

CURRICULUM VITAE

DANIELE D'ANGELI

- **PERSONAL INFORMATION:**

name: Daniele D'Angeli.

birth: Rieti, June the 28th, 1980.

citizenship: Italian.

e-mail address: daniele.dangeli@unicusano.it

languages known: Italian (mother tongue), English (advanced), French (advanced), Spanish (advanced), German (advanced), Portuguese (good).

- **SCIENTIFIC RESPONSABILITY:**

Coordination of scientific project: Principal investigator of the FWF project "ASYMPTOTIC ASPECTS AND AUTOMATA IN GROUP THEORY" (2017-2020).

Two PhD students: Abraham Gutierrez (TUGraz) - subject: Černy conjecture for circular automata.
Stefan Hammer (TUGraz) - subject: The Wiener index for the Basilica graphs.

One master student: Stefan Hammer (TUGraz) - title: The Wiener index for the Basilica graphs.

Two bachelor students: Veronica Caruso (Unicusano) - title: Applicazioni della teoria dei grafi a sistemi idrologici.
Rossella Amato (Unicusano) – in corso

Participant in the FWF project "Hyperbolic Structures in Stochastics, Geometry, and Topology" (Prof. W. Woess 2013-2017).

Participant in the Swiss National Science Foundation Research project "Combinatorial, Geometric and Probabilistic Aspects of Infinite Groups" (Prof. T. Smirnova-Nagnibeda 2008).

Participant in the project of Sapienza university "Algebra di operatori, geometria noncommutativa, gruppi quantistici e applicazioni alla teoria quantistica dei campi, la combinatoria e la teoria dei numeri". Prof. R. Conti (2020)

- **EDUCATION:**

Master's Degree in Mathematics:

University of Rome "La Sapienza", Department of Mathematics
G. Castelnuovo, with thesis "Problems about Inverse Galois Theory"
adviser Prof. A. Machì and grading 110/110 cum laude (September
1999- September 2003).

PhD in Mathematics:

University of Rome "La Sapienza", Department of Mathematics
G. Castelnuovo, with thesis "Groups, Probability and Combinatorics:
different aspects in Gelfand Pairs theory" advisers Proff.
T. Ceccherini-Silberstein and F. Scarabotti (October 2003- January
2008).

- **EDUCATIONAL QUALIFICATIONS:**

National Italian Academic Qualification as Full Professor in Algebra and Geometry (2021).

Qualification as maître de conférences (2015)

Habilitation: Austrian Academic Qualification obtained at TUGraz (2017).

In the short list of candidades considered for the **Teaching Excellence Award of TUGraz (2017-2018)**.

- **RESEARCH POSITIONS:**

Present position: Researcher position (Ricercatore tipo B), Univ. Cusano Roma (since June 2019).

Assistant Professor, TU Graz (Austria) (April 2013-May 2019).

Research position at UTAD University, Vila Real (Portugal) (September 2012-February 2013).

Visiting Professor at the University of Los Andes, Bogotá (Colombia) (August 2010-September 2011).

Research position at Technion University, Department of Mathematics. Haifa, Israel (October 2009-July 2010).

Post-Doc position at University of Geneva, Department of Mathematics. Geneva, Switzerland (September 2007-September 2009)

Post-Doc position in the frame of 2009 Swiss National Science Foundation Research project "Combinatorial, Geometric and Probabilistic Aspects of Infinite Groups" (Prof. T. Smirnova-Nagnibeda).

- **VISITING POSITIONS:**

Visiting researcher at TU Graz University, Department of Mathematics, Graz, Austria (November 2012).

Visiting researcher at Unicusano University, Roma, Italy (February 2014).

Visiting researcher at Porto University, Department of Mathematics, Porto, Portugal (July 2014).

Visiting researcher at Marseille University, Department of Mathematics, Marseille, France (December 2014).

Visiting researcher at Diderot Paris 7 University, LIAFA , Paris, France (February 2015).

Visiting researcher at University of L'Aquila, L'Aquila, Italy (May 2016).

Visiting researcher at Politecnico Milano, Milano, Italy (May-June 2016).

Visiting researcher at Unicusano University, Roma, Italy (February 2018).

