

# Cesar Ceballos

## Curriculum Vitæ

Graz University of Technology  
Institute of Geometry  
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ORCID:0000-0002-7348-3248

### Personal information

Born in Colombia on October 9, 1987. Married, two children (aged 8 & 11).

### Main areas of research

Discrete geometry, polytope theory, algebraic, enumerative and geometric combinatorics, Hopf algebras, diagonal harmonics, representation theory, and tropical geometry.

### Academic Education

2021 **Habilitation**, *Faculty of Mathematics, Physics and Geodesy, TU Graz, Austria.*

2020 **Habilitation**, *Faculty of Mathematics, Universität Wien, Austria.*

2009 – 2012 **Doctorate (Dr. rer. nat.)**, *summa cum laude*, Institute of Mathematics, Freie Universität Berlin, Germany, Supervisor, Günter Ziegler.

2008 – 2009 **Master: Aspects of Calabi-Yau Geometries**, *Department of Mathematics, Universiteit Utrecht, The Netherlands.*

2007 – 2008 **Master degree**, *Department of Mathematics, Universidad de Los Andes, Colombia.*

2002 – 2006 **Bachelor degree**, *Department of Mathematics, Universidad del Valle, Colombia.*

### Employment

2020–Present **Privat Dozent**, *Institute of Geometry, TU Graz, Austria.*

2015 – 2020 **Postdoc**, *Faculty of Mathematics, Universität Wien, Austria.*

2013 – 2015 **Visitor Member**, *Fields Institute, Canada.*

2013 – 2015 **Banting Postdoctoral Fellow**, *Department of Mathematics and Statistics, York University, Canada.*

2012 – 2013 **Postdoc**, *Institute of Mathematics, Freie Universität Berlin, Germany.*

### Selected awards

2022-2026 ANR-FWF Austria-France International Cooperation Project Grant.

2021-2025 FWF Stand Alone Project Grant.

2018 Elsevier Mathematical Sciences Sponsorship Fund.

2013-2015 Banting Postdoctoral Fellowship, Government of Canada's most prestigious award for postdoctoral researches in all areas of natural sciences, engineering, social sciences and health research.

- 2009-2013 Doctoral and Postdoctoral Fellowships, RTG Methods for Discrete Structures.
- 2008-2009 MRI Master Class Fellowship.
  - 2008 Student Award for Art and Science, Mazda Foundation.
  - 2008 Student Research Project Grant, Proyecto Semilla, Universidad de los Andes.
- 2007-2008 Master and Teaching Assistant Fellowship, Universidad de los Andes.
  - 2007 Second best graduating undergraduate student, Universidad del Valle.
  - 2006 Bronze Medal, IX Ibero-American Mathematical Olympiads for University Students.

### Third party funding

- 2022-2026 **ANR-FWF Austria-France International Cooperation Project Grant**  
 Austrian Science Fund (FWF): 291.291 €.
   
 Agence nationale de la recherche (ANR): 208.786,19 €.
   
 Project: Beyond Permutahedra and Associahedra: Geometry, Combinatorics, Algebra, and Probability.
   
 Austrian Team: Cesar Ceballos (Project Coordinator), Oswin Aichholzer, Franz Lehner.
   
 French Team: Viviane Pons (Project Coordinator), Wenjie Fang, Arnau Padrol, Frédéric Patras, Vincent Pilaud.
   
 Position: Project Coordinator.
- 2021-2025 **FWF Stand Alone Project**  
 Austrian Science Fund (FWF), 547.848 €.
   
 Project: Diagonal harmonics, Hopf algebras, and polytopes.
   
 Position: Head of the project.
- 2018-2019 **OeAD Austria/France Scientific & Technological Cooperation Grant**  
 Austrian Federal Ministry of Education, Science and Research, 7.000 €.
   
 French Ministry of Foreign Affairs and International Development, 4.160 €.
   
 Project: Combinatorial, algebraic, and geometric properties of the weak order and its quotients.
   
