

CURRICULUM VITÆ AND PUBLICATIONS LIST¹

Prof. Joseph Maurice Rojas

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PERSONAL INFORMATION

Born: Los Angeles, California, U.S.A.
Citizenship: USA
Current Institution: Texas A&M University (College Station), Mathematics Department

EDUCATION

Ph.D. in Applied Mathematics, University of California, Berkeley (Advisor: Steve Smale) May '95
C. Phil. in Applied Mathematics, University of California, Berkeley May '93
M.S. in Computer Science, University of California, Berkeley (Advisor: John F. Canny) December '91
M.A. in Mathematics, University of California, Berkeley December '91
B.S. in Mathematics/Applied Science (Electrical Engineering emphasis), University of California, Los Angeles June '88

RESEARCH INTERESTS

- Algorithmic Algebraic Geometry (including real and arithmetic methods), Polyhedral Combinatorics
- Complexity Theory, Scientific Computation

RESEARCH EXPERIENCE

Professor, Department of Mathematics, Texas A&M University Aug. '07 – Present
Consultant, Viz and Scientific Computation Group, Sandia National Laboratories Dec. '08 – Present
Consultant, Combustion Research Laboratory, Sandia National Laboratories Aug. & Dec. 2007
Workshop Organizer and Visiting Member, Institute for Mathematics and its Applications, Minneapolis, MN April–May '07
JAMI Visiting Professor, Johns Hopkins University, Baltimore, MD March '07
Associate Professor with Tenure, Texas A&M University, College Station, TX Sept. '04 – Aug. '07
Consultant, Computational Biology Group, CCIM Center, Sandia National Laboratories Oct.–Nov. 2005
Visiting Member, Mathematical Sciences Research Institute (Berkeley, Calif.) April '04
JAMI Visiting Professor, Johns Hopkins University, Baltimore, MD March '04
Assistant Professor (Tenure Track), Texas A&M University January '01 – August '04
New Directions Cellular Physiology Course Participant, Institute for Mathematics and its Applications June '03
Research Assistant Professor, City University of Hong Kong January '98 – December '00
National Science Foundation Postdoctoral Fellow and Applied Mathematics Instructor, MIT Fall '96 – Fall '97
Summer Staff Member, MIT Lincoln Laboratories, Lexington, Massachusetts Summer '97
Research Mathematician, NAWCAD (Office of Naval Research), Warminster, Pennsylvania Summer '96
Visiting Professor, City University of Hong Kong May '96
National Science Foundation Postdoctoral Fellow, Mathematical Sciences Research Institute Spring '96
National Science Foundation Postdoctoral Fellow (mentor: Alan Edelman), MIT Fall '95
Research Mathematician, AT&T Bell Laboratories, Murray Hill, NJ August '95
Research Mathematician, NAWCAD (Office of Naval Research), Warminster, Pennsylvania July '95
Chateaubriand Fellow (mentor: Marie-Francoise Roy), IRMAR, Université de Rennes I, France Spring '95
Visiting Professor (Tenure Track), Universitat Pompeu Fabra, Barcelona Fall '94
Research Mathematician, IBM T. J. Watson Research Center, Yorktown Heights, NY Summer '94
Research Mathematician, AT&T Bell Laboratories, Naperville, IL Summer '93
Research Mathematician, Center for Communications Research, Princeton, NJ Summer '92
Research Mathematician, Center for Communications Research, La Jolla, CA Summer '91
Member of the Technical Staff, Hughes Research Laboratories, Malibu Summers of '90, '89, '87, '86, '85

¹I, J. Maurice Rojas, certify that this is my CV and that it is up to date as of February 3, 2012.

