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Employment:

- Texas A&M University, College Station, TX, professor of mathematics (8/04- present), Owen Professor (6/24-present).
- Harvard University, invited visiting professor (7/04-12/04 and 1/22-2/22).
- Université Paul Sabatier, Toulouse, *chaire d'excellence* (visiting endowed professor) (6 months, 2022-3).
- UC Berkeley Chancellor's Professor at Simons Institute for Theoretical Computing/Univerisity of California at Berkeley, Berkeley, CA, (8/14-12/14).
- Georgia Institute of Technology, Atlanta, GA, associate professor (8/01 -8/04), visiting associate professor (8/00-7/01).
- Université Paul Sabatier, Toulouse, Maître de conférences (9/96-7/00).
- Columbia University, New York, visiting assistant professor (9/94-5/95, 1/96-5/96).
- Institut des Hautes Etudes Scientifiques (IHES), visiting member (9/95-12/95).
- University of Pennsylvania, Philadelphia, Hans Rademacher Instructor and National Science Foundation postdoctoral fellow (9/90-7/92, 9/93-5/94).
- Institute for Advanced Study (IAS), Princeton, Visiting member and National Science Foundation postdoctoral fellow, (9/92-4/93).

Distinctions:

1. Owen Professor of mathematics (since 6/24).
2. UC Berkeley Chancellor's Professor (fall 2014 and fall 2025),
3. U. Toulouse visiting endowed professorship *chaire d'excellence* (6 months, 2022-3),
4. Clay Senior Scholar for *Tensor Methods and Emerging Applications to the Physical and Data Sciences* at Institute for Pure and Applied Mathematics, UCLA (IPAM)(spring 2021) (very competitive award given by the Clay foundation, https://www.claymath.org/people_type/senior-scholars/),

5. Stanford University Exceptional Teacher Tribute (2018),
6. Conference Board of Mathematical Sciences (CBMS) lecturer (8/17) (five day conference featuring a distinguished principal lecturer supported by AMS and NSF, lectures are published by the AMS),
7. AMS fellow (class of 2017),
8. Korean Institute for Advanced Study, Seoul, lecture series associated to invited visiting professorship (6/06 and 1/01),
9. NSF post-doctoral fellow (1990-93).
10. Invited positions of one month or longer: Harvard CS (1/22), Harvard Math (2/22), (fall 04), Mittag-Leffler Inst., Stockholm (5/11), ANU, Canberra (7/10), (7/09), U. Grenoble (10/09), (5/04), (11/95), Institut des Hautes Etudes Scientifiques (IHES) (7/07), (8/99), KIAS Seoul (6/06), (1/01), Mathematisches Institut, Basel (6/00), Mathematical Sciences Research Institute (MSRI) (1/93), University of Chicago (5/92), (5/91).
11. Since 2000: 56 plenary or principal lectures at conferences, 22 research lecture series (usually 5-10 hours of lecture), over 130 colloquium/seminar lectures.
12. Over 100 refereed research publications, including six books.

Major invited presentations:

1. Swiss Mathematical Society annual meeting, the plenary speaker, 6/23
2. Lecture series on quantum information series as part of *chaire d'excellence* position, U. Toulouse (12 hours), 6/22.
3. Introduction to the geometry of random tensors, Centre international de rencontres mathématiques (CIRM) workshop in random tensors (3 hours of lecture), 4/22.
4. Clay senior scholar lecture series (6 hours) IPAM, as part of long program *Tensor Methods and Emerging Applications to the Physical and Data Sciences* spring 2021 (by zoom)
5. International Linear Algebra Society, plenary lecture, Rio de Janeiro, 7/19
6. Southeastern Section AMS, plenary lecture, Vanderbilt University, 4/18
7. SIAM Algebraic Geometry meeting, plenary lecture, Georgia Tech, Atlanta, 7/17
8. Berlin Mathematical School Colloquium, 2/15
9. International Linear Algebra Society, plenary lecture, Braunschweig, 8/11
10. Differential Geometry and its Applications (DGA2010), plenary lecture, Brno, 8/10
11. MEGA 2009: Effective methods in algebraic geometry, plenary lecture, Barcelona, 6/09

12. The 28th Winter School of Geometry and Physics, Srni - plenary lecture series, 1/07.

Education:

1997: Habilitation à diriger des recherches, Université Paul Sabatier, Toulouse.

Director: Dr. Carlos Simpson.

Jury: Dr. A. Beauville, Dr. J.P. Demailly, Dr. M. Green, Dr. M. Gromov, Dr. G. Levitt, Dr. J.C. Sikorav, Dr. C. Simpson, Dr. B. Teissier, Dr. F. Zak.

Mémoire: *Géométrie algébrique et géométrie différentielle projective.*

1990: Ph.D., Duke University, Durham, NC.

Director: Dr. Robert L. Bryant.

Thesis: *Minimal submanifolds defined by first order systems of pde.*

1986: Honors Combined Sc.B. and M.S. degree, Brown University, Providence RI.

Director: Dr. Katsumi Nomizu.

Thesis: *A Gauss-Bonnet formula for Lorentzian two-manifolds.*

Areas of research:

1. Applications of algebraic geometry, differential geometry and representation theory to complexity theory,
2. Geometry of tensors and applications to quantum information theory, signal processing, many body physics and other areas,
3. Geometry of projective varieties,
4. Geometry of exceptional Lie groups,
5. Exterior differential systems.

Research Grants:

National Science Foundation grant CCF-2203618 \$450,000 (3/22 - 8/25)

National Science Foundation grant CCF-1814254 \$482,511 (7/18 - 6/22)

National Science Foundation grant DMS-1405348 (7/15 - 7/18)

National Science Foundation grant DMS-1006353 (joint with C. Robles) (7/10 - 7/14)

National Science Foundation grant DMS-0805782 (joint with C. Robles) (8/08 - 7/10)

National Science Foundation grant DMS-0505216 (collab. w. V. Zharnitsky) (8/05 - 7/08)

National Science Foundation grant DMS-0305829 (sole PI) (8/03 - 7/06)

Prime d'encadrement et de recherche (French government grant) (9/99 - 9/02)

National Science Foundation grant DMS-9626640 (sole PI) (8/96 - 8/99)

National Science Foundation grant DMS-9303704 (sole PI) (7/93 - 7/96)

National Science Foundation Postdoctoral Research Fellowship (7/90-7/93)

Other Grants:

National Science Foundation grant for Texas geometry and topology conference DMS-1812040 (with D. Baskin and I. Zelenko) \$90,000 (5/18 - 5/21)

National Science Foundation grant for Texas geometry and topology conference DMS-1510060 (with J.Pitts) (4/15 - 4/18)

National Science Foundation grant for New Directions in Exterior Differential Systems: A conference in honor of Robert Bryant's 60th birthday DMS-1321212 (with J. Clelland and C. Robles) (2/13 - 2/14)

National Science Foundation grant for Texas geometry and topology conference DMS-1203131 (with J.Pitts) (4/12 - 4/15)

National Science Foundation grant for Texas Algebraic Geometry Symposium DMS-1203175 (with L. Matusevich, J. M. Rojas, P. Lima-Filho, and F. Sottile) (4/12 - 4/13)

Insititue for Math and Applications (IMA) conference grant for Applications of Geometry workshop at TAMU (4/12)

National Science Foundation grant for Texas geometry and topology conference DMS-0904481 (with J.Pitts) (4/09 - 4/12)

National Science Foundation grant for Texas Algebraic Geometry Seminar DMS-0915235 (with M. Rojas, P. Lima-Filho, F. Sottile, L. Matusevich) (4/09 - 4/12)

National Science Foundation grant for Texas geometry and topology conference DMS-0605082 (with J.Pitts) (4/06 - 4/09)

Georgia Tech VIGRE grant (one of 5 PI's) (2002-2007).