 Austrian Team: Martin Rubey (Project Coordinator), Cesar Ceballos.
   
 French Team: Viviane Pons (Project Coordinator), Arnau Padrol, Vincent Pilaud.
   
 Position: Principal Investigator (PI).
- 2018 Conference grants for the organization of the CIMPA School Combinatorics meets Algebra, Geometry and Optimization - ECCO 2018:
   
 Centre International de Mathématiques Pures et Appliquées (CIMPA), 8.000 €.
   
 Elsevier Mathematical Sciences Sponsorship Fund, 5.000 USD.
   
 International Mathematical Union (IMU), 1.500 €.
   
 Abdus Salam International Centre for Theoretical Physics (ICTP) , 1.000 €.
   
 SIAM Colombia, 550 €.
- 2016 Conference grants for the organization of the CIMPA School Algebraic, Enumerative, and Geometric Combinatorics - ECCO 2016:
   
 Centre International de Mathématiques Pures et Appliquées (CIMPA), 11.000 €.
   
 The Fields Institute for Research in Mathematical Sciences, 6.500 CAD.

2013-2015 **Banting Grant Award**  
Government of Canada, 140.000 CAD.  
Additional 30.000 CAD awarded by York University.  
Project: Combinatorial Hopf Algebra of Polytopes and Structure Constants.  
Position: Head of the Project.

## Supervision of students

Since 2023 Matthias Müller, University of Graz. Master Student.  
Since 2022 Sergio Alejandro Fernandez de Soto Guerrero, TU Graz. Doctoral Student.  
2014 – 2016 Andres Saldaña, Universidad del Valle, co-supervised with Federico Ardila.  
Bachelor thesis: Tutte polynomials, knots, and medial graphs.  
2014 – 2015 Hanner Bastidas, Universidad del Valle, co-supervised with Federico Ardila.  
Bachelor thesis: Combinatorial properties of a robot moving in a rectangular grid.

## Postdocs

Since 2022 Matias von Bell, TU Graz.  
Since 2022 Yannic Vargas, TU Graz.  
2021 – 2023 Joseph Doolittle, TU Graz.

## Organization of scientific meetings

2024 PAGCAP Strobl Workshop. Austria.  
2023 PAGCAP Paris Workshop. France.  
2023 PAGCAP Weissensee Workshop. Austria.  
2022 PAGCAP Paris Workshop. France.  
2018 CIMPA School: Combinatorics meets Algebra, Geometry and Optimization.  
2016 CIMPA School: Algebraic, Enumerative and Geometric Combinatorics.  
2014 ECCO 2014, 4th Encuentro Colombiano de Combinatoria.  
2012 ECCO 2012, 3rd Encuentro Colombiano de Combinatoria.

## Scientific committees

2023 Program Committee Member, AltencoA 2023.  
2022 Program Committee Member, Convimate 2022.  
2022 Program Committee Member, FPSAC 2022.  
2014 Program Committee Member, ECCO 2014.

## Institutional responsibilities

2021 – 2022 Organizer, Reading Seminar Topics on Discrete Geometry, TU Graz.  
2015 – 2020 Organizer, Combinatorics Working Seminar, University of Vienna.  
2015 – 2016 Organizer, Rational Combinatorics Seminar, University of Vienna.  
2013 – 2015 Organizer, Applied Algebra Seminar, York University.

- 2013 – 2015 Organizer, Algebraic Combinatorics Seminar, Fields Institute.
- 2013 – 2014 Organizer, Reading Seminar on Schubert Calculus, Fields Institute.
- 2012 – 2012 Organizer, Seminar on Polyhedral Combinatorics, FU Berlin.
- 2011 – 2012 Organizer, Seminar on Associahedra and Related Structures, FU Berlin.
- 2010 – 2011 Student Representative of the Berlin Mathematical School.
- 2010 – 2011 Active member and promoter of the BMS Women in Mathematics group, Berlin.