GRANTS² AND AWARDS

- TAGS (Texas Algebraic Geometry Seminar) 2012,” (\$**13,820**, PI: Laura Matusevich, co-PIs: J. M. Landsberg, Paulo Lima-Filho, J. Maurice Rojas, Frank Sottile), conference proposal, NSF, DMS-1203175, 3/1/2012-2/28/2013
- ASCR: Topology for Statistical Modeling of Petascale Data,” (joint with U Utah and Sandia Labs; TAMU amount is \$**214,795**, Rojas is sole Texas co-PI), Advanced Scientific Computing Research (Mathematics for Analysis of Petascale Data), Department of Energy, DE-SC0002505, 9/1/2009-8/31/2012.
- MCS: Randomization in Algorithmic Fewnomial Theory Over Complete Fields,” (\$**400,001**, PI: Rojas, co-PIs: Martin Avendano, Scott Zrebiec) Mathematics/Computer Science Interface Program, NSF, DMS-0915245, 9/1/2009-8/31/2012.
- Wenner-Gren Foundation Visiting Researcher Grant (\$**75000** Swedish Kroner), to visit and work with M. Passare and B. Shapiro at Stockholm University, Sweden (Mar.–Jun. 2009)
- TAGS (Texas Algebraic Geometry Seminar) 2009,” (\$**8690**, PI: Rojas, co-PIs: J. M. Landsberg, P. Lima-Filho, L. Matusevich, F. Sottile), conference proposal, NSF, DMS-0915235, 4/1/2009-3/31/2010
- NSF CAREER Award: DMS-0349309: Complexity, Reality, and Rationality in Large Nonlinear Equation Solving (jointly funded by the Computational Mathematics and Algebra/Number Theory/Combinatorics programs), 2004–2009, \$**400,000**.
- Outstanding Teaching Award, Department of Mathematics, Texas A&M University (awarded Dec. 2007)
- Senior personnel on Texas A&M Mathematics Department’s Research Experiences for Undergraduates grant (DMS-0552610), 2005–2008, \$**45,000**.
- Texas MTC Grant: Curriculum Alignment, 2006–2007, \$**10,000** (Rojas is a consultant under this grant).
- Real Solving and Protein Structures: Interdisciplinary Training for Undergraduates in Biological and Mathematical Sciences, (supplement to DMS-0211458, jointly funded by the Directorate for Biological Sciences and the Division of Mathematical Sciences), 2003–2005, \$**99,760**.
- Robust Output Sensitive Algorithms for Subanalytic Geometry: Individual NSF Grant DMS-0211458 (jointly funded by the Computational Mathematics and Algebra/Number Theory/Combinatorics programs), 2002–2005, \$**98,800**.
- Degeneracy Detection for Curved Solids (co-PI with John Keyser): Incubation grant from the NSF CARGO (Computational and Algorithmic Representation of Geometric Objects) program, 2002–2003, \$**103,6360**, DMS-0138446.
- CBMS Lecture Series (co-PI with Paulo Lima-Filho and Hal Schenck): NSF Grant DMS-0122220 for public lecture series by Bernd Sturmfels during May 17–24, 2002, \$**27,492**.
- Journal of Complexity 2000 Best Paper Award (awarded at FoCM 2002, August 6, University of Minnesota), \$**3000**.
- Texas A&M University Faculty of Science Grant: Computational Algebraic Geometry (\$**44,000**, 2001–2003)
- Hong Kong CERG Grant: Complexity and Geometric Recognition (\$397,000 (HK), 2000–2002)
- Joint France/Hong Kong PROCORE Grant (Co-PI with Ioannis Z. Emiris of INRIA Sophia-Antipolis): Efficient Numeric and Symbolic Methods for Solving Sparse Polynomial Systems and Their Applications in Economics (\$58,400 (HK), 2000–2001)
- City U Grant (Co-investigator, with 10 other faculty from the Mathematics and Computer Science Departments): Group Research in Learning, Theory, and Applications (\$2,000,000 (HK), 2000–2001)
- Hong Kong CERG Grant: Polyhedral Entropy and Random p -adic Varieties (\$445,500 (HK), 1999–2001)
- Hong Kong CERG Grant: Toric Geometric Methods for Large Real Solving (\$467,500 (HK), 1998–2000)
- City University of Hong Kong Quality Enhancement Project Grant: Algebra, Algorithms, and Applications (\$50,000 (HK), ’98–’99)
- City University of Hong Kong Small Scale Grant: Polyhedral Algorithms for Fast and Stable Equation Solving (\$49,000 (HK), ’98–’99)
- U.S. National Science Foundation Postdoctoral Fellow, ’95–’98
- Chateaubriand Fellow, ’95
- Winner of the 1992 SIAM Student Paper Competition
- Placed 52nd (out of 2170 contestants) in the 1987 William Lowell Putnam Mathematical Competition

CONFERENCES ORGANIZED

- “*Arithmetic Aspects of Numerical Solving*,” (2-day minisymposium at 2011 SIAM Conference on Applied Algebraic Geometry), North Carolina State University, Raleigh, North Carolina, Oct. 6–9, 2011.
- “*Mathematical Aspects of P vs. NP and its Variants*,” (5-day workshop, co-organized with S. Basu and J. M. Landsberg), Institute for Computational and Experimental Research in Mathematics, Brown University, Rhode Island, Aug. 1–5, 2011.

²Unless otherwise noted, Rojas is the Principal Investigator on any grant listed.

- “*Randomization, Relaxation, and Reality*”, (5-day workshop, co-organized with L. Gurvits and P. Parrilo), Banff Institute Research Station, Banff, Calgary, Canada, Feb. 28 - Mar. 5, 2010.
- *Complexity*, (special session co-organized with G. Malajovich and M. Shub), joint SMB-AMS meeting, Rio de Janeiro, June 4–7, 2008
- *Complexity, Coding, and Communication* (co-organized with Peter Buergiesser, Ketan Mulmuley, Joachim Rosenthal, and Madhu Sudan): Spring 2007 period of Special Year on Applications of Algebraic Geometry, Institute for Mathematics and its Applications.
- *Random Analytic Functions and Surfaces*, Workshop at the American Institute of Mathematics (co-organized with Amir Dembo, Bernie Shiffman, and Steve Zelditch), January 16–20, 2006.
- *Effective Analytic Geometry Over Complete Fields* (co-organized with L.-M. Pardo): Special Session, Joint AMS-RSME Meeting in Seville, June 18–21, 2003.
- *CBMS Lectures Series* (co-organized with Paulo Lima-Filho and Hal Schenck): Presented by Bernd Sturmfels at Texas A&M University, May 20-24, 2002.
- *CBMS Preconference* (co-organized with Paulo Lima-Filho, Hal Schenck, and Peter Stiller): Introductory lectures on computational algebraic geometry, May 17-19, 2002.
- *Foundations of Computational Mathematics 2000*, (co-organized with F. Cucker): International Conference in Honor of Steve Smale’s 70th Birthday, City University of Hong Kong, Hong Kong, July 13–17, 2000.
- *Sparse Elimination Methods in Polynomial System Solving*, (co-organized with I. Emiris): Special Session at the Spring Eastern Meeting of the American Mathematical Society, Temple University, Philadelphia, Pennsylvania, April 4–6, 1998.

