

# Michele D'Adderio

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## Contact Information

Université Libre de Bruxelles

Département de Mathématiques

CP 216 Service de Algèbre et Combinatoire

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## Current position

2015 - Chargé de cours au Département de Mathématiques, Université Libre de Bruxelles, Belgium

## Education

2006 - 2010 Ph.D. in Mathematics, University of California, San Diego

Advisor: Efim Zelmanov

2004 - 2006 Laurea Magistrale in Mathematics, Università di Roma *La Sapienza*, summa cum laude

Advisor: Claudio Procesi

2001 - 2004 Laurea in Mathematics, Università di Bologna, summa cum laude

Advisor: Angelo Vistoli

## Previous positions

2012 - 2015 Chargé de cours temporaire au Département de Mathématiques, Université Libre de Bruxelles, Belgium

2012 Postdoc at Mathematisches Institut Georg-August-Universität, Göttingen (April-September 2012)

2011 - 2012 Postdoc at Max Planck Institut für Mathematik (October 2011 - March 2012)

2011 Postdoc at Mathematisches Institut Georg-August-Universität, Göttingen (April-September 2011)

2010 - 2011 Postdoc at Max Planck Institut für Mathematik (October 2010 - March 2011)

## Research interests

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Algebra	Geometric Theory of Algebras, Amenability of Algebras, Representation Theory, Partial Representations, Inverse Semigroups.
Combinatorics	Matroid Theory, Sandpile Model, Symmetric Functions.
Topology	Toric Arrangements.

## Publications and preprints

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Preprints	Pr1. (with M. Romero) New identities for Theta operators, in preparation
	Pr2. (with A. Mellit) A proof of the compositional Delta conjecture, preprint: arXiv:2011.11467
	Pr3. (with W. Hautekiet, P. Saracco, J. Vercauteren) Partial and global representations of finite groups, preprint: arXiv:2005.09465
	Pr4. (with S. Checcoli) Perfect powers in Catalan and Narayana numbers, preprint: arXiv:1306.5929
Accepted articles	AA1. (with A. Iraci, A. Vanden Wyngaerd) Decorated Dyck paths, polyominoes, and the Delta conjecture, to appear in <i>Mem. Amer. Math. Soc.</i> , arXiv:2011.09568 (it is an edited merge of arXiv:1712.08787 and arXiv:1709.08736) (see <a href="https://www.ams.org/cgi-bin/mstrack/accepted_papers/memo">https://www.ams.org/cgi-bin/mstrack/accepted_papers/memo</a> )