### Outreach activities

- Jun. 2016 Instructor, Clubes de Ciencia Colombia, Medellín. One week-long workshop on Mathematics and Robotics for mechanical engineering students.
- Jun. 2016 Organizer, interactive science museum Parque Explora, Medellín. Public math lecture broadcast by television and internet stream.

### Peer review activities

- Journals General: Memoirs of the American Mathematical Society, International Mathematics Research Notices, Canadian Journal of Mathematics, Mathematische Zeitschrift, Revista Colombiana de Matemáticas.  
Specialized: Algebraic Geometry and Physics, Annals of Combinatorics, Combinatorial Theory, Combinatorica, Discrete and Computational Geometry, Electronic Journal of Combinatorics, European Journal of Combinatorics, Journal of Combinatorial Theory Series A.
- Conferences Formal Power Series and Algebraic Combinatorics (FPSAC).

### Publications

Complete list of publications: <http://www.geometrie.tugraz.at/ceballos/research.html>

- Publications 21 in international journals (*Adv. Math.*, *Trans. Amer. Math. Soc.*, *Journal of the London Mathematical Society*, *DCG*, *JCTA*, ...),  
16 in international peer-reviewed conference proceedings (FPSAC 7 talks, 7 posters),  
1 book chapter, 5 arxiv preprints.

### Teaching activities

- 2023 Professor, Topics on Combinatorics, Algebra and Geometry, TU Graz, Austria.
- 2020 Professor, Combinatorial Reciprocity Theorems via Geometry, TU Graz, Austria.
- 2015 Professor, Differential Calculus with Applications, York University, Canada.
- 2013 Professor, Differential Calculus with Applications, York University, Canada.
- 2008 Teaching Assistant, Calculus III, Universidad de los Andes, Colombia.
- 2008 Teaching Assistant, Vector Calculus, Universidad de los Andes, Colombia.
- 2008 Teaching Assistant, Linear Algebra, Universidad de los Andes, Colombia.
- 2007 Teaching Assistant, Linear Algebra, Universidad de los Andes, Colombia.
- 2006 Teaching Assistant, Calculus I, Universidad del Valle, Colombia.

### 5 Selected Publications

- [1] Nantel Bergeron and Cesar Ceballos. A Hopf algebra of subword complexes. *Advances in Mathematics*, 305:1163–1201, January 2017. [doi:10.1016/j.aim.2016.10.007](https://doi.org/10.1016/j.aim.2016.10.007).
- [2] Nantel Bergeron, Cesar Ceballos, and Vincent Pilaud. Hopf dreams and diagonal harmonics. *Journal of the London Mathematical Society*, 105(3): 1546–1600, 2022. [doi:10.1112/jlms.12541](https://doi.org/10.1112/jlms.12541).
- [3] Cesar Ceballos, Jean-Philippe Labbé, and Christian Stump. Subword complexes, cluster complexes, and generalized multi-associahedra. *Journal of Algebraic Combinatorics*, 39(1):17–51, 2014. [doi:10.1007/s10801-013-0437-x](https://doi.org/10.1007/s10801-013-0437-x).
- [4] Cesar Ceballos, Arnau Padrol, and Camilo Sarmiento. Geometry of  $\nu$ -Tamari lattices in types  $A$  and  $B$ . *Transactions of the American Mathematical Society*, 371(4):2575–2622, 2019. [doi:10.1090/tran/7405](https://doi.org/10.1090/tran/7405).
- [5] Cesar Ceballos and Vincent Pilaud. Denominator vectors and compatibility degrees in cluster algebras of finite type. *Transactions of the American Mathematical Society*, 367(2):1421–1439, 2015. [doi:10.1090/S0002-9947-2014-06239-9](https://doi.org/10.1090/S0002-9947-2014-06239-9).

### 5 selected invited presentations

Séminaire Philippe Flajolet, l'Institut Henri Poincaré, Paris, France, Apr 2018.  
 Algebraic and Geometric Combinatorics of Reflection Groups, Centre de Recherches Mathématiques, Montreal, Canada, Jun 2017.  
 UBC Math Colloquium, University of British Columbia, Canada, Jan 2015.  
 Latin American Colloquium of Algebra, Lima, Peru, Dec 2014.  
 Hall and Cluster Algebras, Centre de Recherches Mathématiques, Montreal, Canada, May 2014.