Teaching experience.

Teaching at all levels in the US and France, from first year undergraduate to advanced graduate classes.

Texas A&M graduate class development: Designed Quantum Computing/Quantum Information Theory graduate course, redesigned graduate differential geometry sequence and algebraic geometry I classes, initiated algebraic geometry II class, co-initiated representation theory class.

Initiated supplementary mathematics programs in Philadelphia city schools to spark interest in mathematics (funded by a small grant from the Executive Service Corps of Philadelphia), by giving mathematics presentations at a junior high school and a high school (91-94).

LSAMP mentor - program for first generation college students (2017-18, program discontinued after 2018).

Supervision.

15 PhD students, plus 5 current, 4 Guseman prize winners. PhD students obtained post-doctoral fellowships at U. Chicago (3), Harvard, UC Berkeley, QMath Copenhagen, Duke, Max Plank Inst. Leipzig, U. Firenze, U. Konstanz, U. Toulouse. 2 obtained NSF post-doctoral fellowships. 10 currently in academic positions, 3 in non-academic research. One currently junior permanent member of Chinese National Academy of Science, one *chaire d'excellence junior* (junior endowed associate professor) Toulouse. Former post-doctoral mentees currently professors at U. Warwick, U. Torino, IPAM/U. Warsaw, U. Trento, U. Tromso, Boise State U.

Postdoctoral supervision:

1. T. Mandziuk (1/24-1/27), current,
2. H. Huang (8/19-8/22), currently tenure track at TAMU
3. A. Harper (8/18-8/21)
4. E. Ventura (8/17-12/19), currently associate professor at U. Torino

5. K. Efremenko (8/14-12/14), *funded by Simons Inst. Theoretical computing*, currently at Ben-Gurion University
6. C. Ikenmeyer (1/13-5/16), currently professor of computer science at U. Warwick
7. H. Kadish (8/11-8/12), currently field engineer at Tamr Inc.
8. A. Boralevi (8/08-7/10), currently professor at U. Torino
9. J. Buczynski (8/08-7/10), *funded by Marie Curie fellowship (European Union)*, currently professor at Institute of Mathematics of Polish Academy of Sciences (IMPAN) and Faculty of Mathematics, Computer Science and Mechanics of University of Warsaw (MIMUW)
10. Z. Teitler (8/07-7/10), currently professor at Boise State U.
11. D. The (8/08-7/11), *funded by NSERC fellowship (Canadian government)* and TAMU, currently associate professor at U. Tromso
12. A. Bernardi (8/06-1/07), currently professor at U. Trento
13. J. Dilles (8/06-12/07), currently lecturer at UGA, Athens
14. D. Fox, (8/03-5/04), currently at Universidad Politécnica de Madrid

PhD students: (an asterisk indicates a Guseman prize winner while working under my direction: <https://www.math.tamu.edu/graduate/guseman.html>)

1. C. Chang*, *Border subrank of tensors*, PhD 8/24, currently postdoctoral fellow at U. Paul Sabatier, Toulouse.
2. A. Pal, *Concise tensors of minimal border rank*, PhD 8/23, currently senior data scientist at U. Idaho.
3. R. Geng, *On the geometry of geometric rank*, PhD 5/23, currently Kruskal fellow, U. Chicago applied math.
4. K. Bari, *On the structure tensor of sl_n* , PhD 5/21, currently Operations/Systems Analyst with Metron, Inc.
5. A. Conner*, *New results in the complexity of matrix multiplication*, PhD 5/20, currently NSF postdoctoral fellow at Harvard University and U. Konstanz.
6. F. Gesmundo*, *Geometry and representation theory in the study of matrix rigidity*, PhD 7/17, obtained post-docs at U. Copenhagen, MPI, U. Saarland. Junior *chaire d'excellence* MCF at U. Toulouse (starting 9/23).
7. C. Farnsworth, *The polynomial Waring problem and the determinant*, PhD 8/16, obtained research post-doctoral fellow at Yonsei University, Seoul, currently senior lecturer at U. Texas, San Marcos.

8. Y. Guan, Equations for Chow varieties, their secant varieties and other varieties arising in complexity theory, PhD 8/16, currently Computer Vision Algorithm Scientist at MINIEYE, Shenzhen, China.
9. C. Porter, *The local equivalence problem for 7-dimensional, 2-nondegenerate CR manifolds whose cubic form is of conformal unitary type*, PhD 8/16, post-doctoral fellow at North Carolina State University, currently at Duke University
10. Y. Qi, *Geometry of Feasible Spaces of Tensors*. PhD 8/13. Obtained joint U. Grenoble (engineering) U. Chicago (statistics), and U. Chicago math Dickenson postdoctoral fellow. Currently advanced post-doctoral researcher at INRIA (France)
11. M. Yang, *On partial and generic uniqueness of block term tensor decompositions in signal processing*. PhD 12/12. Currently tenure track at U. Evansville
12. K. Ye, *Immanants, tensor network states and the geometric complexity theory program*. PhD 5/12. Postdoctoral fellow at U. Chicago (joint statistics-math-computer science). Currently associate professor at the Chinese National Academy of Sciences.
13. L. Oeding, *Defining equations of the variety of principal minors*. PhD 5/09. NSF post-doctoral fellow at Firenze followed by RTG postdoctoral fellow at UC Berkeley, currently associate professor at Auburn Univ.
14. F. Holweck, *Singularities of hyperplane sections of homogenous varieties*. PhD 9/04 from Université Toulouse III. Currently MDC (associate professor) at U. Belfort.
15. E. Allaud, *Variation of Hodge structure viewed from an exterior differential systems perspective*. PhD 10/02 from Université Toulouse III. Postdoctoral fellowship at U. Utah. Currently teaching in Brussels.

Current PhD students: N. Amarasinghe, P. Speegle, J. Shen, D. Wu (joint with C. Yan), and Z. Xiao.