- Published articles
- PA1. (with A. Iraci, A. Vanden Wyngaerd) Theta operators, refined Delta conjectures, and coinvariants,  
*Adv. Math.* **376**, 107447 (2021)
- PA2. (with F. Caselli, M. Marietti) Weak generalized lifting property, Bruhat intervals and Coxeter matroids,  
*Int. Math. Res. Not. IMRN* (2020), <https://doi.org/10.1093/imrn/rnaa124>
- PA3. (with A. Iraci, A. Vanden Wyngaerd) The generalized Delta conjecture at  $t = 0$ ,  
*European J. Combin.* **86**, 103088 (2020)
- PA4.  $e$ -positivity of vertical strip LLT polynomials,  
*J. Combin. Theory Ser. A* **172**, 105212 (2020)
- PA5. (with F. Callegaro, E. Delucchi, L. Migliorini, R. Pagaria) Orlik-Solomon-type presentations for the cohomology algebra of toric arrangements,  
*Trans. Amer. Math. Soc.* **373**, no. 3, 1909–1940 (2020)
- PA6. (with A. Iraci) The new  $\text{dinv}$  is not so new,  
*Electron. J. Combin.* **26**, no. 3, Paper 3.48, 24 pp. (2019)
- PA7. (with A. Iraci, A. Vanden Wyngaerd) The Delta square conjecture,  
*Int. Math. Res. Not. IMRN* (2019), <https://doi.org/10.1093/imrn/rnz057>
- PA8. (with F. Cools, D. Jensen, M. Panizzut) Brill-Noether theory of curves on  $\mathbb{P}^1 \times \mathbb{P}^1$ : tropical and classical approach,  
*Algebr. Comb.*, **2**, no. 3, 323–341 (2019).
- PA9. (with A. Iraci, A. Vanden Wyngaerd) The Schröder case of the generalized Delta conjecture,  
*European J. Combin.* **81**, 58–83 (2019)
- PA10. (with Y. Le Borgne) The sandpile model on  $\mathcal{K}_{m,n}$  and the rank of its configurations,  
*Sém. Lothar. Combin.* **77** ([2016–2018]), Art. B77h, 48 pp.
- PA11. (with J.-C. Aval, M. Dukes, Y. Le Borgne) Two operators on sandpile configurations, the sandpile model on the complete bipartite graph, and a Cyclic Lemma,  
*Adv. in Appl. Math.* **73**, 59–98 (2016)
- PA12. (with J.-C. Aval, M. Dukes, A. Hicks, Y. Le Borgne) Statistics on parallelogram polyominoes and a  $q, t$ -analogue of the Narayana numbers,  
*J. Combin. Theory Ser. A* **123**, 271–286 (2014)
- PA13. (with A. Garsia) Explicit formulas for a sequence of binary tree polynomials,  
*Theoret. Comput. Sci.* **502**, 217–226 (2013)
- PA14. (with L. Moci) Arithmetic matroids, Tutte polynomial and toric arrangements,  
*Adv. Math.* **232**, 335–367 (2013)
- PA15. (with L. Moci) Graph colorings, flows and arithmetic Tutte polynomial,  
*J. Combin. Theory Ser. A* **120** (1), 11–27 (2013)
- PA16. (with L. Moci) Ehrhart polynomial and multiplicity Tutte polynomial,  
*European J. Combin.* **3** (7), 1479–1483 (2012)
- PA17. (with L. Moci) On a conjecture of Hivert and Thiery about Steenrod operators,  
*J. Algebra* **354** (1), 158–179 (2012)
- PA18. Entropy and Følner function in algebras,  
*J. Algebra* **342** (1), 235–255 (2011)
- PA19. On isoperimetric profiles of algebras,  
*J. Algebra* **322** (2), 177–209 (2009)
- PA20. (with J. Bandlow) A new proof of a theorem of Littlewood,  
*European J. Combin.* **30** (2), 415–424 (2009)
- Books,  
Thesis,  
Conference  
Proceedings
- O1. (with T. Ceccherini-Silberstein) Groups and geometry: lecture notes on Gromov's theorem on groups of polynomial growth,  
in preparation
- O2. (with A. Iraci, A. Vanden Wyngaerd) Delta conjectures,  
*Sém. Lothar. Combin.* **82B**, Art. 65, 12 pp. (2020)

- O3. (with A. Vanden Wyngaerd) Decorated Dyck paths and the Delta conjecture, *Sém. Lothar. Combin.* **80B**, Art. 34, 12 pp. (2018)
- O4. (with J.-C. Aval, M. Dukes, A. Hicks, Y. Le Borgne) A  $q, t$ -analogue of Narayana numbers, *25th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2013)*, 623–634 (2013)
- O5. Isoperimetric profile of algebras, *PhD Thesis*, (2010)