### Presentations at international conferences, colloquia and seminars

Fakultätstag mit Festvorträgen, TU Graz, Oct 2023.  
 ICMAM Latin America Satellite Conference, Algebra, Combinatorics and Number Theory, Sep 2023.  
 Algebra and Number Theory Seminar, University of Graz, Jan 2023.  
 Berufungskommission, Professor of Algebra, Colloquium, University of Graz, Austria, Dec 2022.  
 Foro del Departamento, Universidad del Valle, Cali, Colombia, Apr 2023.  
 Séminaire Lotharingien de Combinatoire SLC, Strobl, Austria, Sep 2022.  
 Conference Matroids, Ordered Structures, Arrangements in Combinatorics, Manchester, UK, Jul 2022.  
 AICoVE: an Algebraic Combinatorics Virtual Expedition, Jun 2022.  
 PAGCAP Workshop, Sorbonne Université Campus Pierre et Marie Curie, Paris, France, Apr 2022.  
 Online Seminar, Algebraic and Combinatorial Perspectives in the Mathematical Sciences, Jan 2022.  
 Geometry Seminar, TU Graz, Austria, Jan 2022.  
 Formal Power Series and Algebraic Combinatorics, FPSAC 2021, Israel, Online, Jan 2022.  
 Graduate Online Combinatorics Colloquium (GOCC), Nov 2021.  
 AICoVE: an Algebraic Combinatorics Virtual Expedition, Jun 2021.  
 Geometry Seminar, TU Graz, Austria, Jun 2021.  
 Ghent Methusalem Junior Analysis and PDE Seminar, Ghent University, Belgium, May 2021.  
 Conexión U, Universidad del Valle, Colombia, Feb 2021.  
 Berufungskommission, Tenure-Track Professorship in the area of Information, Communication & Computing, Colloquium, TU Graz, Austria, Nov 2020.  
 Gonit Sora Webinar, India, Nov 2020.