Master's students: B. Liu 5/16, Y. Zheng 5/17

Georgia Faculty development program: M. Dillon, *Constructions of graded Lie algebras* (2001-2)

Mémoires de DEA directed:

- M. Canton, *Rigidity of G -structures* (6/00)
- F. Holweck, *Representation theory and geometry* (6/00)
- S. Bonhomme, *Dual Varieties* (6/99)
- S. Lapasset, *The Goresky-MacPherson version of Lefschetz's theorem* (6/99)
- E. Allaud, *The calculus of variations after Bryant and Griffiths* (6/98)
- C. Laratte, *Characteristic varieties and the Radon transform* (6/98)

Undergraduate research supervision:

- J. Zhao, geometry of tensors (since 5/24-8/24).
- P. Sarin (high school student), resulting in the publication "On the geometry of Tensor Network States of $2 \times N$ Grids" (LAA 575 (2019), 235–249).
- D. Allums, project resulting in the publication of "Border rank of ternary trilinear forms and the j -invariant", *Involve* 8 (2015), no. 2, 345–355.

Service since 2007

Member of the scientific committee *Random Tensors and Related Topics* since 2024 (France based group organizing 1 – 2 workshops/year at various locations.)

member of the Advisory Board Group of the HORIZON–MSCA-2023-DN-JD, TENORS (since 6/24)

TAMU math dept. executive committee (9/22-9/24)

TAMU math dept. head search committee (spring 2023)

ILAS (International Linear Algebra Society) awards committee (9/21-9/23)

TAMU math dept. subcommittee P (10/18-10/20)

TAMU math dept. Undergraduate committee (9/17-9/19)

TAMU math dept. Executive committee (9/15-9/17)

TAMU math dept. Awards committee (9/12-9/14)

AMS Committee on Academic Freedom, Tenure, and Employment Security (CAFTES) (11/08-11/11), chair of committee (2011).

TAMU math. dept. subcommittee T (10/10-10/12, head in 2011)

TAMU math dept. postdoctoral fellow committee (10/08-10/10)

TAMU math dept. graduate committee (10/06-10/08)

Organization since 2007

1. Co-organizer of the Simons Center (UC Berkeley) semester program on the complexity of linear algebra (fall 2025).
2. Co-organizer of the *Tensor Networks Workshop*, IPAM (2/24)
3. Member of scientific committee of the special program on random tensors at the Poincaré institute, Paris, fall 2024.
4. Co-organizer of the *Secant v. Cactus Workshop*, Toulouse (5/23)
5. Co-organizer of the *Geometry and Complexity Theory Workshop*, Toulouse (4/22)
6. Co-organizer of the *fall 2019 Texas geometry and topology conference (TGTC)*, TAMU (11/19)
7. Co-organizer of *special session on applications of algebraic geometry and representation theory* at 2018 Spring Southeast AMS sectional meeting, Vanderbilt University (4/18)
8. Co-organizer of *Working Group on Representation Theory and GCT*, Santa Fe Institute (12/16)
9. Co-organizer of the *fall 2016 Texas geometry and topology conference (TGTC)*, TAMU (11/16)
10. Co-organizer of *Differential Geometry and its Applications conference*, and Organizer of a *special workshop on the complexity of matrix multiplication*, Brno (8/16)

11. Co-organizer of the *Algorithms and Complexity in Algebraic Geometry reunion workshop*, Simons Institute of Theoretical Computing, Berkeley (12/15)
12. Steering committee for *SIAM Algebraic Geometry activity group conference and special session organizer*, Daejeon (8/15)
13. Co-organizer of *Special semester on Algorithms and Complexity in Algebraic Geometry*, Simons Institute of Theoretical Computing, Berkeley CA (fall 2014)
14. Co-organizer of *Workshop on uses of algebraic geometry in combinatorial and computational geometry*, IPAM, Los Angeles, CA (4/14)
15. Co-organizer of *Differential Geometry and its Applications conference*, and organizer of a *special session on Geometric Complexity Theory*, Brno (8/13)
16. Co-organizer of *AMS MRC on Geometry and Representation Theory Related to Geometric Complexity and Other Variants of P v. NP* , Snowbird, UT, (6/12)
17. Co-organizer of *Questions in geometry arising in the sciences* TAMU (4/12)
18. Co-organizer of *Mathematical aspects of P v. NP and variants*, ICERM, Brown University, Providence, RI, (8/11)
19. Steering committee for: *Latin American School on Algebraic Geometry and Applications /Escuela Latinoamericana de Geometría Algebraica y Aplicaciones (ELGA 2011)* (8/11)
20. Co-organizer of the *fall 2010 Texas geometry and topology conference (TGTC)*, TAMU (11/10)
21. Steering committee for: *Tensor Decompositions and Applications (TDA 2010)* Bari (Engineering conference on tensors) (09/10)
22. Co-organizer of the *spring 2009 Texas Algebraic Geometry Seminar*, TAMU (05/09)
23. Co-organizer and teacher of MSRI summer graduate workshop, *Geometry and Representation Theory of Tensors for Computer Science, Statistics, and other areas*, (07/08)
24. Co-organizer of AIM workshop *Geometry and representation theory of tensors for computer science, statistics and other areas* (07/08)
25. Co-organizer of the *fall 2007 Texas geometry and topology festival*, TAMU (11/07)

Current seminar organization

Co-organizer and initiator of the twice weekly TAMU *Geometry seminar*
<http://www.math.tamu.edu/seminars/geometry/>

Organizer and initiator of the weekly TAMU *Student/Post-doc geometry seminar*,
http://www.math.tamu.edu/seminars/studentpd_geom_work/

Co-organizer and co-initiator of weekly TAMU *Random Tensors seminar*
<https://www.math.tamu.edu/seminars/randomtensors/index.php>

Editorial board membership

SIGMA since 2019

FOCM since 2015

Linear algebra and its applications since 2012, senior editor since 2020

Differential geometry and its applications 2010-2023

special issue of SIGMA, Eli Cartan and differential geometry (2008)

Membership

Member of the ACM, AMS, SIAM, and ILAS (International Linear Algebra Society).

Publications

Books

1. “Quantum computation and quantum information theory: a mathematical perspective”
AMS Graduate Studies in Mathematics 243, 2024; 204pp.
2. “Tensors: Asymptotic Geometry and Developments 2016–2018”
CBMS lecture series, AMS, Volume: 132; 2019; 152 pp.
3. “Geometry and Complexity Theory”,
Cambridge Studies in Advanced Mathematics 169, Cambridge Univ. Press. 2017, 339pp.
4. “Tensors: Geometry and Applications”
AMS Graduate Studies in Mathematics vol 128, 2011. 439pp.
5. “Cartan for beginners: an introduction to the moving frame and exterior differential systems” (with T. Ivey)
AMS Graduate Studies in Mathematics vol 61, 2003. 378pp. Second Edition, 471pp, vol. 175, 2017.
6. “Algebraic geometry and projective differential geometry, Seoul National University concentrated lecture series 1997”
Seoul National University Press (1999). 85pp.