PUBLICATIONS³ (Please see my web-page at <http://www.math.tamu.edu/~rojas> for updates and downloads.)

BOOKS EDITED

1. Proceedings of Smalefest 2000: Papers From an International Conference in Honor of Steve Smale’s 70th Birthday (July 2000, City University of Hong Kong), (edited by J. M. Rojas and F. Cucker), World Scientific, 2002.

REFEREED RESEARCH PUBLICATIONS

2. “Faster p -adic Feasibility for Certain Multivariate Sparse Polynomials,” (by Martin Avendano, Ashraf Ibrahim, J. Maurice Rojas, and Korben Rusek), *Journal of Symbolic Computation*, special issue in honor of 60th birthday of Joachim von zur Gathen, to appear.
3. “Randomization, Sums of Squares, Near-Circuits, and Faster Real Root Counting,” (by Osbert Bastani, Chris Hillar, Dimitar Popov, and J. Maurice Rojas), *Randomization, Relaxation, and Complexity in Polynomial Equation Solving*, *Contemporary Mathematics*, vol. 556, AMS Press, 2011.
4. “New Multiplier Sequences via Discriminant Amoebae,” (by M. Passare, J. M. Rojas, and B. Shapiro), *Moscow Mathematical Journal* (special issue in memory of Vladimir Igorevich Arnold), vol. 11, no. 3, July–September 2011, pp. 547–560.
5. “Optimizing n -variate $(n+k)$ -nomials for small k ,” (by P. Pébay, J. M. Rojas, and D. C. Thompson), *Theoretical Computer Science*, SNC 2009 special issue, Vol. 412, No. 16 (1 April 2011), pp. 1457–1469.
6. “Randomized NP-Completeness for p -adic Rational Roots of Sparse Polynomials in One Variable,” (by M. Avendaño, A. Ibrahim, J. M. Rojas, and K. Rusek), proceedings of ISSAC 2010 (July 25–28, 2010, Munchen), pp. 331–338, ACM Press, 2010.
7. “Optimization and $\mathbf{NP}_{\mathbb{R}}$ -Completeness of Certain Fewnomials,” (by P. Pébay, J. M. Rojas, and D. C. Thompson), proceedings of SNC 2009 (August 3–5, 2009, Kyoto, Japan), pp. 133–142, ACM Press, 2009.
8. “Faster Real Feasibility via Circuit Discriminants,” (by F. Bihan, J. M. Rojas, and C. E. Stella), proceedings of ISSAC 2009 (July 28-31, Seoul, Korea), pp. 39–46, ACM Press, 2009.
9. “On the Sharpness of Fewnomial Bounds and the Number of Components of Fewnomial Hypersurfaces,” (by F. Bihan, J. M. Rojas, and F. Sottile), *Algorithms in Algebraic Geometry* (Alicia Dickenstein, Frank-Olaf Schreyer, and Andrew J. Sommese, eds.), *IMA Volumes in Mathematics and its Applications*, Vol. 146, pp. 15–20, Springer-Verlag, 2007.

³I, J. Maurice Rojas, certify that this is my publications list and that it is up to date as of February 3, 2012.

