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Department of Mathematics
Dartmouth College
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Research Interests Enumerative and algebraic combinatorics; in particular, pattern-avoiding permutations, bijections, generating functions, lattice paths, generalized triangulations, algorithms, and applications to computational biology and dynamical systems.

Education MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT), Cambridge, MA, 2000-2004.
Ph.D. in Mathematics, June 2004.
Thesis title: *Statistics on Pattern-avoiding Permutations*.
Advisor: Richard Stanley.
GPA: 4.0/4.0.

UNIVERSITAT POLITÈCNICA DE CATALUNYA (UPC), Barcelona, Spain, 1996-2000.
B.S. in Mathematics, June 2000.
Undergraduate advisor: Marc Noy.
Ranked *First in Class*, with final grade of *A with Honors*.

Work Experience DARTMOUTH COLLEGE, Hanover, NH, 2007-present.
Assistant Professor (tenure-track).

DARTMOUTH COLLEGE, Hanover, NH, 2005-2007.
John Wesley Young Research Instructor.

CENTRE DE RECERCA MATEMÀTICA (CRM), Spain, winter 2007.
Postdoctoral Fellow in the program *Enumerative Combinatorics and Random Structures*.

INSTITUT MITTAG-LEFFLER, Sweden, spring 2005.
Postdoctoral Fellow. Member of the program *Algebraic Combinatorics*.

MATHEMATICAL SCIENCES RESEARCH INSTITUTE (MSRI), Berkeley, CA, 2004-2005.
Postdoctoral Fellow. Member of the programs *Hyperplane Arrangements and Applications*, Fall 2004, and *Probability, Algorithms, and Statistical Physics*, Spring 2005.

Publications *Permutations and β -shifts*, *J. Combin. Theory Ser. A* 118 (2011), 2474–2497.
Descent sets of cyclic permutations, *Adv. in Appl. Math.* 47 (2011), 688–709.
Restricted simsun permutations (with E. Deutsch), *Ann. Comb.*, to appear, [arXiv:0912.1361](https://arxiv.org/abs/0912.1361).
On basic forbidden patterns of functions (with Y. Liu), *Discrete Appl. Math.* 159 (2011), 1207–1216.
Cycle-up-down permutations (with E. Deutsch), *Australas. J. Combin.* 50 (2011), 187–199.
The X-class and almost-increasing permutations, *Ann. Comb.* 15 (2011), 51–68.
Improved bounds on the number of numerical semigroups of a given genus, *J. Pure Appl. Algebra* 214 (2010), 1862–1873.
The largest and the smallest fixed points of permutations (with E. Deutsch), *European J. Combin.* 31 (2010), 1404–1409.

Permutations realized by shifts, *Discrete Math. Theor. Comput. Sci. proc. AK* (2009), 361–372.

The number of permutations realized by a shift, *SIAM J. Discrete Math.* 23 (2009), 765–786.

Sorting by Placement and Shift (with P. Winkler), *Proceedings of the Twentieth Annual ACM-SIAM Symposium on Discrete Algorithms, SODA* 2009.

Pattern avoidance in dynamical systems (with J.M. Amigó, M.B. Kennel), *Discrete Math. Theor. Comput. Sci. proc. AJ* (2008), 71–82.

Forbidden patterns and shift systems (with J.M. Amigó, M.B. Kennel), *J. Combin. Theory Ser. A* 115 (2008), 485–504.

Generating trees for permutations avoiding generalized patterns, *Ann. Comb.* 11 (2007), 435–458.

A bijection between 2-triangulations and pairs of non-crossing Dyck paths, *J. Combin. Theory Ser. A* 114/8 (2007), 1481–1503.

Bounds on the number of inference functions of a graphical model (with K. Woods), *Statist. Sinica* 17 (2007), 1395–1415.

The probability of choosing primitive sets (with K. Woods), *J. Number Theory* 125 (2007), 39–49.

Restricted Dumont permutations, Dyck paths, and noncrossing partitions (with A. Burnstein and T. Mansour), *Discrete Math.* 306 (2006), 2851–2869.

Combinatòria i biologia: funcions d’inferència i alineació de seqüències, *Butl. Soc. Catalana Mat.* 21 (2006), n. 1, 39–52.

Asymptotic enumeration of permutations avoiding generalized patterns, *Adv. in Appl. Math.* 36 (2006), 138–155.

Inference functions. Chapter of the book *Algebraic Statistics for Computational Biology*, edited by L. Pachter and B. Sturmfels, Cambridge University Press, 2005.

