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Employment:

Texas A&M University, College Station, TX, professor of mathematics (8/04- present).
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), Bures Sur Yvette, 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).

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: Differential and algebraic geometry. More specifically, exterior differential systems, projective geometry, homogeneous varieties, applications of representation theory to geometry.

Research Grants:

National Science Foundation grant DMS-0505216 (collaborative grant with 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-0605082 (with Jon Pitts) (4/06 - 4/9)

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

Extended research invitations.

Institut des Hautes Etudes Scientifiques (IHES), one month (7/07-8/07)

Korean Institute for Advanced Study, Seoul, one month visiting professor (6/06)

Harvard University, one semester visiting professor (7/04-12/04)

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)

Institut des Hautes Etudes Scientifiques (IHES) (6/95, 9/95-10/95, 12/95)

Mathematical Sciences Research Institute (MSRI) (3/94, 5/94)

Mathematical Sciences Research Institute (MSRI) (1/93, 5/93)

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

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

Teaching experience.

Taught at all levels in the US and France, from first year undergraduate to advanced graduate classes, including experimental calculus courses at the University of Pennsylvania and Columbia University.

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). Monthly mathematics presentations at a junior high school and a high school (91-94).

Supervision.

PhD students:

E. Allaud, *Variation of Hodge structure viewed from an exterior differential systems perspective*, PhD obtained 10/02 from Université Toulouse III. Obtained a three year Wiley assistant professorship at the University of Utah (beginning 8/03).

F. Holweck, *Singularities of hyperplane sections of homogenous varieties*, PhD obtained 9/04 from Université Toulouse III. Offered one year postdoctoral research fellowship at Korean institute for advanced study (KIAS), but was forced to decline because of family circumstances.

L. Oeding, current PhD student (since Spring 05).

Y. Ke, current PhD student (since Fall 07).

M. Yang current PhD student (since Fall 07).

VIGRE post-doc supervision: D. Fox, (8/03-5/04)

Georgia Faculty development program: M. Dillon, *Constructions of graded Lie algebras* (2001-2) *Mémoires de DEA* directed (The French *Mémoire de DEA* is roughly the equivalent of a master's thesis):

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)

Seminar organization

Co-organizer and initiator of the weekly TAMU *Geometry seminar*,

<http://www.math.tamu.edu/research/geom-top/geomsem.html>

Co-organizer and initiator of the weekly TAMU *Working geometry seminar*,

<http://www.math.tamu.edu/research/geom-top/worksem.html>

Organizer and initiator of the weekly TAMU *Student geometry seminar* that met summer

'05 and fall '05, and will reconvene Spring '08. <http://www.math.tamu.edu/~jml/gradsem08.html>

Organized and co-initiated working and regular geometry seminars at Georgia Tech (2000-04).

Membership. Member of the AMS.

Publications

Research articles

1. "Geometry and the complexity of matrix multiplication",
arXiv:cs/0703059. To appear in *Bull. AMS*.
2. "Fubini's Theorem in codimension two" (with C. Robles)
math.AG/0509227. To appear in *Journal für die reine und angewandte Mathematik (Crelle)*

3. “Legendrian varieties” (with L. Manivel)
math.AG/0407279. To appear in *Asian Math. J.*
4. “Generalizations of Strassen’s equations for secant varieties of Segre varieties ” (with L. Manivel)
math.AG/0601097. To appear in *Comm. Alg.*
5. “On the ideals and singularities of secant varieties of Segre varieties” (with J. Weyman)
Bull. Lond. Math. Soc. **39** (2007), no. 4, 685–697.
6. “On Tangential varieties of rational homogeneous varieties” (with J. Weyman)
Journal Lond. Math. Soc. **76** (2007) (2), 513–530.
7. “The border rank of the multiplication of two by two matrices is seven”
J. Amer. Math. Soc. **19** (2006), no. 2, 447–459
8. “A universal dimension formula for complex simple Lie algebras” (with L. Manivel)
Adv. Math. **201** (2006), no. 2, 379–407.
9. “The sextonions and $E_{7\frac{1}{2}}$ ” (with L. Manivel)
Adv. Math. **201** (2006), no. 1, 143–179.
10. “Griffiths-Harris rigidity of compact Hermitian symmetric spaces”
J. Differential Geometry **74** (2006) 395–405.
11. “On the ideals of secant varieties of Segre varieties” (with L. Manivel)
Found. Comput. Math. **4** (2004), no. 4, 397–422.
12. “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.
13. “Series of Lie Groups” (with L. Manivel)
Michigan Math. J. **52** (2004), no. 2, 453–479
14. “Series of nilpotent orbits” (with L. Manivel and B. Westbury)
Experiment. Math. **13** (2004), no. 1, 13–29.

15. "Lines on algebraic varieties"
Journal für die reine und angewandte Mathematik (Crelle), **562** (2003) p 1-3.
16. "On the projective geometry of homogeneous varieties" (with L. Manivel).
Commentari Math. Helv., **78**(2003) p 65-100.
17. "Triality, exceptional Lie algebras, and Deligne dimension formulas"(with L. Manivel)
Advances in Mathematics **171** (2002) p 59-85.
18. "Construction and classification of complex simple Lie algebras via projective geometry"
(with L. Manivel)
Selecta Mathematica, **8** p 137-159 (2002).
19. "On the projective geometry of Freudenthal's magic chart" (with L. Manivel)
J. Algebra, **239** p 477-512 (2001).
20. "On the infinitesimal rigidity of homogeneous varieties"
Compositio Mathematica, **118** (1999) pp. 189-201.
21. "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) pp. 53-60.
22. "On symmetric degeneracy loci, spaces of symmetric matrices of constant rank and dual varieties " (with B. Ilic)
Mathematische Annalen, **314** (1999) pp 159-174.
23. "On a conjecture of Kontsevich and variants of Castelnuovo's lemma"
Compositio Mathematica **115** (1999) pp. 231-239 and **140** (2004), no. 4, 1112..
24. "On minimal isometric embeddings" (with T. Ivey)
Duke Mathematical Journal **89**(1997) pp. 555-576.
25. "Differential-geometric characterizations of complete intersections"
Journal of Differential Geometry **44** (1996) pp. 32-73.
26. "On degenerate secant and tangential varieties and local differential geometry"
Duke Mathematical Journal **85**(1996) pp. 605-634.