10. “Efficiently Detecting Embedded Subtori and Algebraic Torsion Points,” invited paper, proceedings of MAGIC 2005 (Midwest Algebra, Geometry, and their Interactions Conference, Oct. 7–11, 2005, Notre Dame University, Indiana), edited by A. Corso, J. Migliore, and C. Polini, pp. 213–233, Contemporary Mathematics, vol. 448, AMS Press, 2007.
11. “Extremal Real Algebraic Geometry and A -Discriminants,” (by A. Dickenstein, J. M. Rojas, K. Rusek, and J. Shih), Moscow Mathematical Journal, vol. 7, no. 3, July–Sept. 2007, pp. 425–452.
12. “On Interpolating Between Quantum and Classical Complexity Classes,” Proceedings of Mathematics of Quantum Computation and Quantum Technology (November 13–16, 2005, Texas A&M University), pp. 67–88, Taylor & Francis, 2007.
13. “A New Method of Motion Coordination of a Group of Mobile Robots,” (by J. M. Rojas, S. Sethuraman, M. Lal, and S. Jayasuriya), Proceedings of IMECE 2006 (ASME International Mechanical Engineering Congress and Exposition, Nov. 5–10, 2006, Chicago, Illinois), to appear.
14. “On Solving Univariate Sparse Polynomial in Logarithmic Time,” (by J. M. Rojas and Y. Ye), Journal of Complexity, Volume 21, Issue 1 (Foundations of Computational Mathematics Conference 2002 special issue), February 2005, pp. 87–110.
15. “Rapid conversion from torsion space to Cartesian space for *in silico* protein synthesis,” (by J. Parsons, B. Holmes, C. E. Strauss, J. M. Rojas, and J. Tsai), Journal of Computational Chemistry, vol. 26 (July 2005), Issue 10, pp. 1063–1068.
16. “The Exact Rational Univariate Representation for Detecting Degeneracies,” (by J. Keyser, K. Ouchi, and J. M. Rojas), Geometric and Algorithmic Aspects of Computer-Aided Design and Manufacturing (AMS/DIMACS Series in Discrete Mathematics and Theoretical Computer Science), edited by Ravi Janardan, Michiel Smid, and Debasis Dutta, pp. 299–328, AMS Press (2005).
17. “High Probability Estimates for the Numerical Conditioning of Sparse Polynomial Systems,” (by G. Malajovich and J. M. Rojas), Theoretical Computer Science, special issue on algebraic and numerical algorithms, Vol. 315, no. 2–3, pp. 525–555 (May 6, 2004).
18. “Attitude and Position Estimation from Vector Observations,” (by D. Mortari, J. M. Rojas, and J. L. Junkins), Proceedings of the AAS/AIAA Space Flight Mechanics Meeting (February 9–13, 2004, Maui, Hawaii), paper AAS 04-140.
19. “Arithmetic Multivariate Descartes’ Rule,” American Journal of Mathematics, vol. 126, no. 1, February 2004, pp. 1–30.
20. “Why Polyhedra Matter in Non-Linear Equation Solving,” paper corresponding to an invited talk delivered at a conference on Algebraic Geometry and Geometric Modelling (Vilnius, Lithuania, July 29–August 2, 2002), Contemporary Mathematics, vol. 334, pp. 293–320, AMS Press, 2003.
21. “On the Determination of the Degree of an Equation Obtained by Elimination,” (translation of, and commentary on, an 1841 paper of Ferdinand Minding, by David Cox and J. Maurice Rojas), Contemporary Mathematics, vol. 334, pp. 351–361, AMS Press, 2003.
22. “Counting Real Connected Components of Trinomials Curve Intersections and m -nomial Hypersurfaces,” (by T.-Y. Li, J. M. Rojas, and X. Wang), Discrete and Computational Geometry, Discrete and Computational Geometry, **30** (2003), no. 3, pp. 379–414.
23. “Additive Complexity and the Roots of Polynomials Over Number Fields and p -adic Fields,” Proceedings of ANTS-V (5th Annual Algorithmic Number Theory Symposium, University of Sydney, July 7–12, 2002), Lecture Notes in Computer Science #2369, Springer-Verlag (2002), pp. 506–515.
24. “Polynomial Systems and the Momentum Map,” (by G. Malajovich and J. M. Rojas), Proceedings of FoCM 2000, special meeting in honor of Steve Smale’s 70th birthday (July 2000, City University of Hong Kong, Hong Kong), pp. 251–266, World Scientific, 2002.
25. “Extending Triangulations and Semistable Reduction,” (by D. Abramovich and J. M. Rojas), Proceedings of FoCM 2000, special meeting in honor of Steve Smale’s 70th birthday (July 2000, City University of Hong Kong, Hong Kong), pp. 1–13, World Scientific, 2002.
26. “Finiteness for Arithmetic Fewnomial Systems,” invited paper, Contemporary Mathematics, vol. 286, AMS-IMS-SIAM Joint Summer Research Conference Proceedings of “Symbolic Computation: Solving Equations in Algebra, Geometry, and Engineering (June 11–15, 2000, Mount Holyoke College),” edited by E. Green, S. Hosten, R. Laubenbacher and V. Powers, pp. 107–114, AMS Press, 2001.
27. “Computational Arithmetic Geometry I: Diophantine Sentences Nearly Within the Polynomial Hierarchy,” invited paper, Journal of Computer and System Sciences, vol. 62, no. 2, march 2001, pp. 216–235.