Bounds for optimal sequence alignment (with F. Lam). Chapter of the book *Algebraic Statistics for Computational Biology*, edited by L. Pachter and B. Sturmfels, Cambridge University Press, 2005.

Old and young leaves on plane trees (with W.Y.C. Chen and E. Deutsch), *European J. Combin.* 27 (2006), Issue 3, 414–427.

Multiple pattern-avoidance with respect to fixed points and excedances, *Electron. J. Combin.* 11 (2004), #R51.

Restricted Motzkin permutations, Motzkin paths, continued fractions, and Chebyshev polynomials (with T. Mansour), *Discrete Math.* 305 (2005), 170–189.

A simple and unusual bijection for Dyck paths and its consequences (with E. Deutsch), *Ann. Comb.* 7 (2003), 281–297.

Bijections for refined restricted permutations (with I. Pak), *J. Combin. Theory Ser. A* 105 (2004), 207–219.

Fixed points and excedances in restricted permutations, *Proceedings of FPSAC 2003*.

Consecutive Subwords in Permutations (with M. Noy), *Adv. in Appl. Math.* 30 (2003), 110–125.

Games and Invariants. Chapter of the book *Training Sessions for the International Mathematical Olympiad* (in Catalan), Catalan Mathematical Society, Barcelona, 2000.

Selected Presentations

SIAM Conference on Discrete Mathematics, mini-symposium on Algebraic Combinatorics, Jun. 2012 (invited).

University of Florida Mathematics Colloquium, Feb. 2012.

University of Miami Combinatorics Seminar, Feb. 2012.

International conference on Formal Power Series and Algebraic Combinatorics:

FPSAC 2011, FPSAC 2008, FPSAC 2007, FPSAC 2006, FPSAC 2003 (talks);
FPSAC 2009, FPSAC 2005, FPSAC 2004, FPSAC 2001 (posters).
Dartmouth College Combinatorics Seminar, Sep. 2011, Oct. 2010, Jan. 2010, Apr. 2009, Jan. 2009.
University of Pennsylvania Combinatorics Seminar, Apr. 2011.
University of British Columbia Discrete Maths Seminar, Apr. 2011.
Pacific Permutation Patterns Workshop, SFU, Mar.-Apr. 2011 (invited).
Simon Fraser University Discrete Maths Seminar, Mar. 2011.
AMS Fall Eastern Section Meeting, Oct. 2010 (invited).
SIAM Conference on Discrete Mathematics, mini-symposium on Enumerative Combinatorics, Jun. 2010 (invited).
Conference in Honor of Doron Zeilberger's 60th Birthday, Rutgers University, May 2010.
Howard University Mathematics Colloquium, May 2010, Feb. 2007.
JHU Center for Talented Youth, Keynote address, May 2010.
LaCIM Séminaire, UQAM, Apr. 2010.
MIT Combinatorics Seminar, Mar. 2010, Sep. 2006, Feb. 2005, Nov. 2003.
Rutgers University Experimental Mathematics Seminar, Feb. 2010.
AMS Fall Southeastern Meeting, Oct. 2009 (invited).
AMS Fall Eastern Section Meeting, Oct. 2009 (invited).
University of Hawaii Mathematics Colloquium, Oct. 2009.
23rd Midwest Conference on Combinatorics, Cryptography, and Computing, Oct. 2009 (invited).
International conference on Permutation Patterns: PP 2009, PP 2008, PP 2006, PP 2005, PP 2004.
SIAM Symposium on Discrete Algorithms, SODA, Jan. 2009.
Universitat Politècnica de Catalunya, Seminar in non-linear dynamics, Dec. 2008.
University of Washington Combinatorics Seminar, Oct. 2008.
Jornadas de Matemática Discreta y Algorítmica, Spain, July 2008.
George Washington University Combinatorics Seminar, May 2008.
AMS Fall Central Section Meeting, De Paul University, Oct. 2007 (invited).
Discrete Mathematics Day of the Northeast, Middlebury College, Sep. 2007.
Coloquio Latinoamericano de Álgebra, Colombia, Jul. 2007 (invited).
Conference on Enumeration and Probabilistic Methods in Combinatorics, CRM, Spain, Jun. 2007.
University of Denver Mathematics Colloquium, Feb. 2007.
University of Colorado at Boulder Mathematics Colloquium, Feb. 2007.
UQAM Mathematics Colloquium, Feb. 2007.
University of Vermont Mathematics Colloquium, Feb. 2007.
Dartmouth College Mathematics Colloquium, Jan. 2007.
University of South Carolina Mathematics Colloquium, Jan. 2007.
University of Kentucky Mathematics Colloquium, Jan. 2007.
Centre de Recerca Matemàtica Seminar, Dec. 2006.
Wesleyan University, Algebra and Topology Seminar, Dec. 2006.
University of Vermont, Combinatorics Seminar, Nov. 2006.
AMS Fall Southeastern Meeting, Nov. 2006 (invited).
AMS Fall Eastern Meeting, Oct. 2006 (invited).
International Congress of Mathematicians (ICM), Madrid, Aug. 2006.
York University, Applied Algebra Seminar, Mar. 2006, Jan. 2004.
San Francisco State University Algebra-Geometry-Combinatorics Seminar, Jan. 2006.
U.C. Berkeley Combinatorics Seminar, Jan. 2006, Feb. 2004.