Visiting researcher at Bicocca University, Milano, Italy (May-June 2018).

- **GIVEN TALKS:**

Amenability and Burnside Groups (Rome, May 2004);

For Harmonic Analysis Seminar:

Groups of Automorphisms of the Rooted Tree I (Rome, November 2005);

Groups of Automorphisms of the Rooted Tree II (Rome, November 2005);

The Baumslag-Solitar Group as a Group of Automorphisms of the Dyadic Tree (Rome, February 2006).

Chaine de Markov sur les structures "orthogonal block" (Geneva, June 2007).

Paires de Gelfand et fonctionnes spheriques (Geneva, November 2007).

Groups, Probability and Combinatorics: different aspects in Gelfand Pairs theory (Roma, January 2008).

The dimer model on the Sierpinski gasket and on the Pascal graph (Wien, July 2008).

The dimer and the Ising model for Schreier graphs of self-similar groups (Rome, September 2008).

The Ising model and the Dimer model on some Schreier graphs of self-similar groups (Fribourg, November 2008).

The boundary action of the Basilica group (Graz, June 2009).

Self-similar groups and finite Gelfand pairs (Haifa, November 2009).

Infinite Schreier graphs of self-similar groups: the case of the Basilica group (Jerusalem, November 2009).

Infinite Schreier graphs of self-similar groups (Haifa, January 2010).

Groups generated by bounded automata (Be'er Sheva, March 2010).

Grafi di Schreier infiniti di gruppi self-similar (Roma, April 2010).

Insect Markov Chain and Crested Products (Haifa, May 2010).

Schreier graphs and limit space (Haifa, May 2010).

Cayley graphs and growth of groups (Uniandes, Bogotà, August 2010).

The dimer model and the Ising model: the combinatorial approach in the case of the Schreier graphs of self-similar groups (Uniandes, Bogotà, September 2010).

The Dimer and the Ising model on some self-similar graphs (Universidad Javeriana, Bogotà, October 2010).

Ends of Schreier graphs of self-similar groups (Pucòn, December 2010).

Infinite Schreier graphs of self-similar groups (Uniandes, Bogotá, April 2011).

Schreier graphs of self-similar groups (Caldas Novas, Brazil, May 2011).

Self-similar groups: examples, constructions and more (Southampton, UK, December 2011).

New example of self-similar constructions (Vila Real, Portugal, October 2012).

Self-similar groups: constructions, applications and open problems (Graz, Austria, November 2012).

Automata groups (Porto, Portugal, November 2012).

Schreier graphs of self-similar groups (Coimbra, Portugal, December 2012).

Schreier graphs of self-similar groups (Lisbona, Portugal, December 2012).

Markov chains and Gelfand pairs (Vila Real, Portugal, January 2013).

L'iperboloide di Cartesio (Roma, Italia, May 2013).

The zig-zag product of graphs (Graz, Austria, November 2013).

Topological and isometric properties of the zig-zag product of graphs (Cortona, Italy, June 2014).

Freeness in automata groups (Porto, Portugal, July 2014).

Open problems in automata groups (Graz, Austria, October 2014).

Action graphs and transducers (Marseille, France, December 2014).

Freeness of automata groups vs boundary dynamics (Paris, France, February 2015).

An invitation to Groups and Graphs from Automata (Graz, Austria, October 2015).

Gruppen und Automaten (Graz, Austria, December 2015).

Groups and graphs from automata (L'Aquila, Italy, May 2016)

An invitation to Automaton Groups (Milano Politecnico, Italy, May 2016)

Wachstum von Gruppen und Mittelbarkeit Cayley Graphen endlich präsentierter Gruppen (Talk for the Austrian Academic Qualification) (Graz, Austria, April 2017)

Automaton (semi)groups: on the undecidability of some problems (Paris, France, July 2017).

Automata and Schreier graphs (Milano Bicocca, Italy, May 2018).

Some recent results in Automaton (semi-)groups (Pavia, Congresso UMI, September 2019).

Cerny conjecture (Graz, Austria, December 2019).