Refereed research articles

When a coauthor is a past or current graduate student, their name is marked with a an asterisk and when a former or current post-doc, their name is marked with a dagger.

1. “On linear spaces of matrices of bounded rank” (with H. Huang[†]),
Selecta Mathematica (to appear) arXiv:2306.14428

2. “Towards finding hay in a haystack: explicit tensors of border rank greater than $2.02m$ in $\mathbb{C}^m \otimes \mathbb{C}^m \otimes \mathbb{C}^m$ ”, (with M. Michalek[†]),
Theory of Computing 2025, arXiv:1912.11927
3. “Equivariant spaces of matrices of constant rank” (with L. Manivel)
Pure Appl. Math. Q. 21 (2025), no. 3, 1209–1244.
4. “New lower bounds for matrix multiplication and the 3×3 determinant”, (with Austin Conner* and Alicia Harper[†])
Forum of Mathematics Pi, DOI 10.1017/fmp.2023.14, vol. 11, 2023
5. “Concise tensors of minimal border rank”, (with J. Jelisiejew and A. Pal*)
Math. Annalen 388 (2024), no. 3, 2473–2517.
6. “Geometry of backflow transformation ansatz for quantum many-body fermionic wave functions”, (with H. Huang[†] and J. Lu),
Communication in Mathematical Sciences 21(2023), no.5, 1447–1453.
7. “Bad and Good news for Strassen’s laser method: Border rank of the 3×3 permanent and strict submultiplicativity” (with Austin Conner* and Hang Huang[†]),
Found. Comput. Math. 23 (2023), no. 6, 2049–2087.
8. “Kronecker powers of tensors and Strassen’s laser method”, (with Austin Conner*, Fulvio Gesmundo*, and Emanuele Ventura[†])
LIPIcs. Leibniz Int. Proc. Inform., 151 Schloss Dagstuhl. Leibniz-Zentrum für Informatik, Wadern, 2020, Art. No. 10, 28 pp.
9. “On the geometry of geometric rank” (with Runshi Geng*),
Algebra Number Theory 16 (2022), no. 5, 1141–1160.
10. “A geometric study of Strassen’s asymptotic rank conjecture and its variants”, (with Austin Conner*, Fulvio Gesmundo*, Emanuele Ventura[†], and Yao Wang*),
Collect. Math. 72 (2021), no. 1, 63–86.
11. “Multilinear Compressive Sensing and an Application to Convolutional Linear Networks”, (with F. Malgouyres)
SIAM J. Math. Data Sci. 1 (2019), no. 3, 446–475.
12. “Explicit polynomial sequences with maximal spaces of partial derivatives and a question of K. Mulmuley”, (with F. Gesmundo*),
Theory of Computing, 15 (2019) no. 3, pp. 1-24
13. “The geometry of rank decompositions of matrix multiplication II: 3×3 matrices”, (with G. Ballard, C. Ikenmeyer[†], and N. Ryder),
J. Pure Appl. Algebra 223 (2019), no. 8, 3205–3224.

14. “The geometry of rank decompositions of matrix multiplication I: 2x2 matrices”, (with L. Chiantini, C. Ikenmeyer[†], and G. Ottaviani),
Exp. Math. **28** (2019), no. 3, 322–327.
15. “Matrix Product States and the Quantum Max-Flow/Min-Cut Conjectures” (with F. Gesmundo* and M. Walter),
J. Math. Phys. **59** (2018), no. 10, 102205, 11 pp.
16. “On minimal free resolutions of sub-permanents and other ideals arising in complexity theory”, (with K. Efremenko[†], H. Schenck, and J. Weyman),
J. Algebra **503** (2018), 8–20
17. “Polynomials and the exponent of matrix multiplication”, (with L. Chiantini, J. Hauenstein[†], C. Ikenmeyer[†], and G. Ottaviani),
Bull. Lond. Math. Soc. **50** (2018), no. 3, 369–389.
18. “The method of shifted partial derivatives cannot separate the permanent from the determinant”, (with K. Efremenko[†], H. Schenck, and J. Weyman),
Math. Comp. **87** (2018), no. 312, 2037–2045
19. “A $2n^2 - \log_2(n) - 1$ lower bound for the border rank of matrix multiplication”, (with M. Michalek[†]),
Int. Math. Res. Not. IMRN 2018, no. 15, 4722–4733.
20. “Permanent vs determinant: an exponential lower bound assuming symmetry and a potential path towards Valiant’s conjecture”, (with N. Ressayre),
DGA special issue on geometry and complexity theory, **55** (2017), 146–166.
21. “On the complexity of the permanent in various computational models”, (with C. Ikenmeyer[†]),
J. Pure Appl. Algebra **221** (2017), no. 12, 2911–2927.
22. “An explicit description of the irreducible components of the set of matrix pencils with bounded normal rank”, (with F. De Teran and F. Dopico),
Linear Algebra Appl. **520** (2017), 80–103.
23. “On the geometry of border rank algorithms for matrix multiplication and other tensors with symmetry” (with M. Michalek[†]),
SIAM J. Appl. Algebra Geom. **1** (2017), no. 1, 2–19.
24. “Abelian Tensors”, (with M. Michalek[†]),
J. Math. Pures Appl. (9) **108** (2017), no. 3, 333–371.
25. “On the geometry of border rank algorithms for $n \times 2$ by 2×2 matrix multiplication”, (with N. Ryder)
Exp. Math. **26** (2017), no. 3, 275–286.

26. “Complexity of linear circuits and geometry ”, (with F. Gesmundo*, J. Hauenstein[†], and C. Ikenmeyer[†])
FOCM **16**(2016) no. 3, 599–635.
27. “New lower bounds for the border rank of matrix multiplication”, (with G. Ottaviani)
Theory of Computing, **11** (2015), 285–298.
28. “Explicit tensors of border rank at least $2n - 1$ ”,
J. Pure and appl. Algebra, **219** (2015), no. 8, 3677—3684.
29. “Connections between conjectures of Alon-Tarsi, Hadamard-Howe, and integrals over the special unitary group ”, (with S. Kumar)
Discrete Math. **338** (2015), no. 7, 1232—1238.
30. “Geometric Complexity Theory: an introduction for geometers”,
Annali di Matematica dell’Università di Ferrara, **61** (2015), no. 1, 65—117.
31. “New lower bounds for the rank of matrix multiplication”,
SIAM J. Comput. **43** (2014), no. 1, 144—149.
32. “Padded polynomials, their cousins, and geometric complexity theory”, (with H. Kadish[†]),
Comm. Algebra **42** (2014), no. 5, 2171—2180.
33. “On the third secant variety” (with J. Buczyński[†]),
J. Algebraic Combin. **40** (2014), no. 2, 475—502.
34. “Equations for lower bounds on the border rank” (with G. Hauenstein[†] and C. Ikenmeyer[†]),
Exp. Math. **22** (2013), no. 4, 372—383.
35. “Determinantal equations for secant varieties and the Eisenbud-Koh-Stillman conjecture”
(with J. Buczyński[†] and A. Giesky),
J. Lond. Math. Soc. (2) **88** (2013), no. 1, 1—24.
36. “Equations for secant varieties of Veronese and other varieties” (with G. Ottaviani),
Ann. Mat. Pura Appl. (4) **192** (2013), no. 4, 569—606.
37. “Fubini-Griffiths-Harris rigidity of homogeneous varieties” (with C. Robles),
Int. Math. Res. Not. IMRN **7** (2013), 1643—1664.
38. “Hypersurfaces with degenerate duals and the Geometric Complexity Theory Program”
(with L. Manivel and N. Ressayre),
Comment. Math. Helv. **88** (2013), no. 2, 469—484.
39. “Holographic algorithms without matchgates” (with J. Morton and S. Norine),
Linear Algebra Appl. **438** (2013), no. 2, 782—795.