## Conferences, talks and visits (incomplete)

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### Talks

- T1. Algebra and Geometry Seminar, University of Bologna, Italy, October 28, 2020.
- T2. Algebra and Geometry Seminar, University of Bologna, Italy, September 29, 2020.
- T3. Algebra and Geometry Seminar, University of Rome “La Sapienza”, Italy, May 27, 2020.
- T4. Geometry, Algebra and Combinatorics of Moduli Spaces and Configurations IV, Dobbiaco, February, 2020
- T5. InterCity seminar of combinatorics, University of Fribourg, Fribourg, December 13, 2019
- T6. Combinatorics, Algebra and GEometry (CAGE) seminar, University of Pennsylvania, Philadelphia, November 1, 2018
- T7. 79th Séminaire Lotharingien de Combinatoire, Bertinoro, September 10–13, 2017.
- T8. Seminar UGent-ULB-VUB, ULB, Bruxelles, November 17, 2016.
- T9. University of Bremen, Bremen, August 25, 2016.
- T10. Combinatorics of root systems, University of Pisa, Cortona, April 16–19, 2016.
- T11. Groups and Geometry Seminar, University of Pisa, Pisa, October 30, 2015.
- T12. XX Congresso dell’Unione Matematica Italiana, University of Siena, Siena, September 7–12, 2015.
- T13. Groups and Geometry Seminar, University of Geneva, Geneva, October 7, 2014.
- T14. Formal Power Series and Algebraic Combinatorics (FPSAC) 2013, Université Sorbonne Nouvelle Paris 3, France, June 25, 2013. Poster.
- T15. Algebra and Geometry Seminar, University of Rome “La Sapienza”, Italy, June 5, 2013.
- T16. Algebra Seminar, Université Catholique de Louvain, Belgium, December 17, 2012.
- T17. 34th Algebra and Representation Theory in the North (ARTIN), University of Edinburgh, UK, December 1, 2012.
- T18. Number Theory Seminar, University of Basel, Switzerland, November 21, 2012.
- T19. Combinatorial Methods in Geometry and Topology, University of Bremen, Germany, September 29, 2012.
- T20. Formal Power Series and Algebraic Combinatorics (FPSAC) 2012, Nagoya University, Nagoya, Japan, August 2, 2012. Talk.
- T21. Combinatorics Seminar, Institute Camille Jordan, Lyon, March 6, 2012.
- T22. Combinatorics Seminar, LaBRI (CNRS), Bordeaux, February 17, 2012.
- T23. Journées de Combinatoire de Bordeaux, LaBRI (CNRS), Bordeaux, February 2, 2012.
- T24. Combinatorics seminar, Université Paris-Est, Marne-la-Vallée, December 2, 2011.
- T25. Combinatorics seminar, University of California San Diego, November 1, 2011.
- T26. Université du Québec à Montréal, October 25, 2011.
- T27. 67th Séminaire Lotharingien de Combinatoire, Bertinoro, September 20, 2011.
- T28. Seminar: Groups and Algebras, University of Göttingen, June 3, 2011.

- T29. University of Bologna, May 30, 2011.
- T30. Seminar: Groups and Algebras, University of Göttingen, May 13, 2011.
- T31. Seminar: Groups and Algebras, University of Göttingen, May 6, 2011.
- T32. Journées de Combinatoire de Bordeaux 2011, LaBRI, January 26–28, 2011.
- T33. MPIM Oberseminar, Max Planck Institut für Mathematik, January 13, 2011.
- T34. Lattice Path Combinatorics and Applications 2010, University of Siena, July 4–7, 2010.
- T35. CMS Summer Sectional Meeting, University of New Brunswick, Fredericton, June 3–7, 2010.
- T36. Mathematisches Institut Georg-August-Universität, Göttingen, December 14, 2009.
- T37. Algebra reading seminar, University of California, San Diego, February 12, 2009.
- T38. Structural Probability. Erwin Schrödinger International Institute of Mathematical Physics, Vienna, November 7-12, 2008.
- T39. Interactions Between Noncommutative Algebra and Algebraic Geometry. Banff International Research Station, Banff, October 26-31, 2008.
- T40. AMS Sectional Meeting, University of British Columbia, Vancouver, October 4-5, 2008.
- T41. Food For Thought Seminar, University of California, San Diego, April 17, 2008.
- T42. Advancement to Candidacy Talk, University of California, San Diego, September 20, 2007.

Visits,  
attended  
conferences

- V1. University of Pisa, May – June 2021, Visiting Fellow.
- V2. University of Bologna, March – April 2021, Visiting Fellow of ISA.
- V3. University of Rome “La Sapienza”, January – February 2021, Visiting Professor.
- V4. Formal Power Series and Algebraic Combinatorics (FPSAC) 2019, University of Ljubljana, Ljubljana, Slovenia, July 1–5, 2019. Poster.
- V5. New Directions in Algebraic Combinatorics, UCSD, San Diego, US, June 17–20, 2019.
- V6. University of Pennsylvania, October 28 – November 3, 2018. Visit, host: Jim Haglund
- V7. University of Bologna, October 2017. Visit, host: Luca Migliorini
- V8. Combinatorics of Root Systems, Cortona, May 19–22, 2017.
- V9. LaBRI (CNRS), Bordeaux, October. Visit, host: Yvan Le Borgne
- V10. University of California San Diego, San Diego July-August 2014. Visit, host: Efim Zelmanov
- V11. University of Siena, Siena June 2014. Visit, host: Simone Rinaldi
- V12. University of Bologna, Bologna March 2014. Visit, host: Luca Migliorini
- V13. LIAFA, Université Paris 7, Paris January 2014. Visit, host: Enrica Duchi
- V14. Max Planck Institut für Mathematik, Bonn October 2013. Visit, host: Luca Migliorini
- V15. University of Siena, Siena September 2013. Visit, host: Simone Rinaldi
- V16. LaBRI (CNRS), Bordeaux, January-February 2012. Visit, host: Robert Cori
- V17. Journées de Combinatoire de Bordeaux 2011, LaBRI (CNRS), Bordeaux, January 26–28, 2011.
- V18. The Interplay of Algebra and Geometry, Il Palazzone, Cortona, June 14–20, 2009.
- V19. University of California Lie Theory Workshop, University of California, San Diego, February 16–18, 2008.
- V20. AMS-MAA Joint Meeting, San Diego, January 6–8, 2008.
- V21. Dichotomy Amenable/Nonamenable in Combinatorial Group Theory, AIM, Palo Alto, October 8–12, 2007.
- V22. XIII Incontro Italiano di Combinatorica Algebrica, Università di Roma *La Sapienza*, Roma, December 18–20, 2006.