Graph automaton Groups (TUGraz talk online, November 2020)

- **ORGANIZATION OF CONFERENCES AND WORKSHOPS:**

Organizer of the first meeting of Algebra in Bogotà (April, 2011).

Organizer: Section NEW TRENDS IN AUTOMATA (SEMI)GROUPS, AMS-EMS-SPM International Meeting 2015 (Porto, Portugal, June 2015).

Organizer: of A conference on the occasion of the 50th birthday of Tullio Ceccherini-Silberstein (Rome, Italy, February, 2017).

Organizer: of GAG Workshop (Groups, Automata, Graphs) (Graz, Austria, February, 2019).

Organizer: of Semigroups and Groups, Automata, Logics Sandgal 2019 (Cremona, Italy, June, 2019).

Organizer: Algebraic Combinatorics and Graph Theory (Roma, Italy, Dipartimento SBAI - Sapienza, Settembre, 2021)

- **CONFERENCES ATTENDED:**

Geometric Group Theory, Random Walks and Harmonic Analysis (Cortona, Italy, June 2004).

Asymptotic Group Invariants and Their Applications (A&M University College Station, Texas U.S., February 2005).

Discrete Probability (Vienna, Austria, March 2006).

Random Walks on Groups (Marseille, France, February 2007).

Winter school in group theory (Dijon, France, November 2007).

Groups generated by automata (Ascona, Switzerland, February 2008).

Groups and Dynamics (Les Diablerets, Switzerland, March 2008).

Combinatorics and Statistical Mechanics (Wien, Austria, July 2008).

Workshop on boundaries (Graz, Austria, June 2009).

Action Now. Mathematics in Israel (Haifa, Israel, December 2009).

Cat(0)- spaces and affine buildings (Sde-Boker, Israel, February 2010).

Geometry, Topology and Computation in Groups (Les Diablerets, Switzerland, March 2010).

First meeting AMS-SOMACHI (Pucòn, Chile, December 2010).

Meeting Sidki 70 in honour of S. Sidki (Caldas Novas, Brazil, May 2011).

Algebraic methods in experimental design (London, United Kingdom, October 2011).

AGORA meeting sur Dynamique topologique (France, January 2012).

Parole aux jeunes chercheurs sur les groupes (Geneva, Switzerland, December 2012).

OEMG-DMV-Congress (Innsbruck, Austria, September 2013).

Groups acting on rooted trees and around (IHP, Paris, February 2014).

Groups, Graphs, and Random Walks (Conference in Honor of Wolfgang Woess's 60th Birthday) (Cortona, Italy, June 2014) - **invited speaker**.

Ischia group Theory 2016 (Ischia, Italy, April 2016).

Groups of intermediate growth, amenability and related questions (Les Diablerets, Switzerland, March 2017).

MealyM Final Event (Paris, France, July 2017) - **invited speaker**.

Congresso UMI 2019 (Pavia, Italy, September 2019) - **invited speaker**.

Workshop on Graphs, Topology and Topological Groups (online – March 2021)

Ischia Group Theory (online – April 2021)

• **PUBLICATIONS AND PREPRINTS:**

- (1) D. D'Angeli and A. Donno, Self-similar Groups and finite Gelfand pairs, *Algebra and Discrete Math*, No.2 (2007) 43–53.
- (2) D. D'Angeli and A. Donno, Weights, Growth and Amenability, *J. Math. Sci. (N.Y.)*, Vol. 156, no.1, (2009) 123–155.
- (3) D. D'Angeli and A. Donno, D. D'Angeli and A. Donno, Some examples of Tychonoff groups, *J. Math. Sci. (N.Y.)*, Vol. 156, no.1, (2009), 156–172.
- (4) D. D'Angeli and A. Donno, A group of the automorphisms of the rooted dyadic tree and associated Gelfand pairs, *Rendiconti del Seminario Matematico dell'Univ. di Padova*, Vol. 121 (2009), 73–92.
- (5) D. D'Angeli and A. Donno, Crested products of Markov chains, *Annals of Applied Probability*, Vol. 19, no. 1, (2009), 414–453.
- (6) D. D'Angeli and A. Donno, No cut-off phenomenon for the Insect Markov chain, *Monatshefte für Mathematik*, Vol. 156, Issue 3, (2009), 201–210.
- (7) T. Ceccherini-Silberstein, D. D'Angeli, A. Donno, F. Scarabotti and F. Tolli, Finite Gelfand pairs: examples and application, in *Proceedings Group Theory Ischia 2008*, World Scientific 2009.
- (8) D. D'Angeli and A. Donno, Markov Chains in orthogonal block structures, *European Journal of Combinatorics*, Vol. 31 (2010), 34–46.
- (9) D. D'Angeli and A. Donno, Weighted spanning trees on some self-similar graphs, *Electronic J. Comb.* Vol. 34, (2010), 139–156.
- (10) D. D'Angeli, A. Donno, M. Matter, T. Nagnibeda, Schreier graphs of the Basilica group, *Journal of Modern Dynamics*, Vol.