40. “Ranks of tensors and a generalization of secant varieties” (with J. Buczyński[†]),
Linear Algebra Appl. **438** (2013), no. 2, 668—689.
41. “On the geometry of Tensor Network States” (with Y. Qi* and K. Ye*),
Quantum Inf. Comput. **12** (2012), no. 3-4, 346–354.
42. “Fubini-Griffiths-Harris rigidity and Lie algebra cohomology” (with C. Robles),
Asian J. Math. **16** (2012), no. 4, 561–586.
43. “An overview of mathematical issues arising in the Geometric complexity theory approach
to $VP \neq VNP$ ” (with P. Bürgisser, L. Manivel and J. Weyman),
SIAM J. Comput. **40** (2011), no. 4, 1179—1209.
44. “Lines on hypersurfaces” (with C. Robles),
J. London Math. Soc. (2) **82** (2010), no. 3, 733–746,
45. “On the Debarre-deJong and Beheshti-Starr conjectures on varieties with too many lines”
(with O. Tommasi),
Mich. Math. J. **59** N. 3 (2010) 573–588.
46. “P versus NP and geometry”
J. Symbolic Computation, **45** (2010) 1359–1377.
47. “On the ranks and border ranks of symmetric tensors” (with Z. Teitler[†]),
Found. Comput. Math. **10** (2010), no. 3, 339–366.
48. “On secant varieties of Compact Hermitian Symmetric Spaces” (with J. Weyman),
Journal of Pure and Applied Algebra **213** (2009), no. 11, 2075–2086.
49. “Fubini’s Theorem in codimension two” (with C. Robles),
J. Reine Angew. Math. **631** (2009), 221–235.
50. “Geometry and the complexity of matrix multiplication”,
Bull. Amer. Math. Soc. (N.S.) **45** (2008), no. 2, 247–284.
51. “Differential geometry of submanifolds of projective space”
in Symmetries and overdetermined systems of partial differential equations, 105–125, IMA
Vol. Math. Appl., **144** (2008)
52. “Generalizations of Strassen’s equations for secant varieties of Segre varieties ” (with L.
Manivel),
Comm. Algebra **36** (2008), no. 2, 405–422
53. “On the ideals and singularities of secant varieties of Segre varieties” (with J. Weyman),
Bull. Lond. Math. Soc. **39** (2007), no. 4, 685–697.

54. “Legendrian varieties” (with L. Manivel),
Asian J. Math. **11** (2007), no. 3, 341–359
55. “On Tangential varieties of rational homogeneous varieties” (with J. Weyman),
Journal Lond. Math. Soc. **76** (2007) (2), 513–530.
56. “The border rank of the multiplication of two by two matrices is seven”
J. Amer. Math. Soc. **19** (2006), no. 2, 447–459
57. “A universal dimension formula for complex simple Lie algebras” (with L. Manivel),
Advances in Math. **201** (2006), no. 2, 379–407.
58. “The sextonions and $E_{7\frac{1}{2}}$ ” (with L. Manivel),
Advances in Math. **201** (2006), no. 1, 143–179.
59. “Griffiths-Harris rigidity of compact Hermitian symmetric spaces”
J. Differential Geometry **74** (2006) 395–405.
60. “On the ideals of secant varieties of Segre varieties” (with L. Manivel),
Found. Comput. Math. **4** (2004), no. 4, 397–422.
61. “On space-time coding in the presence of spatio-temporal correlation ”
(with M. Fozunbal (principal author), S. McLaughlin, R. Schafer), IEEE Transactions on
Information Theory **50** (2004), no. 9, 1910–1926.
62. “Series of Lie Groups” (with L. Manivel),
Michigan Math. J. **52** (2004), no. 2, 453–479
63. “Series of nilpotent orbits” (with L. Manivel and B. Westbury),
Experiment. Math. **13** (2004), no. 1, 13–29.
64. “Lines on algebraic varieties”
Journal für die reine und angewandte Mathematik (Crelle), **562** (2003) 1–3.
65. “On the projective geometry of homogeneous varieties” (with L. Manivel),
Commentari Math. Helv., **78**(2003) 65–100.
66. “Triality, exceptional Lie algebras, and Deligne dimension formulas”(with L. Manivel) ,
Advances in Mathematics **171** (2002) 59–85.
67. “Construction and classification of complex simple Lie algebras via projective geometry”
(with L. Manivel),
Selecta Mathematica, **8** 137–159 (2002).

68. “On the projective geometry of Freudenthal’s magic chart” (with L. Manivel),
J. Algebra, **239** 477–512 (2001).
69. “On the infinitesimal rigidity of homogeneous varieties”,
Compositio Mathematica, **118** (1999) 189–201.
70. “Is a linear space contained in a submanifold? - On the number of derivatives needed to tell ”,
Journal für die reine und angewandte Mathematik (Crelle) **508**(1999) 53–60.
71. “On symmetric degeneracy loci, spaces of symmetric matrices of constant rank and dual varieties ” (with B. Ilie),
Mathematische Annalen, **314** (1999) 159–174.
72. “On a conjecture of Kontsevich and variants of Castelnuovo’s lemma”,
Compositio Mathematica **115** (1999) 231–239 and **140** (2004), no. 4, 1112..
73. “On minimal isometric embeddings” (with T. Ivey),
Duke Mathematical Journal **89**(1997) 555–576.
74. “Differential-geometric characterizations of complete intersections”,
Journal of Differential Geometry **44** (1996) 32–73.
75. “On degenerate secant and tangential varieties and local differential geometry”,
Duke Mathematical Journal **85**(1996) 605–634.
76. “On second fundamental forms of projective varieties”,
Inventiones Math. **117**(1994) 303–315.
77. “Minimal submanifolds defined by first order systems of PDE”,
Journal of Differential Geometry, **36**(1992) 369–417.
78. “Minimal submanifolds of E^{2n+1} arising from degenerate $SO(3)$ orbits on the Grassmannian”,
AMS Transactions, **325**(1991), 101–117.