## Teaching Experience

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I am (or I have been) in charge of the following bachelor and master courses:

Date	Code	Course
2019-2020	MATHF102	Algèbre linéaire et géométrie: aspects théoriques et algorithmiques. Université Libre de Bruxelles (ULB), Belgium. ETCS: 7,5. Hours: 42h. Level: Bachelor.
	MATHF112	Mathématiques. Université Libre de Bruxelles (ULB), Belgium. ETCS: 5. Hours: 30h. Level: Bachelor.
	MATHF3003	Algèbre et géométrie II. Université Libre de Bruxelles (ULB), Belgium. ETCS: 5. Hours: 24h. Level: Bachelor.
	MATHF427	Algèbre combinatoire. Université Libre de Bruxelles (ULB), Belgium. ETCS: 5. Hours: 24h. Level: Master.
2013-2019	MATHF102	Algèbre linéaire et géométrie: aspects théoriques et algorithmiques. Université Libre de Bruxelles (ULB), Belgium. ETCS: 15. Hours: 84h. Level: Bachelor.
	MATHF427	Algèbre combinatoire. Université Libre de Bruxelles (ULB), Belgium. ETCS: 5. Hours: 24h. Level: Master.
2013-2015 2016-2019	MATHF305	Travaux de recherche mathématique. Université Libre de Bruxelles (ULB), Belgium. ETCS: 5. Hours: 12h. Level: Bachelor.
2012-2013	MATHF102	Algèbre linéaire et géométrie. Université Libre de Bruxelles (ULB), Belgium. ETCS: 6. Hours: 36h. Level: Bachelor.
	MATHF418	Théorie des groupes. Université Libre de Bruxelles (ULB), Belgium. ETCS: 5. Hours: 24h. Level: Master.

I have been teaching assistant for the following courses:

2011-2012	Group Rings.	University of Göttingen, Germany. Level: Master.
	Self-similar algebras and combinatorics	(Student seminar: organizer). University of Göttingen, Germany. Level: Master.
2010-2011	Groups and algebras	(Student seminar: organizer). University of Göttingen, Germany. Level: Master.
2009-2010	MATHF187	Introduction to cryptography. University of California San Diego, USA. Level: Bachelor.
	MATHF103B	Modern algebra II. University of California San Diego, USA. Level: Bachelor.
	MATHF20C	Calculus and analytic geometry for science and engineering. University of California San Diego, USA. Level: Bachelor.
	MATHF148A	Combinatorics. University of California San Diego, USA. Level: Bachelor.
2008-2009	MATHF202C	Applied algebra. University of California San Diego, USA. Level: Master.
	MATHF187	Introduction to cryptography. University of California San Diego, USA. Level: Bachelor.
	MATHF20C	Calculus and analytic geometry for science and engineering. University of California San Diego, USA. Level: Bachelor.
	MATHF200B	Algebra. University of California San Diego, USA. Level: Master.
	MATHF10A	Calculus. University of California San Diego, USA. Level: Bachelor.
2007-2008	MATHF202C	Applied algebra. University of California San Diego, USA. Level: Master.
	MATHF202C	Applied algebra. University of California San Diego, USA. Level: Master.
	MATHF103A	Applied modern algebra. University of California San Diego, USA. Level: Bachelor.
	MATHF20A	Calculus and analytic geometry for science and engineering. University of California San Diego, USA. Level: Bachelor.
2006-2007	MATHF109	Mathematical reasoning. University of California San Diego, USA. Level: Bachelor.
	MATHF20F	Linear algebra. University of California San Diego, USA. Level: Bachelor.