- 4, no. 1, 167–205, (2010).
- (11) D. D’Angeli and A. Donno, Generalized crested product of Markov Chain, *European Journal of Combinatorics*, 32, Issue 2, (2011), 23–46.
- (12) D. D’Angeli, A. Donno and T. Smirnova-Nagnibeda, Partition functions of the Ising model on some self-semiar Schreier graphs, *Progress in Probability: Random Walks, Boundaries and Spectra*, (D. Lenz, F. Sobieczky and W. Woess editors), 64, (2011), 277–304, Springer Basel.
- (13) D. D’Angeli, A. Donno and T. Smirnova-Nagnibeda, Counting dimer coverings on self-similar Schreier graphs, *European Journal of Combinatorics*, Vol. 33, no. 7, 1484–1513. (2012)
- (14) D. D’Angeli, A. Donno, The lumpability property for a family of Markov chains on poset block structures, *Adv. in Appl. Math.* Vol. 51 (2013), no. 3, 367–391.
- (15) G. Chacòn, R. Colucci and D. D’Angeli, Recurrence analysis on Julia sets of semigroups of complex polynomials, *J. Appl. Math. Comput.* Vol. 46 (2014), no. 1-2, 201–214.
- (16) D. D’Angeli and A. Donno, Gelfand pairs associated with the action of G , appendix to the paper “On a family of Schreier graphs of intermediate growth associated with a selfsimilar group”, *European Journal of Combinatorics*, 33, Issue 7, (2012), 1408–1421.
- (17) G. Chacòn, R. Colucci and D. D’Angeli, Density of backward paths on the Julia set of a semigroup, *Sarajevo J. Math.*, 10 (22) (2014), no. 1, 77–85.
- (18) D. D’Angeli and E. Rodaro, Groups and semigroups defined by colorings of synchronizing automata, *Internat. J. Algebra Comput.* Vol. 24 (2014), no. 6, 773–793.
- (19) D. D’Angeli and A. Donno, Isomorphism classification of infinite Sierpinski carpet graph, in *Proceedings of the First Minisymposium on Mathematics in Engineering and Technology, ICNAAM 2014*.
- (20) D. D’Angeli, Schreier graphs of an extended version of the binary adding machine, *Electron. J. Combin.* Vol. 21 (2014), no. 4, Paper 4.20