27. “On second fundamental forms of projective varieties”
Inventiones Math. **117**(1994) pp. 303-315.
28. “Minimal submanifolds defined by first order systems of PDE”
Journal of Differential Geometry, **36**(1992) pp. 369-417.
29. “Minimal submanifolds of E^{2n+1} arising from degenerate $SO(3)$ orbits on the Grassmannian”
AMS Transactions, **325**(1991), pp. 101-117.

Submitted research articles

1. “Fubini-Griffiths-Harris rigidity and Lie algebra cohomology (with C. Robles),
arXiv:0707.3410.

Expository articles

1. “Differential geometry of submanifolds of projective space”
to appear in the proceedings of the IMA workshop *Symmetries and overdetermined systems of partial differential equations*, math.DG/0609507.
2. “Exterior differential systems and billiards”
in *Geometry, Integrability and Quantization VII* edited by Ivailo M. Mladenov and Allen C. Hirshfeld. 35–54, Softex, Sofia, 2006.
3. “Representation theory and projective geometry” (with L. Manivel)
in *Algebraic transformation groups and algebraic varieties*, 71–122, Encyclopaedia Math. Sci., 132, Springer, Berlin, 2004
4. “ G -structures via three examples”
in *Web theory and related topics*, Grifone, Salem, eds., World Scientific 2001, p 133-150.
5. “Exterior differential systems: a geometric approach to pde”
Proc. Workshop pure math. **17.III**(1998) pp. 77-101.
6. “Géométrie algébrique et géométrie différentielle projective”
Prépublication 106 du Laboratoire E. Picard, décembre 1997. (Habilitation à diriger des recherches)
7. “On the local differential geometry of complete intersections”
Séminaire de théorie spectrale et géométrie, Grenoble (1994-1995) pp. 1-12.

Books

1. “Cartan for beginners: an introduction to the moving frame and exterior differential systems” (with T. Ivey)
AMS graduate studies in mathematics vol 61, 2003. 378 pages.
2. “Algebraic geometry and projective differential geometry, Seoul National University concentrated lecture series 1997”
Seoul National University Press (1999). 85 pages.

Plenary or principal lectures at conferences (previous five years)

Annual Conference of the Heilbronn Institute for Mathematical Research (HIMR), Bristol (9/07)
Workshop on Complexity, Coding, and Communication, IMA, Minneapolis MN (4/07)
Texas geometry and topology conference, Texas Christian University (3/07)
Geometry of vector distributions, differential equations, and variational problems, ITCP, Trieste, Italy (12/06)
Symmetries and Overdetermined Systems of Partial Differential Equations, IMA, MN. (7/06)
Lie algebra workshop, Field’s Institute, Univ. of Ottawa (3/06)
Geometry Meeting in memory of Professor S.S. Chern, Guanajuato Mexico (11/05)
AGAFE, “Geometry of algebraic varieties” Ferrara, Italy, invited lecture (6/05)
Seventh international conference on Geometry, Integrability and Quantization, Varna, Bulgaria. (Course on exterior differential systems and geometry) (6/05)
Texas geometry and topology conference (10/04)

Lecture series and intensive courses (previous five years)

UC Berkeley, Special day long seminar on representation theory and algebraic statistics (5/06)
CIMAT, Guanajuato, Mexico, lecture series on G -structures in projective geometry, (8/06).
Seoul National University, Seoul, Korea, lecture series on the rigidity of projective varieties (6/06)
Korean Institute for Advanced Study (KIAS), lecture series on Billiards and exterior differential systems (4/05)
Scuola Matematica Inter-universitaria at Cortona, summer research course (11 hours, 7/03)
Collegio Docenti of the Ph.D. Consortium Milan-Trieste, graduate level course and research seminars (15 hours, 2/03)

Other invited talks (previous five years):

London geometry and topology seminar, Imperial College (9/07)
Geometry day at Loughborough (9/07)
Harvard-MIT algebraic geometry seminar (9/07)
Northeastern geometry-representation theory seminar (9/07)
U. College, Cork, Ireland, colloquim and geometry seminar (9/07)
U. Firenze, geometry seminar (7/07)
U. Bologna, geometry seminar (7/07)
U. Grenoble, geometry seminar (7/07)
UT Austin, geometry seminar (4/07)
Duke University, geometry seminar (10/06)
Univ. Utah, colloquium (10/06)
KIAS, Seoul, Korea, geometry seminar (6/06)
SNU, Seoul, Korea, colloquium (6/06)
SIAM annual meeting, mini-symposium on billiards and EDS, Boston, MA (7/06)
AMS, special session on Grobner bases, San Francisco, CA (4/06)
Univ. of Houston, Colloquium (1/06)
Univ. of Pennsylvania, Colloquium (11/05)
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, Colloquim and geometry seminar (2/04)
AIM workshop in computational algebraic statistics (12/03)
Rutgers University geometry seminar (11/03)
Emory University colloquim (10/03)
U. Mass. Amhearst Valley geometry seminar (9/03)
Harvard/MIT algebraic geometry seminar (9/03)
University of Georgia, Athens, Representation theory seminar (10/03)
Southeast geometry conference, College of Charleston (3/03)