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Home

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Personal

Born 4 August 1967 in Atlanta, Georgia. Married, with two children.

Degrees

BS 1989, with honors, Stanford University. Honors thesis: *The topology of hypersurface singularities*. Advisor: Steven Kerckhoff.
PhD 1994, MIT. Thesis title: *The topology of Hecke correspondences*. Advisor: Robert D. MacPherson.

Experience

Tufts University. Instructor, 1994–95.
Columbia University. Ritt Assistant Professor, 1995–99.
Barnard College, Columbia University. Visiting Assistant Professor, 1999–2000.
Rutgers University (Newark). Assistant Professor, 2000–02.
Max Planck Institut für Mathematik (Bonn). Research affiliate, Spring 2001.
University of Massachusetts (Amherst), Assistant Professor, 2002–06.
University of Massachusetts (Amherst), Associate Professor, since 2006.

Research Interests

Algebraic geometry, number theory, representation theory, and topology of singular spaces
(MR Classification Numbers: 11F, 20G, 14M)

Publications

Appeared/To Appear

- [1] *The topology of Hecke correspondences*, PhD thesis, MIT (1994).
- [2] *Modular symbols for \mathbf{Q} -rank one groups and Voronoï reduction*, J. of Number Theory **75** (1999), no. 2, 198–219.
- [3] *Symplectic modular symbols*. Duke Math. J. **102** (2000), no. 2, 329–350.
- [4] *Finiteness of minimal modular symbols for SL_n* . J. of Number Theory **82** (2000), no. 1, 134–139.
- [5] *Computing Hecke eigenvalues below the cohomological dimension*, J. of Experiment. Math. **9** (2000), no. 3, 351–367.
- [6] *Computing special values of partial zeta functions*, with Gautam Chinta and Robert Sczech, Algorithmic number theory (Leiden, 2000), 247–256, Lecture Notes in Comput. Sci., 1838, Springer, Berlin, 2000.
- [7] *Modular symbols and Hecke operators*, Algorithmic number theory (Leiden, 2000), 347–358, Lecture Notes in Comput. Sci., 1838, Springer, Berlin, 2000.
- [8] *Eisenstein series twisted by modular symbols for the group SL_n* , with Dorian Goldfeld. Math. Res. Lett. **7** (2000), 1–10.
- [9] *Toric modular forms and nonvanishing of L -functions*, with Lev A. Borisov. J. Reine Angew. Math. **539** (2001), 149–165.

- [10] *Toric varieties and modular forms*, with Lev A. Borisov, Invent. Math. **144** (2001), no. 2, 297–325.
- [11] *Elliptic functions and equations of modular curves*, with Lev A. Borisov and Sorin Popescu, Math. Ann. **321** (2001), no. 3, 553–568.
- [12] *A smooth space of tetrahedra*, with Eric Babson and Richard Scott, Adv. Math. **165** (2002), no. 2, 285–312.
- [13] *Cohomology of congruence subgroups of $SL(4, \mathbf{Z})$* , with Avner Ash and Mark McConnell, J. of Number Theory **94** (2002), 181–212.
- [14] *Wonderful blowups associated to group actions*, with Lev A. Borisov, Selecta Math. N.S. **8** (2002), no. 3, 373–379.
- [15] *Evaluation of Dedekind sums, Eisenstein cocycles, and special values of L -functions*, with Robert Sczech. Duke Math. J. **118** (2003), no. 2, 229–260.
- [16] *Hecke operators and \mathbf{Q} -groups associated to self-adjoint homogeneous cones*, with Mark McConnell, J. of Number Theory **100** (2003), no. 1, 46–71.
- [17] *Toric modular forms of higher weight*, with Lev A. Borisov, J. Reine Angew. Math. **560** (2003), 43–64.
- [18] *A characterization of Dynkin elements*, with Eric Sommers, Math. Res. Lett. **10** (2003), no. 2–3, 363–373.
- [19] *Some elementary Ramanujan graphs*, Geometriae Dedicata. **112** (2005), no. 1, 53–65.
- [20] *Geometry of the tetrahedron space*, with Eric Babson and Richard Scott. Adv. Math. **204** (2006), no. 1, 176–203.
- [21] *Cells and Coxeter groups*, Notices of the AMS, **53** (2006), no. 5, 528–535.
- [22] *Computing in higher rank*, appendix to the book *Modular Forms, a computational approach*, by William Stein, GSM v.79, American Math. Society.
- [23] *Robert MacPherson and arithmetic groups*, Pure and Appl. Math. Quarterly **2** (2006), no. 4, 1015–1052. Special volume dedicated to Robert MacPherson.
- [24] *Weyl group multiple Dirichlet series constructed from quadratic twists*, with Gautam Chinta, Invent. Math. **167** (2007), no.2, 327–353.
- [25] *On certain integral Schreier graphs of the symmetric group*, with Richard Scott and Byron Walden, Electronic J. of Combinatorics **14** (2007), no. 1.
- [26] *Lattice polytopes, Hecke operators, and the Ehrhart polynomial*, with Fernando Rodriguez Villegas, Selecta Math. **13** (2007), 253–276.
- [27] *On the p -parts of quadratic Weyl multiple Dirichlet series*, with Gautam Chinta and Solomon Friedberg, J. Reine Angew. Math. **623** (2008), 1–23. J. Reine Angew. Math.
- [28] *Cohomology of congruence subgroups of $SL(4, \mathbf{Z})$ II*, with Avner Ash and Mark McConnell, J. of Number Theory **128** (2008), no. 8, 2263–2274.
- [29] *Hecke operators and Hilbert modular forms*, with Dan Yasaki, Algorithmic number theory (Banff, 2008), 387–401, Lecture Notes in Comput. Sci., 5011, Springer, Berlin, 2008.
- [30] *Constructing Weyl group multiple Dirichlet series*, with Gautam Chinta, J. Amer. Math. Soc., to appear.
- [31] *Cohomology of congruence subgroups of $SL_4(\mathbf{Z})$ III*, with Avner Ash and Mark McConnell, Math. Comp., to appear.
- [32] *Weyl group multiple Dirichlet series of type A_2* , with Gautam Chinta, to appear in the Lang memorial volume.
- [33] *On the cohomology of congruence subgroups of $SL_4(\mathbf{Z})$* , Proceedings of the RIMS workshop *Automorphic representations, automorphic L -functions, and arithmetic*, 2009.

