **The third Pacific Rim Mathematical Association (PRIMA) 2017**, *"Structure of the Hopf algebra of packed words"*, Algebraic and enumerative combinatorics session, Oaxaca.

2016 **Math Seminar**, *"An introduction to combinatorial Hopf algebras"*, Instituto Venezolano de Investigaciones Científicas, Caracas.

2016 **Algebra Seminar**, *"A Hopf algebra of permutation pattern functions"*, Universidad Central de Venezuela, Caracas.

2015 **The Applied Algebra Seminar**, *"Hopf algebras of packed words"*, York University, Toronto.

2014 **Permutation Patterns 2014**, *"A Hopf algebra of permutation pattern functions"*, East Tennessee State Universit, Johnson City.

Assistance to conferences and workshops

2022 **Geometry and Renormalisation**, Institut für Mathematik, Potsdam Universität, Potsdam.

2022 **Workshop in Geometry and Geometric integration**, Bergen.

2021 **Higher Structures emerging from Renormalisation**, *Master class and workshop*, Erwin Schrödinger International Institute for Mathematics and Physics (ESI), Vienna.

2021 **Noncommutative algebra, probability and analysis in action**, *Master class and conference*, Univesität Greifswald, Greifswald.

2019 **Research School on Quantum Symmetries**, *CIMPA School*, Universidad de los Andes, Bogotá.

2018 **Matemáticas en el cono sur**, *Workgroup*, Group session "Combinatorial models in algebraic structures", Montevideo.

2018 **Combinatorics meets algebra, geometry, and optimization - ECCO 2018**, *School and conference*, 6to Encuentro Colombiano de Combinatoria, Barranquilla.

2018 **Satellite Meeting: A Pan-Hemispheric Celebration of Mathematics in Miami**, *Workshop*, Algebraic Combinatorics session, Miami.

2017 **The third Pacific Rim Mathematical Association (PRIMA) 2017**, *Conference*, Algebraic and enumerative combinatorics session, Oaxaca.

2014 **26th Annual Internacional Conference on Formal Power Series and Algebraic Combinatorics**, *International conference*, DePaul University, Chicago.

2013 **International Workshop in Combinatorial Algebra**, *Conference*, Dalhousie University/Saint Mary's University Halifax.

2009 **Operads 2009**, *International conference and school*, Centre Internacional de Rencontres Mathématiques, Marseille.

2008 **20th Annual Internacional Conference on Formal Power Series and Algebraic Combinatorics**, *International conference*, Universidad de Talca, Viña del Mar.

2007 **Algèbres de Hopf combinatoire et polynômes de Macdonald**, *Thematic semester*, Université de Montréal, Montréal.