28. “Algebraic Geometry Over Four Rings and the Frontier to Tractability,” invited paper, *Contemporary Mathematics*, vol. 270, Proceedings of a Conference on Hilbert’s Tenth Problem and Related Subjects (University of Gent, November 1999, edited by Jan Denef, Leonard Lipschitz, Thanases Pheidas, and Jan Van Geel), pgs. 270–321, AMS Press (2000).
29. “Some Speed-Ups and Speed Limits for Real Algebraic Geometry,” *Journal of Complexity*, FoCM 1999 special issue, vol. 16, no. 3 (sept. 2000), pp. 552–571. [Winner of the Journal of Complexity 2000 Best Paper Award.]
30. “Uncomputably Large Integral Points on Algebraic Plane Curves?,” *Theoretical Computer Science*, special issue in honor of Manuel Blum’s 60th birthday, vol. 235, no. 1, March, 2000, pp. 145–162.
31. “Solving Degenerate Sparse Polynomial Systems Faster,” *Journal of Symbolic Computation*, vol. 28 (special issue on elimination theory), no. 1/2, July and August 1999, pp. 155–186.
32. “On the Complexity of Diophantine Geometry in Low Dimensions,” *Proceedings of the 31th ACM Symposium on Theory of Computing (STOC ’99, May 1–4, 1999, Atlanta, Georgia)*, pp. 527–536, ACM Press, 1999.
33. “Toric Intersection Theory for Affine Root Counting,” *Journal of Pure and Applied Algebra*, vol. 136, no. 1, March, 1999, pp. 67–100.
34. “Intrinsic Near Quadratic Complexity Bounds for Real Multivariate Root Counting,” *Proceedings of the Sixth Annual European Symposium on Algorithms*, pp. 127–138, Lecture Notes in Computer Science 1461, Springer-Verlag, 1998.
35. “Toric Laminations, Sparse Generalized Characteristic Polynomials, and a Refinement of Hilbert’s Tenth Problem,” *Foundations of Computational Mathematics*, selected papers of a conference, held at IMPA in Rio de Janeiro, January 1997, Felipe Cucker and Mike Shub (eds.), pp. 369–381, Springer-Verlag (1997).
36. “Affine Elimination Theory,” *Proceedings of a Conference in Honor of David A. Buchsbaum*, October 18–20, 1997, Northeastern University, Boston, Massachusetts.
37. “A New Approach to Counting Nash Equilibria,” *Proceedings of the IEEE/IAFE Conference on Computational Intelligence for Financial Engineering, Manhattan, New York, March 23–25, 1997*, pp. 130–136.
38. “On the Average Number of Real Roots of Certain Random Sparse Polynomial System,” *Lectures in Applied Mathematics*, Vol. 32 (1996), pp. 689–699, American Mathematical Society.
39. “Counting Affine Roots Via Pointed Newton Polytopes,” (by J. M. Rojas and X. Wang), *Journal of Complexity*, vol. 12 (June 1996), pp. 116–133.
40. “A Convex Geometric Approach to Counting the Roots of a Polynomial System,” *Theoretical Computer Science*, vol. 133 (1), pp. 105–140, October, 1994.
41. “A New Upper Bound on the Number of Roots of a Multilinear System,” technical report, SCAMP 1992, Center for Communications Research, Princeton, New Jersey.
42. “An Optimal Condition for Determining the Exact Number of Roots of a Polynomial System,” (by J. Canny and J. M. Rojas), *Proceedings of ISSAC ’91* (Bonn, Germany), pp. 96–102, ACM Press, 1991.

INVITED BOOK REVIEWS

43. Review of József Beck’s: *Inevitable Randomness in Discrete Mathematics*, *Bulletin of the American Mathematical Society*, in progress
44. Review of Basu, Pollack, and Roy’s: *Algorithms in Real Algebraic Geometry*, *Foundations of Computational Mathematics*, Vol. 8, No. 6 (2008), pp. 765–771.

PAPERS SUBMITTED FOR PUBLICATION

45. “Building Extremal Fewnomial Lower Bounds Over Local Fields, and the Adelic Tau Conjecture,” (by J. Maurice Rojas)

WORKING PAPERS⁴

46. “New Complexity Bounds for Certain Real Fewnomial Zero Sets,” (by Joel Gomez, Andrew Niles, and J. Maurice Rojas), accepted for presentation at MEGA (Effective Methods in Algebraic Geometry) 2007.
47. “Dedekind Zeta Functions and the Complexity of Hilbert’s Nullstellensatz,” paper corresponding to semi-plenary talk at FoCM 2002 (August 5–14, 2002, University of Minnesota, Minneapolis).

⁴See <http://www.math.tamu.edu/~rojas/extreme.html> for further information on Rojas’ research work with REU students.

OTHER PUBLICATIONS

48. “Open Questions on Extensions of Hilbert’s Tenth Problem,” expository paper for Workshop on Extensions of Hilbert’s Tenth Problem, American Institute of Mathematics (March 21–25, 2005), Palo Alto, California.
49. “Open Questions on Amoeba Theory and Tropical Geometry,” expository paper for Workshop on Amoebas and Tropical Geometry, American Institute of Mathematics (October 23–26, 2003), Palo Alto, California.
50. “Encryption, $1 + 1 = 0$, and Secure Information,” Advance, 2003 Edition, Office of the Vice President for Research, Texas A&M University.
51. Geometry and Topology: Seven Lectures by Raoul Bott, (notes edited by J. Maurice Rojas), Lecture Notes in Mathematics, Liu Bie Ju Centre for the Mathematical Sciences, City University of Hong Kong, to appear.
52. Problem 10437, *American Mathematical Monthly*, Volume 102, #2, February 1995, page 170.
53. “Commutative Algebra Without Commutativity (Solution to Problem 10437),” *American Mathematical Monthly*, vol. 104, no. 7, Aug.-Sept. 1997.

THESES

- “Cohomology, Combinatorics, and Complexity Arising from Solving Polynomial Systems,” *Applied Mathematics Ph.D. Thesis, University of California, Berkeley*, University Microfilms International, 1995.
- “An Optimal Condition for Determining the Exact Number of Roots of a Polynomial System,” *Computer Science M.S. Thesis, University of California, Berkeley*, 1991.