Submitted research articles

1. “Tensors with maximal symmetries”, (with Austin Conner*, Fulvio Gesmundo*, and Emanuele Ventura[†]) arXiv:1909.09518

Refereed Conference Proceedings

1. “Tensors not subject to barriers for Strassen’s laser method”, (with A. Conner* and F. Gismundo*)
Innovations in Theoretical Computer Science (ITCS), 2020, Seattle, WA.
2. “Stable recovery of the factors from a deep matrix product”, (with François Malgouyres)
Signal Processing with Adaptive Sparse Structured Representations (SPARS), 2017, Lisbon, Portugal
3. “On the identifiability and stable recovery of deep/multi-layer structured matrix factorization”, (with F. Malgouyres),
IEEE Information Theory Workshop (ITW) 2016
4. “Permanent vs determinant: an exponential lower bound assuming symmetry”, (with N. Ressayre),
ITCS’16—Proceedings of the 2016 ACM Conference on Innovations in Theoretical Computer Science, 29–35, ACM, New York, 2016

Refereed expository articles

1. “Secant varieties and the complexity of matrix multiplication”, Rendiconti dell’Istituto di Matematica dell’Università di Trieste (special volume of the proceedings of the Conference GO60), 2022.
2. “Algebraic Geometry and Representation theory in the study of matrix multiplication complexity and other problems in theoretical computer science” (invited article for special issue) Differential Geom. Appl. 82 (2022), 23 pp.
3. “A very brief introduction to quantum computing and quantum information theory for mathematicians” (invited article),
in book Quantum Physics and Geometry, UMI Springer Lecture Notes. **25** (2019) 5–41.
4. “On the geometry of matrix multiplication” (invited article).
Notices Amer. Math. Soc. **65** (2018), **4**, 402.
5. “An introduction to geometric complexity theory” (invited article),
Eur. Math. Soc. Newsl. **99** (2016), 10–18.
6. “Exterior differential systems, Lie algebra cohomology, and the rigidity of homogeneous varieties”,
Proceedings of the 2008 Srni Winter School in geometry and Physics, Arch. Math. (Brno) **44** (2008), no. 5, 419–447.
7. “Exterior differential systems and billiards”,
Geometry, Integrability and Quantization VII edited by Ivailo M. Mladenov and Allen C. Hirshfeld. 35–54, Softex, Sofia, 2006.

8. “Representation theory and projective geometry” (with L. Manivel),
Algebraic transformation groups and algebraic varieties, 71–122, Encyclopaedia Math. Sci., 132, Springer, Berlin, 2004
9. “ G -structures via three examples”,
in Web theory and related topics , Grifone, Salem, eds., World Scientific 2001, 133–150.
10. “Exterior differential systems: a geometric approach to pde”,
Proc. Workshop pure math. **17.III**(1998) pp. 77-101.
11. “Géométrie algébrique et géométrie différentielle projective”,
Prépublication 106 du Laboratoire E. Picard, décembre 1997. (Habilitation à diriger des recherches)
12. “On the local differential geometry of complete intersections”
Séminaire de théorie spectrale et géométrie, Grenoble (1994-1995) pp. 1-12.

Research invitations

Université Paul Sabatier, Toulouse, *chaire d'excellence* (visiting endowed professor) (6 months, 2022-3).

Harvard University Mathematics dept., three months (2022) (only used one due to COVID19)
 Harvard University Computer Science dept., one month (2020, postponed due to COVID19)
 IPAN/U. Krakow , Warsaw, one month (2020, postponed due to COVID19)
 Max Plank Institute, Leipzig, one week (7/19), (7/18), (10/17) and (5/13)
 IPAN special semester, Warsaw, two weeks (fall 2018) (Simons Visiting Professorship)
 QMath, Copenhagen, two weeks (7/18)
 Univ. Trento, two months (6-7/17)
 Univ. Lyon/ENS Lyon, three weeks (6/15)
 Research “in pairs”, Oberwolfach Math. Inst., Germany, two weeks (11/13)
 IAS (to work with CS group), one week (7/13)
 Algebraic Geometry with a view towards applications, Mittag-Leffler Inst., Stockholm one month (5/11)
 ANU, Canberra, 3 weeks (7/10)
 U. Grenoble, France, one month (10/09)
 ANU, Canberra, 3 weeks (7/09)
 Institut des Hautes Etudes Scientifiques (IHES), one month (7/07)
 Korean Institute for Advanced Study, Seoul, one month visiting professor (6/06)
 University of Grenoble, one month visiting professor (5/04)
 Korean Institute for Advanced Study, Seoul, one month visiting professor (12/00-1/01)
 Mathematisches Institut, Basel, one month visiting professor (6/00)
 Institut des Hautes Etudes Scientifiques (IHES) (8/99)
 University of Grenoble, one month visiting professor (11/95)
 Mathematical Sciences Research Institute (MSRI), four one month postdoctoral visits (1/93, 5/93, 3/94, 5/94)

University of Chicago, one month visiting professor (5/92)

University of Chicago, one month visiting professor (5/91)

Plenary or principal lectures (since 2000), format (month/year)

1. Applications of commutative algebra, Fields Inst. (5/25)
2. TAGA2024, Tensors: algebra, geometry, and applications (6/24)
3. Swiss Mathematical Society annual meeting, the plenary speaker (6/23)
4. Deformation theory workshop, Warsaw, Poland (12/22)
5. CATS60, a conference in honor of Carlos Simpson, Toulouse (5/22)
6. GO60, pure and applied algebraic geometry (6/21)
7. ILAS, Rio de Janeiro (7/19)
8. IAMCS Workshop on Quantum Computation and Information, TAMU (5/19)
9. Matrix multiplication: geometry and recent developments, Oberwolfach Complexity meeting (11/18)
10. Geometry and group actions, Warsaw (9/18)
11. Tensors: geometry and quantum information, Copenhagen (7/18)
12. Southeastern Section AMS, Vanderbilt University (4/18)
13. SLAM, U. Arkansas (2/18)
14. Berlin-Leipzig Seminar on Algebra, Geometry and Combinatorics (10/17)
15. SIAM Algebraic Geometry meeting, Georgia Tech, Atlanta (7/17)
16. Quantum Physics and Geometry, Levico Terme (7/17)
17. ALGECOM, Purdue University (10/16)
18. CMO Workshop: Integrability and Near-Integrability in Mechanics and Geometry, Oaxaca (6/16)
19. The Classification Program of Counting Complexity workshop, Simons Inst. UC Berkeley (3/16)
20. Innovations in Theoretical Computer Science MIT, (1/15) [not a plenary talk but a competitive CS conference]
21. Simons Algebraic Geometry reunion workshop (12/15)
22. Wildness in Computer Science, Physics and Mathematics, Santa Fe Institute (10/15)