Submitted/Preprints

Most preprints are available from arXiv.org.

- [34] *Units, polyhedra, and a conjecture of Satake*, with Jacob Sturm, preprint 2001.
- [35] *On toric varieties and modular forms*, MPIM preprint 2001. This is a writeup of a talk given at the Arbeitstagung, Bonn, 2001.
- [36] *Automata and cells in affine Weyl groups*, submitted to Representation Theory, 2008.

- [37] *Littelman patterns and Weyl group multiple Dirichlet series of type D*, with Gautam Chinta, submitted to Proceedings of the Edinburgh workshop on multiple Dirichlet series.
- [38] *Perfect forms over totally real fields*, with Dan Yasaki, submitted to J. Theorie des Nombres de Bordeaux
- [39] *Kazhdan–Lusztig cells in infinite Coxeter groups*, with Misha Belolipetsky, submitted to the proceedings of Belfast (UK) meeting Workshop on Algebra, Combinatorics and Dynamics, August 17–21, 2009. (Also published in Russian.)

In preparation

- [40] *The Atiyah–Singer theorem and elementary number theory (2nd ed.)*, with Friedrich E. P. Hirzebruch and Don Zagier (approximately 250 new pages to be written, currently have 145 pp. completed)
- [41] *On Hilbert modular threefolds of discriminant 49*, with Lev A. Borisov.
- [42] *Computing Hecke operators on modular forms over real quadratic and complex quartic fields*, with Dan Yasaki.
- [43] *Modular forms and elliptic curves over the field of fifth roots of unity*, with Farshid Hajir and Dan Yasaki.
- [44] *Cohomology of congruence subgroups of $SL_4(\mathbf{Z})$ IV*, with Avner Ash and Mark McConnell.

In progress

- [45] *Computational investigation of the cohomology of subgroups of $SL_4(\mathbf{Z})$* , with Avner Ash, Mark McConnell, and David Pollack.
- [46] *Cells for hyperbolic planar Coxeter groups*, with Misha Belolipetsky.
- [47] *On the central values of quadratic twists of certain Hecke L -functions*, with Farshid Hajir.
- [48] *Quadratic multiple Dirichlet series and Gelfand–Tsetlin patterns*, with Dan Bump, Gautam Chinta, and Solomon Friedberg.

Research Grants

- NSF Graduate Fellow, 1989–1993.
- NSF Mathematical Sciences Computing Research Environments grant DMS 96–27870, 1996–1999.
- NSF Mathematical Sciences Grant, *Algebraic geometry and number theory*, DMS 00-70747, DMS 01–96109, DMS 02–45580, (PI); July 1, 2000—June 30, 2004, \$67,850.
- Rutgers Competitive Fellowship Grant, spring 2001.
- NSF Mathematical Sciences Grant, *Algebraic geometry, number theory, and representation theory* DMS 04–01525, (PI); July 1, 2004—June 30, 2008, \$107,000.
- Five College Number Theory Seminar *Program in analysis in number theory*, 2005–2007 NSA Mathematical Sciences Program CWSS, H98230-05-1-0291, co-PI with Robert Benedetto, Gregory Call, Giuliana Davidoff, Farshid Hajir, Leanne Robertson, Margaret Robinson, Thomas Weston, and Siman Wong.
- NSF Mathematical Sciences Computing Research Environments grant DMS 06–19492, 2006, \$84,000. Co-PI with Hans Johnston, Markos Katsoulakis, Panayotis Kevrekidis, and Bruce Turkington.
- NSF Mathematical Sciences Grant, *Problems in number theory and representation theory*, DMS 08–01214, (PI); July 1, 2008—June 30, 2011, \$150,001.