SOME INVITED LECTURES

1. “Petascale Polynomials and a Real Analogue of Smale’s 17th Problem,” invited talk in Optimization Session, DOE Applied Mathematics Program Meeting, Washington, D.C., Oct. 17, 2011
2. “Real Feasibility is in **NP** Most of the Time,” Arithmetic Aspects of Numerical Solving Minisymposium, 2011 SIAM Conference on Applied Algebraic Geometry, North Carolina State University, Raleigh, North Carolina, Oct. 6–9, 2011.
3. “Fast Toric Algorithms Over Local Fields,” Toric Geometry and Applications, Katholieke Universiteit Leuven, Leuven, Belgium, June 6–10, 2011
4. “Short Certificates for p -adic Feasibility,” Tropical and Non-Archimedean Geometry, Bellairs Research Institute, Barbados, May 6–13, 2011.
5. “Extreme Extremal Results for Sparse Systems,” Notre Dame University, Aug. 4, 2010
6. “Satellite Orbits and Solving Equations,” NSF Mathematics at Critical Transitions guest lecture, Texas A&M University, July 14, 2010.
7. “Satellite Orbits and Solving Equations,” SEEMath Program (expository lecture for 5th–8th graders), Texas A&M University, July 2, 2010.
8. “Simple Homotopies for Just Real Roots,” plenary talk, workshop on Randomization, Complexity, and Relaxation, Banff International Research Station, Banff, Alberta, Canada, March 1, 2010.
9. “Optimization and **NP** _{\mathbb{R}} -Completeness of Certain Fewnomials,” Symbolic Numeric Computation, Kyoto, Japan, Aug. 4, 2009.
10. “Faster Real Feasibility via Circuit Discriminants,” International Symposium on Symbolic and Algebraic Computation, Seoul, South Korea, Jul. 31, 2009.
11. “When Pretty Pictures Fail,” SMaRT (Summer Mathematics Research Training) camp guest lecture (expository lecture for high school students), June 17, 2009.
12. “Coamoebae and Hypergeometric Functions after Lisa Nilsson,” opponent presentation for thesis defense, Stockholm University, June 5, 2009
13. “Number Theory, Randomization, and Real Topology Computation,” Colloquium, Mathematics Department, Technical University of Lisboa, Portugal, May 20, 2009
14. “Number Theory and the Hardness of Complex Geometry,” Several Complex Variables Seminar, Stockholm University, April 28, 2009
15. “Real Topology Computation via Amoebae I,” Several Complex Variables Seminar, Stockholm University, April 14, 2009
16. “Statistical Modelling and Real Solving,” Sandia National Laboratories, Livermore, California, April 1, 2009
17. “ABCs of Real Solving,” San Francisco State University, Mar. 4, 2009

18. “Hilbert’s 10th Problem in Low Dimensions,” University of Utah, Salt Lake City, Nov. 21, 2008
19. “ABCs of Real Algebraic Geometry,” colloquium, University of Utah, Salt Lake City, Nov. 20, 2008
20. “ABCs of Real Algorithmic Geometry,” colloquium, Center for Communications Research, Institute for Defense Analyses, Princeton, NJ, Oct. 24, 2008
21. “Unifying Algorithms for Real and p-adic Geometry,” special seminar, University of Illinois, Urbana-Champaign, Aug. 15, 2008.
22. Algorithmic Fewnomial Theory, invited 1 week lecture series, IAS Park City Mathematics Institute Undergraduate Mathematics Summer School, July 6–13, 2008.
23. “Randomization and Discriminant Chambers,” joint AMS/SMB meeting, Rio de Janeiro, June 4-8, 2008.
24. “Sharper, High Probability Bounds for Real Fewnomial Zero Sets,” Enumeration and bounds in real algebraic geometry (April 21–26, 2008), Bernoulli Center, EPFL, Laussane.
25. “Most Hard Equations are Easy,” invited mathematics colloquium, University of Houston, November 28, 2007.
26. “Most Hard Equations are Easy,” introductory talk, MSRI Modern Mathematics Workshop, Kansas City, Missouri, October 11, 2007.
27. “Torsion Points and Algorithmic Fewnomial Theory,” Number Theory Seminar, Univeristy of Texas at Austin, September 27, 2007.
28. “Efficient Polynomial System Solving: An Introduction,” invited series of 10 talks, Sandia National Laboratories, Combustion Research Facility, Livermore, California, August 8-12, 2007.
29. “P=NP, Optimization, and Algebraic Geometry,” IMA summer school in algebraic geometry, Texas A&M University, July 27, 2007.
30. “Descartes’ Rule for Complete Fields and Arbitrary Codimension,” Latin-American Colloquium on Algebra, Medellín, Colombia, July 23, 2007.*
31. “Arithmetic Progressions and Complex Algebraic Geometry,” invited talk; Workshop on Number Theory and Computability, Edinburgh, Scotland, June 26, 2007.*
32. “The Complete Fewnomial Conjecture,” algebraic geometry seminar, University of Chicago, May 9, 2007.
33. “Feasibility of Complex Equations and Primes in Arithmetic Progressions,” computer science seminar, University of Wisconsin, May 7, 2007.
34. “Random Polynomials and Balanced Metrics,” Algebraic Geometry Seminar, Institute for Mathematics and its Applications, Minnesota, April 26, 2007.
35. “A Critical Radius for Low Complexity,” Workshop on Complexity, Coding, and Communications, Institute for Mathematics and its Applications, Minnesota, April 20, 2007.
36. “Large Chambers, Discriminants, and Fewnomials,” invited series of 3 talks, Johns Hopkins University, March 21, 22, 27; 2007.
37. “An Introduction to \mathcal{A} -discriminants and Chambers,” Johns Hopkins University, March 22, 2007.
38. “The Complete Fewnomial Conjecture,” New York University, Courant Institute of Mathematical Sciences, March 20, 2007.
39. “On the Effectiveness of Number Theory in Algebraic Geometry,” invited talk, Algorithms in Algebraic Geometry Workshop, Institute for Mathematics and its Applications, Minnesota, September 20, 2006.
40. “On the Effectiveness of Number Theory in Algorithmic Geometry,” Algebra Seminar, Colorado State University, Ft. Collins, Colorado, August 24, 2006.
41. “Extremal Real Algebraic Geometry,” Applied Mathematics Seminar, Colorado State University, Ft. Collins, Colorado, August 22, 2006.
42. “Convexity and a Phase Transitions for Detecting Real Roots,” MAA MathFest 2006, Invited Paper Session on Computational Convexity and its Applications, Knoxville, Tennessee, August 10, 2006.
43. “Interpolating Between Quantum and Classical Complexity,” NEC Research Laboratories, Princeton, New Jersey, May 18, 2006.
44. “Understanding Polynomial Equations: Complexity and Reality,” two invited plenary lectures, Midatlantic Algebra Conference, James Madison University, Virginia, April 29–30, 2006.
45. “A-Discriminants and Real Algebraic Geometry,” Invited Undergraduate Seminar Lecture, Trinity University, San Antonio, Texas, February 9, 2006.