23. Optimization in machine learning, vision and image processing, CIMI Toulouse, (10/15)
24. GCT Workshop, ENS Lyon, (6/15)
25. Workshop: Tensor Low-rank Optimization and Applications, Bonn, (6/15)
26. ICRTCA conference in honor of J. Weyman, U. Conn (4/15)
27. Berlin Mathematical School Colloquium , Berlin (2/15)
28. Tensor workshop, Simons Inst. UC Berkeley (11/14)
29. Geometric Complexity Theory Workshop, Simons Inst. UC Berkeley (9/14)
30. ICERM workshop on computational multilinear algebra, Providence, RI (6/14)
31. Tools from Algebraic Geometry at IPAM, UCLA (4/14)
32. Computational Algebraic Statistics, Theories and Applications (CASTA 2014), Kyoto (1/14)
33. Quantum Marginals conference, Isaac Newton Institute for Mathematical Sciences, Cambridge UK (10/13)
34. Tensor network algorithms in computational physics and numerical analysis, ETH Zurich (5/13)
35. The interaction of geometry and representation theory: exploring new frontiers (conference in honor of 60th birthday of M. Eastwood) at ESI (Vienna) (9/12)
36. Genova-Torino-Milano seminar, Torino (6/12)
37. 17-th Conference of the International Linear Algebra Society, Braunschweig (8/11)
38. Conformal Differential Geometry and its Interaction with Representation Theory, University of Arkansas, Fayetteville (4/11)
39. Workshop on Tensor Decompositions and Applications (TDA), Bari (9/10).
40. Differential Geometry and its Applications (DGA2010), Brno, (8/10)
41. Mathematics and Physics on the Borderline between Algebraic and Differential Geometry, Australian National University, Canberra (7/10).
42. MEGA 2009: Effective methods in algebraic geometry, Barcelona (6/09)
43. Workshop on tensors and interpolation, Nice (6/09)
44. 2009 Haifa Matrix theory Conference, U Haifa (5/09)
45. Texas geometry and topology conference, University of Houston (2/09)

46. The 28th Winter School of Geometry and Physics, Srni, Czech Republic (1/07) - plenary lecture series.
47. Annual Conference of the Heilbronn Institute for Mathematical Research (HIMR), Bristol (9/07)
48. Workshop on Complexity, Coding, and Communication, IMA, Minneapolis MN (4/07)
49. Texas geometry and topology conference, Texas Christian University (3/07)
50. Geometry of vector distributions, differential equations, and variational problems, ITCP, Trieste (12/06)
51. Symmetries and Overdetermined Systems of Partial Differential Equations, IMA, MN. (7/06)
52. Lie algebra workshop, Field's Institute, Univ. of Ottawa (3/06)
53. Geometry Meeting in memory of Professor S.S. Chern, Guanajuato (11/05)
54. AGAFE, "Geometry of algebraic varieties" Ferrara, (6/05)
55. Seventh international conference on Geometry, Integrability and Quantization, Varna, (Course on exterior differential systems and geometry) (6/05)
56. Texas geometry and topology conference, TAMU (10/04)
57. XIV Coloquio Latinoamericano de algebra, La Falda, Argentina. Lecture and mini-course (8/01)
58. IXth Oporto meeting on Geometry, Topology and Physics, Oporto Lecture series (9/00)

Lecture series and intensive courses (since 2000)

1. UC Berkeley Chancellor's professor research course fall semester 2025
2. U. Warsaw intensive class (9 hours) 6/25
3. TENORS, Antibes (3 hours) 2/25
4. Scuola Matematica Interuniversitaria summer course in Perugia (40 hours of lecture) 7/22.
5. Lecture series on quantum information series as part of *chaire d'excellence* position, U. Toulouse (12 hours), 6/22.
6. Introduction to the geometry of random tensors, CIRM workshop in random tensors (3 hours of lecture), 4/22.
7. Clay senior scholar lecture series (6 hours) IPAM, as part of long program *Tensor Methods and Emerging Applications to the Physical and Data Sciences* spring 2021 (by zoom)

8. KAIST/ICERM school and workshop on Nonlinear Algebra (4 hours of lecture) 8/20, postponed due to COVID19
9. CBMS lecture series on tensor networks, U. Auburn, (10 hours of lecture, 1 week) 7/17
10. Intensive summer course on Quantum Information Theory and Geometry (36 hours of lecture) 6-7/17
11. Summer school on Complexity Theory and Geometry for U. Vienna graduate students, Obergurgl (7.5 hours of lecture, 1 week) 9/16
12. Mini-course on algebraic geometry in complexity theory, KAIST (8 hours of lecture, 1 week) 8/15
13. Mini-course/workshop on tensors at U. Chicago, funded by IMA, (10 hours of lecture, 3 weeks) 7/14
14. An interdisciplinary approach to tensor decomposition (CIRM, Trento) (4 hours of lecture) 6/14
15. Max-Planck-Institut für Mathematik in den Naturwissenschaften, Leipzig Germany, lecture series (one week) 5/13
16. Scuola Matematica Inter-universitaria at Cortona, summer reasearch course *Tensors: War-ing problems and Geometric Complexity theory* (11 hours), 7/12
17. Nordfjordeid summer school, Norway Geometry of tensors and applications (8 hours) 6/10
18. GNSAGA (3 hours), U. Firenze, 6/09
19. MSRI summer graduate workshop, (5 hours), *Geometry and Representation Theory of Tensors for Computer Science, Statistics, and other areas*, 07/08
20. UC Berkeley, Special day long seminar on representation theory and algebraic statistics 5/06
21. CIMAT, Guanajuato, *G-structures in projective geometry*, 8/06
22. Seoul National University, Seoul *Rigidity of projective varieties* 6/06
23. Korean Institute for Advanced Study (KIAS), *Billiards and exterior differential systems* 4/05
24. Scuola Matematica Inter-universitaria at Cortona, summer reasearch course *Algebraic ge-ometry: Exceptional groups and projective geometry* (11 hours), 7/03
25. Collegio Docenti of the Ph.D. Consortium Milan-Trieste, graduate level course and research seminars (15 hours), 2/03

Other invited talks since 2000:

- Weyman 70th birthday conf. (10/25)
 Simons Inst. bootcamp (9/25)
 Simon Frasier U. colloquium (8/24)
 SIAM TX-LA meeting seminar (11/23)
 UNC Chapel Hill rep. theory seminar (8/23)
 U. Toulouse Complex Geometry Seminar (6/23)
 UIUC Computer Science colloquium (11/22)
 Carnegie Mellon Optimization, Alg., and Geom. seminar (10/22)
 Harvard Center math and appl. "New Technologies" (9/21)
 IPAM workshop on tensor networks (3/21)
 VA Tech. Geometry Seminar (9/20)
 Northern Italy geometry zoom seminar (5/20)
 U. Grenoble Alg. Geom. Seminar (6/19)
 IPAM seminar, Warsaw (6/19)
 Seminar MPI Leipzig (7/18)
 U. Chicago algebraic geometry sem. (10/18)
 Colloquium, UIC (2/18)
 Colloquium, Cornell Univ. (10/17)
 Colloquium, Stanford Univ. (3/17)
 Harvard/MIT CS reading group (3/16)
 Brown Algebra seminar (3/16)
 Rutgers Computer Science Seminar (11/15)
 SIAM algebraic geometry (3 short lectures) Daejon (8/15)
 Geometry Seminar, Grenoble (6/15)
 Colloquium, U. Belfort (6/15)
 Harvard/MIT Algebraic Geometry Seminar (4/15)
 Combinatorics, complexity of Kronecker coefficients, AIM (11/14)
 U. Penn combinatorics and algebraic geometry seminar (11/14)
 Computer Science/Disc. Math. at IAS (Princeton) (11/13)
 New directions in EDS, Estes Park CO (7/13)
 Colloquium U. Belfort (6/13)
 AMS JMM session on GCT (1/13)
 Computer Science/Disc. Math. at IAS (Princeton) (11/12)
 Geometry seminar at Duke University (10/12)
 Colloquium at UT Austin (10/12)
 Geometric Methods in Rep. Theory, UNC Chapel Hill (1/12)
 Algebraic geometry seminar, U. Montpellier (7/11)
 Seminar, Mittag-Leffler Institute, Stockholm (5/11)
 U. Chicago Statistics colloquium (2/11)
 Rice U., geometry seminar (1/10)
 U. Chicago Computer Science Dept. Colloquium (11/09)
 Colloquium and Geometry seminar, ANU, Canberra (8/09)
 UNC Chapel Hill Representation Theory Seminar (5/08)
 London geometry and topology sem., Imperial College (9/07)
 Harvard-MIT algebraic geometry seminar (9/07)
 U. College, Cork, Ireland, colloq. and geom. seminar (9/07)
 U. Bologna, geometry seminar (7/07)
 UT Austin, geometry seminar (4/07)
 Univ. Utah, colloquium (10/06)
 SNU, Seoul, Korea, colloquium (6/06)
 AMS, special session on Grobner bases, SF, CA (4/06)
 Univ. of Pennsylvania, Colloquium (11/05)
 UC Berkeley alg. geom. sem. (9/25)
 UC Berkeley Math. Dep. colloq. (9/25)
 IPAM tensor network workshop (2/24)
 IPAM second tensor reunion workshop (12/23)
 Konstanz Geometry Seminar (6/23)
 Columbia Univ. Computer Science seminar (11/22)
 Carnegie Mellon CS seminar (10/22)
 SUNY Stony Brook colloq. and geom. seminar (10/21)
 IPAM tutorial workshop (3/21)
 U. Wisc. Colloquium (9/20)
 CMI zoom seminar, India (6/20)
 UCSD Colloquium (9/19)
 Rice U. Colloquium (8/19)
 Berkeley Comm. Alg. seminar (double lect.) (1/19)
 Warsaw geometry seminar (11/18)
 U. Missouri algebraic geometry sem. (10/18)
 Comp. and Appl. Math. Colloq., U. Chicago (2/18)
 Colloquium, Syracuse Univ. (4/17)
 Rocky Mtn. Alg. Comb. Seminar, Colorado State (10/16)
 Algebraic Geometry Seminar U. Chicago (5/16)
 UVA colloquium (10/15)
 Princeton Computer Science Seminar (11/15)
 Rep. theory seminar U. Basel (6/15)
 Seminar U. Lyon (6/15)
 Rutgers Computer Science Seminar (4/15)
 MIT Algorithms and Complexity Seminar (4/15)
 Rutgers geometry seminar (11/14)
 Eisenbud seminar, UC Berkeley (12/14)
 Geometry seminar at Rutgers Univ. (11/13)
 GCT workshop, Brno (8/13)
 U. Chicago Alg. Geom. Seminar (2/13)
 Geometry seminar at Rutgers Univ. (11/12)
 Symbolic Computation Seminar at NC State (10/12)
 Geometry/rep. theory seminar at UNC Chapel Hill (10/12)
 Rep. Theory, Combinatorics, and Geom., UC Berkeley (5/12)
 Algebraic geometry seminar, Princeton U. (11/11)
 Colloquium, Linköping U., Linköping Sweden. (6/11)
 TAGS (graduate student talk), Rice U., Houston (4/11)
 UIC colloquium (3/10)
 WUSTL, St. Louis, Colloquium (12/09)
 U. Grenoble Geometry seminar (11/09)
 UC Irvine Geometry seminar, (6/08)
 Exterior Differential Systems Workshop, MSRI (5/08)
 Geometry day at Loughborough (9/07)
 Northeastern geometry-representation theory seminar (9/07)
 U. Firenze, geometry seminar (7/07)
 U. Grenoble, geometry seminar (7/07)
 Duke University, geometry seminar (10/06)
 KIAS, Seoul, Korea, geometry seminar (6/06)
 SIAM, mini-symposium on billiards and EDS, Boston (7/06)
 Univ. of Houston, Colloquium (1/06)
 Rice Univ., Colloquium (9/05)

Univ Texas at Austin, Geometry seminar (5/05)	UIUC, geometry seminar (3/05)
TAMU, Computer Science dept. seminar (3/05)	TAMU, Math-physics Harmonic analysis seminar (3/05)
MIT/Harvard algebraic geometry seminar (9/04)	Univ. Fourier, Grenoble, Algebraic geometry seminar, (5/04)
UIUC, Colloquium (3/04)	Georgia Southern colloquium (2/04)
Texas A&M, Colloquium and geometry seminar (2/04)	AIM workshop in computational algebraic statistics (12/03)
Rutgers University geometry seminar (11/03)	Emory University colloquium (10/03)
SU. Mass. Amhearst Valley geometry seminar (9/03)	Harvard/MIT algebraic geometry seminar (9/03)
U. of Georgia, Athens, Representation theory seminar (10/03)	Southeast geometry conference, College of Charleston (3/03)
Rutgers University, geometry seminar (11/02)	UNC, Chapel Hill, algebraic geometry seminar (11/02)
Duke University, geometry seminar (11/02)	Penn State, Colloquium (10/02)
Penn State, undergraduate colloquium (10/02)	University of Warwick, Algebra seminar (10/02)
U. of Georgia, Athens, Representation theory seminar (10/02)	University of Utah, colloquium (4/02)
Group actions, Schrodinger Inst., Vienna (10/01)	Northeastern U., colloquium (5/01)
Northeastern U., rep. theory seminar (5/01)	U. of Georgia, Athens, colloquium (2/01)
Purdue University, colloquium (11/00)	Purdue University, geometry seminar (11/00)
Cornell University, Ithaca, colloquium (9/00)	Cornell University, Ithaca, Lie theory seminar (9/00)
U. of Debrecen, Debrecen, Hungary, colloquium (7/00)	Basel/Freibourg/Strasbourg Lie theory seminar (6/00)
Mathematische Institut, Basel, Algebra seminar (6/00)	Jussieu, Paris, journée de la géométrie algebrique (6/00)