- (21) D. D'Angeli and E. Rodaro, A geometric approach to (semi)-groups defined by automata via dual transducers, *Geom. Dedicata* Vol. 174 (2015), 375–400.
- (22) D. D'Angeli, A. Donno and A. Monti, Computing the Wiener index in finite Sierpinski carpet graphs, International Conference of Numerical Analysis and Applied Mathematics 2015 (ICNAAM 2015), 22–28 September 2015, Rhodes, Greece, Vol. 1738.
- (23) D. D'Angeli, A. Donno and E. Sava-Huss, Connectedness and isomorphism problems of the zig-zag product of graphs, *J. Graph Theory*, 83 (2016), no. 2, 120–151.
- (24) D. D'Angeli and E. Rodaro, Freeness of automata groups vs boundary dynamics, *Journal of Algebra*, 462 (2016), 115–136.
- (25) I. Bondarenko, D. D'Angeli and E. Rodaro, The lamplighter group $Z_3 \wr \mathbb{Z}$ generated by a bireversible automaton, *Communications in Algebra*, 44 (2016), no. 12, 5257–5268. .
- (26) D. D'Angeli and A. Donno, Metric compactification of infinite Sierpinski carpet graphs, *Discrete Mathematics*, 339, (2016), 2693–2705.
- (27) D. D'Angeli, Horofunctions in Sierpiński type graphs, *Utilitas Mathematica*, 105 (2017), 267–277.
- (28) D. D'Angeli and A. Donno, Wreath product of matrices, *Linear Algebra Appl.*, 513 (2017), 276–303.
- (29) I. Bondarenko, D. D'Angeli and T. Nagnibeda, Ends of Schreier graphs and cut-points of limit spaces of self-similar groups, *J. Fractal Geom.* 4 (2017), no. 4, 369–424.
- (30) D. D'Angeli, E. Rodaro and J.P. Wächter, On the Complexity of the Word Problem of Automaton Semigroups and Automaton Groups, *Advances in Applied Mathematics*, 90 (2017), 160–187.
- (31) D. D'Angeli and A. Donno, Shuffling matrices, Kronecker product and Discrete Fourier Transform, *Discrete Applied Mathematics*, 233 (2017), 1–18.
- (32) D. D'Angeli and E. Rodaro, Fragile words and Cayley machines, *Int. J. Group Theory*, Volume 7, Issue 3 (Proceedings of the Ischia Group Theory 2016-Part III), (2018), 95–109.

- (33) D. D'Angeli and A. Donno, Structure polynomials and subgraphs of rooted regular trees, *Algebra Colloq.* 25 (2018), no. 1, 45–70.
- (34) D. D'Angeli, A. Donno and E. Rodaro, Catalan fragile words, to appear in *Int. J. Group Theory*.
- (35) D. D'Angeli, T. Godin, I. Klimann, M. Picantin and E. Rodaro, Boundary dynamics for bireversible and for contracting automaton groups, *Int. J. Algebra and Computation* vol. 30 , p. 431–449, (2020).
- (36) D. D'Angeli, E. Rodaro and J.P. Wächter, Automaton semigroups and groups: On the undecidability of problems related to freeness and finiteness, *Israel J. of Mathematics*, <https://doi.org/10.1007/s11856-020-1972-5>.
- (37) D. D'Angeli, E. Rodaro and J.P. Wächter, Orbit expandability of automaton semigroups and groups, *Theoretical Computer Science*, Volume 809, Pages 418–429.
- (38) A. Shaikh, D. D'Angeli, H. Bhate, D. Sheth, Galois coverings of Schreier graphs of groups generated by bounded automata, submitted (2018).
- (39) M. Cavaleri, D. D'Angeli and A. Donno, Permutational powers of a graph, *Electronic J. of Combinatorics*, Vol. 26 (4) 2019, P4.22 .
- (40) D. D'Angeli, E. Rodaro, P. Silva and A. Zakharov (2020). Eraser morphisms and membership problem in groups and monoids. *Communications in Algebra*. 1–23. 10.1080/00927872.2020.1740243
- (41) D. D'Angeli, E. Rodaro and J.P. Wächter, (2020). Orbit Expandability of Automaton Semigroups and Groups. *Theoretical Computer Science*. 809. 10.1016/j.tcs.2019.12.037.
- (42) D. D'Angeli, T. Godin, I. Klimann, M. Picantin and E. Rodaro, Boundary dynamics for bireversible and for contracting automaton groups, *Int. J. Algebra and Computation*, Vol. 30, No. 02, pp. 431-449 (2020) .