* Shortly after I was invited, I needed to cancel due to conflicts with other invitations and my summer REU course.

46. “A-Discriminants and Real Algebraic Geometry,” Graduate Student Seminar, Texas A&M University, February 2, 2006.
47. “Basic Tropicalia (or, How to Use Polyhedra to Understand Polynomials),” Workshop on Random Analytic Functions and Surfaces, American Institute of Mathematics, January 16, 2006.
48. “Algebraic Geometry Tools for Inverse QSAR”, invited talk at Sandia National Laboratories, Nov. 15, 2005.
49. “A p -adic Quantum Complexity Threshold,” invited talk at Los Alamos National Laboratories, Nov. 13, 2005.
50. “From Classical to Quantum Complexity via Sparse Polynomials,” Mathematics of Quantum Computing and Quantum Technology, Texas A&M University, College Station, Texas, Nov. 11, 2005.
51. “An Introduction to Arithmetic Fewnomial Theory,” University of New Mexico, Albuquerque, New Mexico, Oct. 26, 2005.
52. “Why Polyhedra Matter in Nonlinear Equation Solving,” Sandia National Laboratories, Oct. 24, 2005.
53. “Algorithms for Real and p -Adic Geometry,” UT San Antonio, Oct. 14, 2005.
54. “Extremal and Algorithmic Algebraic Geometry,” invited talk; Midwest Algebra, Geometry, and their Interactions Conference; Notre Dame, October 9, 2005.
55. “Extremal Real Algebraic Geometry and A-Discriminants,” Combinatorics Seminar, Texas A&M University, College Station, Texas, Sep. 16, 2005.
56. “Extremal Real Algebraic Geometry,” Departmental Colloquium, Prairie View A&M University, Prairie View, Texas, Sep. 9, 2005.
57. “From Descartes to Reality,” Guest Lecture at Scott Chapman’s Summer REU Course, Trinity University, San Antonio, Texas, July 13, 2005.
58. “Parallels Between Real and p -Adic Complexity,” invited talk, Foundations of Computational Mathematics Meeting, Real Number Complexity Workshop, University of Cantabria, Santander, Spain, July 8, 2005.
59. “A Subexponential Algorithm for Containment and Intersection Between Translated Subtori and Algebraic Sets,” invited talk, MEGA (Effective Methods in Algebraic Geometry) 2005, Sardinia, Italy, May 27, 2005.
60. “Arithmetic and Algorithmic Aspects of Fewnomial Theory,” invited talk, Algebra Seminar, University of Texas, Austin, March 29, 2005.
61. “Real Solving and Proteomics,” guest lecture, Biology Seminar Course of Vincent Cassone, Texas A&M University, College Station, Texas, March 8, 2005.
62. “Some Speed-Ups and Speed Limits for Real Fewnomials,” Joint Mathematics Meeting, Atlanta, Georgia, Special Session on Algorithmic Algebraic and Analytic Geometry, January 8, 2005.
63. “Torsion Points on Algebraic Sets and A-discriminants,” invited talk, Workshop on resolution of singularities, factorization of birational mappings, and toroidal geometry, Banff International Research Station, December 12, 2004.
64. “Flipping Coins and Solving Equations,” guest lecture, calculus classes of Ms. Linda Stearns, Bryan High School, Bryan, Texas, Dec. 8, 2004.
65. “From Descartes’ to Reality,” invited talk, Aerospace Engineering Seminar, Texas A&M University, November 30, 2004.
66. “New Complexity Thresholds for Fewnomials,” Algebraic Geometry Seminar, Texas A&M University, October 15, 2004.
67. “Some Algorithmic Aspects of Fewnomials,” invited talk, Workshop on Algorithmic, Combinatorial, and Applicable Real Algebraic Geometry, Mathematical Sciences Research Institute, April 12, 2004.
68. “A Complex Analytic Approach to Real Solving,” Random Notions Seminar, Johns Hopkins University, March 23, 2004.
69. “Algorithmic and Arithmetic Aspects of Fewnomials,” Conference in Honor of the 60th Birthday of Bernard Shiffman, Johns Hopkins University, March 15, 2004.