DK Seminar Advanced Topics in Discrete Mathematics, Graz, Austria, Oct 2020.  
 Combinatorial Coworkspace, Haus Bergkranz, Kleinwalsertal, Austria, Mar 2020.  
 Berufungskommission, Tenure-Track Professor Discrete Mathematics, Colloquium, TU Wien, Austria, Dec 2019.  
 Plateau Saclay Combinatorics Seminar, École Polytechnique, Paris, France, Nov 2019.  
 Berufungskommission, Tenure-Track Professor Applied Geometry, Colloquium, TU Graz, Austria, Nov 2019.  
 Formal Power Series and Algebraic Combinatorics, FPSAC, Ljubljana, Slovenia, Jul 2019.  
 Berufungskommission, W2-Professur Angewandte Algebra, Colloquium, University of Leipzig, Germany, Jul 2019.  
 Discrete Geometry Seminar, Freie Universität Berlin, Germany, Jun 2019.  
 Math Colloquium, Universidad de Los Andes, Bogota, Colombia, May 2019.  
 Foro del Departamento, Universidad del Valle, Cali, Colombia, Apr 2019.  
 Algebra and Incidence Geometry Seminar, Vrije Universiteit Brussel, Belgium, Mar 2019.  
 Einstein Workshop on Geometric and Topological Combinatorics, Berlin, Germany, Oct 2018.  
 Algebra and Number Theory Seminar, Graz, Austria, Oct 2018.  
 CSASC 2018, Bratislava, Slovakia, Sep 2018.  
 Arbeitsgemeinschaft Diskrete Mathematik, TU Wien, Austria, Apr 2018.  
 Séminaire Philippe Flajolet, l'Institut Henri Poincaré, Paris, France, Apr 2018.  
 Oberseminar Geometry, University of Fribourg, Switzerland, Feb 2018.  
 SFB Status Seminar, Strobl, Austria, Dec 2017.  
 19th ÖMG Congress and Annual DMV Meeting, Salzburg, Austria, Sep 2017.  
 European Conference on Combinatorics, Graph Theory and Applications, Vienna, Austria, Aug 2017.  
 Formal Power Series and Algebraic Combinatorics, FPSAC, London, England, Jul 2017.  
 Berufungskommission, Assistant Professorship Discrete Mathematics, Colloquium, TU Munich, May 2017.  
 Geometry and Analysis on Groups Research Seminar, University of Vienna, Austria, Apr 2017.  
 The 78th Séminaire Lotharingien de Combinatoire, Domaine Saint-Jacques, France, Mar 2017.  
 Arbeitsgemeinschaft Diskrete Mathematik, TU Wien, Austria, Mar 2017.  
 Arbeitsgemeinschaft Diskrete Mathematik, TU Wien, Austria, Dec 2016.  
 Algebra and Number Theory Seminar, Graz, Austria, Nov 2016.  
 Seminar at École Polytechnique, Palaiseau, France, Apr 2016.  
 The 76th Séminaire Lotharingien de Combinatoire, Domaine Saint-Jacques, France, Apr 2016.  
 SFB-AEC Statusseminar 2015, Strobl am Wolfgangsee, Austria, Nov 2015.  
 Arbeitsgemeinschaft Diskrete Mathematik, TU Wien, Austria, Nov 2015.  
 Formal Power Series and Algebraic Combinatorics, FPSAC, Daejeon, South Korea, Jul 2015.  
 Discrete Geometry and Combinatorics Seminar, Cornell University, USA, Nov 2014.  
 Combinatorics Seminar, University of Washington, USA, Mar 2014.  
 60th anniversary of the Mathematics Department, Universidad del Valle, Colombia, Jan 2014.  
 Foro del Departamento, Universidad del Valle, Cali, Colombia, Aug 2013.  
 XIX Colombian Mathematics Conference, Barranquilla, Colombia, Jul 2013.  
 Formal Power Series and Algebraic Combinatorics, FPSAC, Paris, France, Jun 2013.  
 Combinatorics Seminar, University of Minnesota, USA, May 2013.  
 Formal Power Series and Algebraic Combinatorics, FPSAC, Nagoya, Japan, Jul-Aug 2012.  
 Algebra-Geometry-Combinatorics Seminar, San Francisco State University, USA, Nov 2011.  
 Algebra and Discrete Mathematics Seminar, UC Davis, USA, Nov 2011.

Applied Algebra Seminar, York University, Canada, Nov 2011.  
Student-Postdoc Seminar, CIRGET-LaCIM, Nov 2011.  
LaCIM Seminar, LaCIM, Canada, Nov 2011.  
What is Seminar, Berlin Mathematical School, Oct 2011.  
BMS Days, Berlin Mathematical School, Feb 2011.  
Graduate Colloquium, Zurich, Switzerland, Nov 2010.  
Discrete Geometry Seminar, Berlin, Germany, Jun 2010.  
Lattice Polytopes Seminar, Berlin, Germany, Feb 2010.  
MDS Monday Colloquium, Berlin, Germany, May 2009.  
Graduate Student Combinatorics Seminar, San Francisco State University, USA, Apr 2008.  
Graduate Student Combinatorics Conference, UC Davis, USA, Apr 2008.

## References

Prof. Federico Ardila, San Francisco State University, USA.  
Prof. Nantel Bergeron, York University, Canada.  
Prof. Christian Krattenthaler, Universität Wien, Austria.  
Prof. Francisco Santos, University of Cantabria, Spain.  
Prof. Johannes Wallner, Technische Universität Graz, Austria.  
Prof. Günter M. Ziegler, Freie Universität Berlin, Germany.

## Other Information

Languages English (advanced)  
German (advanced)  
Spanish (native)

Hobbies and interests Dancing, Swimming, Football, Gardening, Nature, Wildnispädagogik, Survival and Nature Skills.