- (43) D. D'Angeli, E. Rodaro and J.P. Wächter, On the Structure Theory of Partial Automaton Semigroups, submitted (2018).
- (44) D. D'Angeli, D. Francoeur, E. Rodaro and J.P. Wächter, Infinite automaton semigroups and groups have infinite orbits, *Journal of Algebra*, Volume 553, 1 July 2020, Pages 119–137
- (45) D. D'Angeli, E. Rodaro and J.P. Wächter, Automaton semi-groups and groups: On the undecidability of problems related to freeness and finiteness, *Israel Journal of Mathematics* volume 237, pages 15–52 (2020)
- (46) M. Cavaleri, D. D'Angeli, A. Donno and E. Rodaro, Graph automaton groups, *Adv. Group Theory Appl.*, Vol. 11, 75-112, (2021).
- (47) M. Cavaleri, D. D'Angeli and A. Donno, A group representation approach to balance of gain graphs, *Journal of Algebraic Combinatorics*, 1-29, (2020)
- (48) M. Cavaleri, D. D'Angeli and A. Donno, Gain-line graphs via G-phases and group representations, *Linear Algebra and its Applications*, 613, 241-270 (2021)
- (49) M. Cavaleri, D. D'Angeli, A. Donno and E. Rodaro, On an uncountable family of graphs whose spectrum is a Cantor set, submitted (2021)

• **TEACHING EXPERIENCE:**

Teaching Assistant of Geometry I (Department of Engineering “La Sapienza” Univ. Rome, Fall 2006) (in Italian).

Teaching Assistant of Geometry II (Department of Engineering “La Sapienza” Univ. Rome, Fall 2006) (in Italian).

Assistant of Analysis I (Department of Mathematics University of Geneva, Fall 2007) (in French).

Assistant of Math. Générale (Department of Mathematics University of Geneva, Fall 2007) (in French).

Assistant of Algebra I (Department of Mathematics University of Geneva, Spring 2008) (in French).

Assistant of Math. Générale (Department of Mathematics University of Geneva, Fall 2008) (in French).

Assistant of Travaux pratiques Analysis and Algebra (Department of Mathematics Uni-versity of Geneva, Fall 2008) (in French).

Assistant of Travaux pratiques Analysis and Algebra (Department of Mathematics Uni-versity of Geneva, Spring 2009) (in French).

Professor of Linear Algebra (Department of Mathematics Universidad de los Andes in Bogotá, Fall 2010) (in English).

Professor of Calculus (Department of Mathematics Universidad de los Andes in Bogotá, Fall 2010) (in English)

Professor of Geometric Group Theory (Department of Mathematics Universidad de los Andes in Bogotá, Spring 2011) (in Spanish).

Professor of Mathematik A (Department of Engineering TU Graz, Fall 2014) (in German).

Professor of Mathematik B (Department of Engineering TU Graz, Spring 2015) (in German).

Teaching Assistant of Mathematik A (Department of Engineering TU Graz, Fall 2013) (in German).

Teaching Assistant of Functional Analysis (Department of Mathematics TU Graz, Spring 2014) (in German).

Teaching Assistant of Symbolic Computations (Department of Mathematics TU Graz, Spring 2015) (in German).

Professor of Mathematik A (Department of Engineering TU Graz, Fall 2015) (in German).

Teaching Assistant of Mathematik B (Department of Engineering TU Graz, Spring 2016) (in German).

Professor of Measure Theory (Department of Mathematics TU Graz, Fall 2016) (in English).

Teaching Assistant of Mathematik B (Department of Engineering TU Graz, Spring 2017) (in German).

Professor of Mathematik A (Department of Engineering TU Graz, Fall 2017) (in German).

Professor of Functional Analysis (Department of Mathematics TU Graz, Spring 2018) (in German).

Professor of Mathematik A (Department of Engineering TU Graz, Fall 2018) (in German).

Professore di Istituzioni di Matematica per Ingegneria (Univ. Cusano, 2019-20-21) (in Italian).

- **REFeree ACTIVITY:**

Referee for the following journals: Combinatorica, Journal of Algebra and Its Applications, International Journal of Algebra and Computation, Discrete Mathematics.

- **COMPUTER SKILLS:**

PC operating systems - Windows (all versions up to and including XP), Linux and Mac.

Advanced command of Maple.

Advanced command of GAP.

Advanced command of Latex.

Software - Microsoft Office including Word, Excel, Powerpoint and Project; MS Works, Access, Win Zip, Internet Explorer, Outlook, including email, C++. Matlab, Mathematica, R user.

- **INTERESTS:**

Geometric Group Theory, Self-similar groups, Schreier graphs, Cellular Automata, Amenability, Models on Schreier graphs, Markov chains, Formal languages, Combinatorics.