MENTORING

Harlan Kadish	Postdoc (co-mentored with J.M. Landsberg), Fall ’11 – Present
Rohun Kshirsagar	Graduate Research Assistant, Spring ’11
Mounir Nisse	Postdoc (co-mentored with F. Sottile), Fall ’10 – Present
Martin Avendaño (now tenured at U Zaragoza, Spain)	Postdoc, Fall ’08 – Summer ’11
Scott Zrebiec (now statistical projects manager, Lexis-Nexis)	Postdoc, Fall 2007 – June 2010

Korben Rusek (Ph.D. expected Summer 2012)
 Kaitlyn Hellenbrand Ph.D. student, Fall 2011 – Present
 Ashraf Ibrahim (now postdoc at Texas A&M Aerospace Dept.) Ph.D. Dec. 2009
 Swami Sethuraman (now quantitative analyst at Royal Bank of Scotland) Ph.D. May 2009
 Dozens of undergraduate NSF-sponsored REU students Summers '04–'10
 Theodoros Kyriopolos (M.S. mathematics, Dec. '07); Michael Muzheve (M.S. mathematics, Dec. '05);
 Casey Stella (M.S. mathematics, May '05);
 Katherine Turner (Mathematics, B.S.) Summer 2011 – Present
Undergraduate research assistant funded by my NSF Grant DMS-0211458
 Jennifer Dieringer (Mathematics, B.S.) June 2004 – Spring 2005
Undergraduate research assistant funded by my NSF Grant DMS-0211458
 Brian Worthen (Mathematics, B.S.) June 2004 – Fall 2005
Undergraduate research assistant funded by my NSF Grant DMS-0211458
 Robert Bliss (Biochemistry, B.S.) Oct. 2003 – Spring 2005
Undergraduate biochemistry research assistant, funded by my NSF Grant DMS-0211458, co-advised with Prof. Jerry Tsai (Biochemistry, Texas A&M)
 Brad Holmes (Biochemistry, B.S.) Oct. 2003 – Present
Undergraduate biochemistry research assistant, funded by my NSF Grant DMS-0211458, co-advised with Prof. Jerry Tsai (Biochemistry, Texas A&M)
 Marianne Manglicmot (Computer Science, B.S.) Dec. 2003 – Dec. 2004
Undergraduate computer science research assistant, funded by my NSF Grant DMS-0211458
 Zhigang Zhang (Ph.D. Mathematics) Fall 2002
Graduate research assistant, funded by my NSF Grant DMS-0138446
 1 M. Phil. student (Shirley Cheung, co-advised with F. Cucker) and 4 B. Sci. Honors students (Nancy Chan, Jacqueline Chan, Angle Kim, and Christopher Wong) in computational mathematics at City University of Hong Kong, 1998–2000

EXTERNAL ACTIVITIES

- Editor, Houston Journal of Mathematics (Jan. 2008 – Present)
- Reviewer for Canadian NSERC program, 2011
- NSF Panelist during '02–'09
- Reviewer for Argentinian PICS Program, 2010
- Reviewer for AMS MathSciNet, Sept. '05 – Present
- Reviewer for NSF and DOE proposals, '03–'11
- Reviewer for NSF/CONICYT (joint US/Chile) Bicentennial Program in Science and Technology, '06
- Referee for:
 - Journal of the American Mathematical Society
 - Journal of the Association for Computing Machinery
 - Discrete and Computational Geometry
 - Journal of Mathematical Analysis and Applications
 - Symposium on Theory of Computing (1999 Proceedings)
 - Foundations of Computational Mathematics
 - Effective Methods in Algebraic Geometry (2002 Proceedings)
 - Information and Computation
 - Computer Science Symposium in Russia '07
 - Effective Methods in Algebraic Geometry (MEGA) '05, '07, '09, '11
 - International Symposium on Symbolic and Algebraic Computation
 - Contemporary Mathematics
 - Econometrica
 - Advances in Mathematics
 - Journal of Symbolic Computation
 - Mathematics of Computation
 - American Journal of Mathematics
 - Mathematical Programming
 - Journal of Complexity
 - Computational Complexity
 - Journal of Algebraic Combinatorics

UNIVERSITY ACTIVITIES

- Member, Faculty Senate, Fall '10 - Present
- Member, Faculty Senate Research Committee, Fall '10 – Present
- Member, Faculty Senate Legislative Affairs Committee, Fall '10 - Present
- Member, Executive Committee, Mathematics Department, Sept. '04 - Aug. '06 & Sept. '09 - Present
- Member, Undergraduate Program Committee, Mathematics Department, Sept. 2005 – Aug. 2007

LANGUAGES

- English (native speaker)
- Portuguese
- Spanish
- French (reading knowledge)

REFERENCES

- Steve Smale (Toyota Research Laboratories, Chicago)
- Tien-Yien Li (Distinguished University Professor, Michigan State University, East Lansing)
- Andrew Sommese (Duncan Professor of Mathematics, Notre Dame University, Indiana)
- Eric Bach (Professor of Computer Science, University of Wisconsin, Madison)
- Jan Denef (Professor, Catholic University of Belgium, Leuven)
- Alan Edelman (Professor, MIT)
- Bruce Reznick (Professor, University of Illinois, Urbana-Champaign)
- Bernie Shiffman (Professor, Johns Hopkins University)