Meetings organized

- Special session on arithmetic geometry and modular forms*, AMS Eastern Section Meeting, with Farshid Hajir, Durham, NH, Spring 2006.
- Special session on automorphic forms and arithmetic geometry*, AMS Eastern Section Meeting, with Gautam Chinta, Hoboken, NJ, Spring 2007.
- Low-dimensional topology and number theory*, BIRS Workshop, Banff, Alberta, with David Boyd, Walter Neumann, and Adam Sikora, Fall 2007.

Dedekind sums in geometry, topology, and arithmetic, BIRS Workshop, Banff, Alberta, with Matthias Beck and Adam Sikora, Fall 2009.

Whittaker Functions, Crystal Bases, and Quantum Groups, BIRS Workshop, Banff, Alberta, with Ben Brubaker, Dan Bump, and Gautam Chinta, Summer 2010.

Low-dimensional topology and number theory, Oberwolfach Workshop, Germany, with Walter Neumann, Adam Sikora, and Don Zagier, Summer 2010.

Selected talks and conferences

Special addresses

Japan-U.S. Mathematical Institute (JAMI) 2001, Johns Hopkins, *Toric varieties and modular forms*, Spring 2001.

Arbeitstagung 2001, Bonn, *On toric varieties and modular forms*, Summer 2001.

MSRI Summer Graduate Program on Modular forms, Berkeley, California, Summer 2006. Gave a short course of four lectures on computing cohomology of arithmetic groups.

Southeast Regional Meeting on Numbers 2009, UNC Greensboro, plenary address, *Multiple Dirichlet Series*.

Colloquia

University of Arizona, *Configuration varieties and the space of tetrahedra*, Fall 2004.

University of Massachusetts, *Dedekind sums in arithmetic and geometry*, Fall 2005.

Research Seminars

University of Maryland, Algebra and Number theory seminar, *Quadratic Weyl multiple Dirichlet series*, Fall 2006.

Five College Number theory seminar (Amherst, MA), *Weyl group multiple Dirichlet series*, Spring 2007.

CUNY Graduate Center (New York), Collaborative Number theory seminar, *Automorphic forms and the cohomology of arithmetic groups*, Spring 2007.

Everytopic Seminar, Brandeis, *Weyl group multiple Dirichlet series*, Fall 2008.

MIT Number Theory Seminar, *Weyl group multiple Dirichlet series*, Spring 2009.

Brown Algebra Seminar, *Modular forms and elliptic curves over $\mathbf{Q}(\zeta_5)$* , Spring 2009.

CUNY Graduate Center (New York), Collaborative Number theory seminar, *Modular forms and elliptic curves over $\mathbf{Q}(\zeta_5)$* , Spring 2009.

Invited talks and workshops

Stanford Workshop on Multiple Dirichlet Series, Stanford, California, Summer 2006.

Arithmetic harmonic analysis on character and quiver varieties, American Institute of Mathematics, Palo Alto, California, Summer 2007.

Explicit methods in number theory, Oberwolfach, Germany, *Weyl group multiple Dirichlet series*, Summer 2007.

L-functions and modular forms, American Institute of Mathematics, Palo Alto, California, *Modular forms and their generalizations*, Summer 2007.

Maine/Québec Conference on Number Theory & Related Topics, University of Maine, *Weyl group multiple Dirichlet series*, Fall 2007.

Low-dimensional topology and number theory (co-organizer), Banff International Research Station, Alberta, Canada, Fall 2007.

Computing Arithmetic Spectra, American Institute of Mathematics, Palo Alto, California, Spring 2008.

Locally symmetric spaces, Banff International Research Station, Alberta, Canada, Spring 2008.

Edinburgh workshop on multiple Dirichlet series, Edinburgh, Scotland, *Constructing Weyl group multiple Dirichlet Series*, Summer 2008.

Number theory and physics at the crossroads, Banff International Research Station, Alberta, Canada, *Weyl group multiple Dirichlet series*, Fall 2008.