## Editorial and Organizational Activities

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I served as referee for the following journals and conferences:

Journals	Journal of the European Mathematical Society Journal of Algebraic Combinatorics Groups, Geometry and Dynamics Journal of Combinatorial Theory series A International Mathematics Research Notices Journal of the London Mathematical Society Journal of Graph Theory Annals of Combinatorics Discrete Mathematics Order
Conferences	FPSAC SODA

Other activities: I am (or I have been)

- Secretary of jury of Bachelor of Mathematics at ULB
- Président coordination pédagogique at Mathematics Department of ULB
- Member of “Commission Assistants”
- Member of hiring committees at Mathematics Department of ULB
- Referee for national grants for research
- Coordinator of “Guidances mathématiques”
- Organizer of “ULB Algebra and Combinatorics seminar”

## Grants and Honorary Fellowships

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During my studies and my research activities I obtained the following grants and honorary fellowships:

2020-2025	Research grant ARC advanced (one of four Principal Investigators, ~ 660000 EUR), <i>From algebra to combinatorics, and back.</i>
2020-2022	Research grant from Thelam Fund, <i>Theta operators, Delta conjectures, and coinvariants.</i>
2014-2016	Crédit de recherche FNRS J.0127.14, <i>Algebraic Combinatorics and Sandpile model.</i>
2010-2012	European Post-Doctoral Institute Fellowship (offered but declined).
2006-2007	Graduate Research Assistantship, University of California San Diego
2001-2004	Scholarship from Istituto Nazionale Di Alta Matematica.

## Supervision Activity

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I am or I have been the supervisor the following students:

Type	Date	Names
Doctoral Thesis	2016-2020	Anna Vanden Wyngaerd (ULB)
	2016-2019	Alessandro Iraci (University of Pisa / ULB)
Mémoires (Master thesis)	2019-2020	Corentin Bodart, Carole Duvivier

	2018-2019 Clara Deldaele
	2017-2018 Metti Kayser
	2015-2016 Noé Berger, Guillaume Konen, Anna Vanden Wyngaerd
Initiation à la recherche	2019-2020 Yasser Chamaoui, Leonel Damdja Mfondja
	2018-2019 Corentin Bodart
	2017-2018 Youssef Ben Abdelkader, Carole Duvivier
	2016-2017 Metti Kayser
	2015-2016 Adrien Vandenschrick, Carole Müller, Nicolas Roobaert
	2014-2015 Julien Remy
Travaux de recherche (Bachelor thesis)	2018-2019 Christoph Broy, Serdar Turkoz, Pacôme Van Overschelde
	2017-2018 Leonel Damdja Mfondja, Remy Hadhri, Jamal Menssouri
	2016-2017 Colin Sterckx, Lancelot Semal, Yasmina El Oudghiri
	2015-2016 Nathan Meynaert, Yan Qian
	2014-2015 Enrico Laddomada, Fränk Plein, Yannick Thiry, Adrien Vandenschrick

I have been referee for the following PhD thesis and mémoires:

PhD thesis	2020 Hoan-Phung Bui (ULB)
	2019 Alessandro Iraci (University of Pisa / ULB)
	2018 Jiawei Hu (ULB), Jordi Vanpoucke (VUB)
	2016 Sonia Riedel (University of Bremen)
Mémoires (Master thesis)	2020 Laura Dumont (ULB)
	2019 Lancelot Semal (ULB)
	2018 Nathan Meynaert (ULB), Corentin Vienne (ULB), Thomas Makkink (ULB)
	2016 Jérôme Heyder (ULB), Eileen Robinson (ULB), Nikolaj Ryschkov (Antwerp)
	2015 Robin Walravens (ULB), Emilie Clette (ULB)
	2014 François Thilmany (ULB)
	2013 Adam Virginie (ULB), Kerg Giancarlo (ULB)

## Personal Informations

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Born in:	Foggia, Italy, on February 10th 1983
Nationality:	Italian.