Dartmouth College Mathematics Colloquium, Jan. 2006.
 Joint meeting AMS - German Math. Soc. - Austrian Math. Soc., Germany, Jun. 2005 (invited).
 Institut Mittag-Leffler Seminar, Sweden, May 2005.
 MSRI Post-doc Seminar, Apr. 2005, Nov 2004.
 Bay Area Discrete Mathematics Day, San Jose State University, Apr. 2005.
 Algebraic Statistics in Computational Biology Seminar, U.C. Berkeley, Feb. 2005, Nov. 2004.
 University of Central Florida, Mathematics Department Colloquium, Jan. 2005.
 Stanford University Representation Theory and Algebra Seminar, Dec. 2004.
 U.C. San Diego Combinatorics Seminar, Oct. 2004.
 University of Michigan Combinatorics Seminar, Oct. 2004.
 U.C. Davis Discrete Mathematics and Representation Theory Seminar, Oct. 2004.
 Joint International Meeting RSME-AMS, Spain, Jun. 2003 (invited).
 UPC Seminar of Graph Theory, Combinatorics and Applications, Jun. 2000.

Awards and Fellowships

National Science Foundation Individual Grant DMS-1001046, *Pattern avoidance in dynamical systems*, Program in Algebra, Number Theory and Combinatorics, July 2010-July 2013, PI, \$150,000.
National Science Foundation Grant to organize the Conference on Permutation Patterns 2010, PI, \$14,460.
Junior Faculty Fellowship, Dartmouth College, 2010-2011.
Burke Research Initiation Award for Junior Faculty, Dartmouth College, 2007.
Beatriu de Pinós Postdoctoral Fellowship, Spain, winter 2007.
J. William Fulbright Association of Spanish Fulbright Alumni Fellowship, 2006.
Ph.D. Thesis Extraordinary Award, Universitat Politècnica de Catalunya (UPC), Barcelona, 2006.
Clay Mathematics Institute affiliate scholar, 2004-2006.
Institut Mittag-Leffler Postdoctoral Fellowship, Sweden, spring 2005.
Mathematical Sciences Research Institute Postdoctoral Fellowship, fall 2004 and spring 2005.
MAE Fellowship to study abroad, Spanish Ministry of Foreign Affairs, 2002-2003 and 2003-2004.
Second National Graduation Award in Mathematics, Ministry for Education, Spain, 2001.
“La Caixa” Foundation Fellowship. This is one of the most prestigious graduate fellowships conceded in Spain, and is awarded in person by His Majesty Juan Carlos I, King of Spain; Barcelona, 2000.
Initiation in Research Fellowship, Higher Council of Scientific Research (CSIC, Spain), Section of Physics and Mathematics, 2000.
Collaboration Fellowship from the Ministry of Education and Culture, Department of Applied Mathematics, UPC, Spain, 1999.
Silver Medal 1997, *Bronze Medal* 1996, Iberoamerican Mathematical Olympiad.
Record high score, Spanish Mathematical Olympiad, 1997. Received also two *Special Mentions* for exceptionally good solutions.
Honorable Mention, International Mathematical Olympiad, Bombay, India, 1996.
Gold Medal, Spanish Physics Olympiad, 1996.
Winner and Gold Medal, Spanish Mathematical Olympiad, 1996.

Professional Activities

Main organizer of the Eighth International Conference on Permutation Patterns, Dartmouth College, Aug. 9-13, 2010, with over 70 participants.

Member of the **Program Committee** of FPSAC 2010, San Francisco, Aug. 2010.

Main organizer of the weekly *Dartmouth Combinatorics Seminar*, 2007-present.

Co-organizer of the conference *Discrete Mathematics Day of the Northeast*, Dartmouth College, Oct. 2007, with over 50 participants.

Co-organizer of the conference *Mechanical Puzzles Day*, Dartmouth College, Feb. 2008, with over 100 participants.