Automorphic representations, automorphic L -functions, and arithmetic, RIMS, Kyoto, Japan, *On the cohomology of congruence subgroups of $SL(4, \mathbf{Z})$* , Spring 2009.
Stanford Workshop on Multiple Dirichlet Series, Stanford, California, *On p -parts of Weyl group multiple Dirichlet series*, Summer 2009.
Explicit methods in number theory, Oberwolfach, Germany, *Modular forms and elliptic curves over $\mathbf{Q}(\zeta_5)$* , Summer 2009.
Computational Arithmetic Geometry, Warwick, UK, *Hecke operators, automorphic forms, and the cohomology of arithmetic groups I*, Fall 2009.
Dedekind sums in geometry, topology, and arithmetic (co-organizer), Banff International Research Station, Alberta, Canada, Fall 2009.
Whittaker Functions, Crystal Bases, and Quantum Groups (co-organizer), Banff International Research Station, Alberta, Canada, Summer 2010.
Low-dimensional topology and number theory (co-organizer), Oberwolfach, Germany, Summer 2010.

Graduate/Undergraduate/High school Colloquia

PROMYS program (Boston University), *Diophantine equations in polynomials*, Summer 2004.
TAP program (UMass-Amherst), *Diophantine equations in polynomials* and *Configuration spaces*, Fall 2004.
TWIGS (UMass-Amherst), *What is a stratified space?*, Fall 2005.
TAP program (UMass-Amherst), *Ramanujan graphs*, Fall 2006.
UConn Math Club (UConn), *Ramanujan graphs*, Fall 2007.
PROMYS program (Boston University), *Configuration spaces*, Summer 2008.
TWIGS (UMass-Amherst), *What is a modular form?*, Fall 2009.

Service

Past UMass Departmental Service

Colloquium Committee, 2001–02.
Graduate Affairs Committee, 2002–06.
Faculty search subcommittees (Number theory (Chairman) 2002–03; Topology, since 2002; Number theory and algebra, since 2003).
Course chair, Math 131, Spring 2004.
Development Committee, 2004–05.
TAP seminar organizer, Fall 2004.
Algebra graduate examination committee, 2002–04.
Geometry graduate examination committee, 2004–05.
Research Computing Facility Committee, 2005–06.
Dedekind Sums: a bridge between topology and number theory, article for the 2005 Departmental Newsletter.
Personnel Committee, 2006–08.

Current UMass Departmental Service

Co-organizer of Five College Number Theory Seminar, since 2002.
Development Coordinator, since 2005.
Henry Jacob Mathematics Competition, since 2005.
Topology graduate examination committee, since 2006.
Newsletter Committee, since 2006.
Faculty Search Committee, since 2008.

University Service

NSM Awards Committee, since 2008.

Professional

- Moderator for the number theory section (`math.NT`) of the Los Alamos Preprint Archive (`arXiv.org`).
 - Referee for various journals, including *Compositio*, *Duke Mathematical Journal*, *Advances in Mathematics*, *Annals of Mathematics*, *Mathematische Annalen*, *Journal of Number Theory*, *Pure and Applied Mathematics Quarterly*, *International Journal of Number Theory*, *Experimental Mathematics*, *Journal of Algebraic Geometry*, *SIDMA*, *SICOMP*.
 - Referee for various grant programs: National Science Foundation (NSF), National Security Agency (NSA), National Sciences and Engineering Research Council of Canada (NSERC), Austrian Science Fund (FWF), and the CUNY Research Award Program.
 - Reviewer for *Mathematical Reviews* (29 reviews) and *Zentralblatt* (8 reviews).
- See also **Meetings organized**.

Additional teaching service

- Mentor for the PROMYS program, Boston University, since 2002.
- Committee for the honors thesis of Jennie D'Ambroise, Univ. of Mass., 2002.
- Supervised undergraduate research and honors thesis of Daniel Epstein, Univ. of Mass. 2004–05. Project: *The space of hypertetrahedra*.
- Supervised undergraduate research of Alexander McAvoy, Univ. of Mass., Summer 2006. Project: *Cayley graphs on two generators for the symmetric group*.
- Supervised undergraduate research of Jacob Mitchell, Univ. of Mass., Fall 2006. Project: *Arithmetic hyperbolic orbifolds*. Summer 2007. Project: *Graphics in hyperbolic 3-space*.
- Doctoral thesis committee member, Chris McDaniel, Univ. of Mass. since 2006.
- Doctoral thesis committee member, Eli Beechaven, Univ. of Mass., 2007.
- Thesis advisor, Patrick Boland, Univ. of Mass., since 2006.
- Postdoctoral advisor, Dan Yasaki, Univ. of Mass., 2005–08. (Currently tenure-track at UNC Greensboro)

References

- Avner Ash, Boston College.
- Dan Bump, Stanford University.
- Dorian Goldfeld, Columbia University.
- Steve Kudla, University of Toronto.
- Robert MacPherson, Institute for Advanced Study.
- Glenn Stevens, Boston University.
- T. N. Venkataramana, Tata Institute, Bombay.
- Fernando Rodriguez Villegas, University of Texas.
- Don Zagier, College de France, Paris, and Max Planck Institut für Mathematik, Bonn.