Member of the Undergraduate Program Committee at the Dartmouth Math Department, 2010-2011.

Member of the Graduate Admissions Committee at the Dartmouth Math Department, 2008-2010.

Referee for 32 journals: *Advances in Applied Mathematics*; *American Mathematical Monthly*; *Analysis of Algorithms*; *Annals of Combinatorics*; *Australasian Journal of Combinatorics*; *Discrete Applied Mathematics*; *Discrete Mathematics*; *Discrete Mathematics and Theoretical Computer Science*; *Electronic Journal of Combinatorics*; *EuroComb*; *European Journal of Combinatorics*; *Experimental Mathematics*; *Formal Power Series and Algebraic Combinatorics*; *Integers: Electronic Journal of Combinatorial Number Theory*; *Journal of Algebraic Combinatorics*; *Journal of Combinatorial Theory Series A*; *Journal of Combinatorics*; *Journal of Integer Sequences*; *Journal of Mathematical Psychology*; *Journal of Pure and Applied Algebra*; *LMS Lecture Notes Series*; *Memorias Congreso Internacional Fibonacci*; *Order*; *Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms*; *Proceedings of the AMS*; *Pure and Applied Mathematics*; *Pure Mathematics and Applications*; *Séminaire Lotharingien de Combinatoire*; *SIAM Journal on Discrete Mathematics*; *SIAM Symposium on Discrete Algorithms (SODA)*; *Theoretical Computer Science*; *World Scientific Publishing Co.*

Guest editor for *Pure Mathematics and Applications*.

Reviewer for *Mathematical Reviews*.

Problem Coordinator (in charge of developing the grading schemes) for the International Mathematical Olympiad, Madrid, 2008.

President of *Xarxa FME*, the Association of Alumni and Friends of the Facultat de Matemàtiques i Estadística of the Universitat Politècnica de Catalunya, 2005-present.

President of *Iberia*, the Association of Spanish people in the Boston area, with over 400 members, 2003-2004.

Teaching and advising

Instructor of the following courses at Dartmouth College:

- Fall 2011: *Algebraic Combinatorics*.
- Winter 2011: *Combinatorics* (graduate course); *Introduction to Combinatorics*.
- Spring 2010: *Graph Theory*.
- Winter 2010: *Introduction to Combinatorics*; *Abstract Algebra*.
- Winter 2009: *Abstract Algebra*.
- Fall 2008: *Introduction to Calculus*; *Topics in Algebra* (graduate course).
- Winter 2008: *The Probabilistic Method* (graduate course).
- Fall 2007: *Algebraic Combinatorics*.
- Spring 2007: *Graph Theory*.
- Fall 2006: *Topics in Combinatorics* (graduate course); *Multivariable Calculus*.
- Summer 2006: *Discrete Probability*.
- Spring 2006: *Graph Theory*; *Linear Programming*.
- Fall 2005: *Introduction to Calculus*; *Algebraic Combinatorics*.

Supervisor of two graduate students (Jonathan Bloom and Kassie Archer), and the following undergraduate students:

- Elaine Levey, *Forbidden patterns in financial series*, Presidential Scholarship, 2011-12.
- Yangyang Liu, *On basic forbidden patterns of functions*, Senior Thesis, 2008-09.
- Alexander Borland, *Allowed patterns of β -shifts*, Presidential Scholarship, 2008-09.
- Emily Chang, *Forbidden patterns of the Collatz sequence*, Women in Science Project, 2008-09.
- Vlad Dobru, *Combinatorics of the logistic map*, Presidential Scholarship, 2008-09.
- Will Chen, *The Fibonacci conjecture on numerical semigroups*, 2009.

Coach of the Dartmouth Putnam team, 2008-present.

Deputy leader of the Spanish Team in the Iberoamerican Mathematical Olympiad, Colombia, 2005.

Recitation Instructor in *Theory of Computation*, MIT, fall 2002 and fall 2003.

Academy Fellow for the *Clay Mathematics Research Academy*, Clay Mathematics Institute, Cambridge, MA, 2003, 2004 and 2005.

Teaching Assistant in *The art of counting*, MIT, spring 2003.

Microteaching Workshop, MIT, 2002.

Instructor in the training sessions of the Spanish team for the International Mathematical Olympiad, 1999, 2000, 2001 and 2003.

Additional Studies

Languages spoken: Spanish, Catalan, English; French, German, Italian.

Music Studies:

PROFESSIONAL CONSERVATORY OF MUSIC OF TERRASSA, Spain, 1990-2000.

Title of *Professor in Piano*, *Professional Degree*, June 2000.