CONTACT
INFORMATION

Department of Mathematics
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EDUCATION

Massachusetts Institute of Technology, Cambridge, MA, USA

Ph.D. in Mathematics, June 1998.

Northwestern University, Evanston, IL, USA

B.A. *summa cum laude* in Mathematics and Integrated Science, June 1993.

EMPLOYMENT
HISTORY

University of Utah, Salt Lake City, UT

2019—, Dean, College of Science
2018–2019, Chair, Department of Physics & Astronomy
2011–2017, Chair, Department of Mathematics
2011—, Professor of Mathematics
2005–2011, Associate Professor of Mathematics
2001–2005, Assistant Professor of Mathematics

Harvard University, Department of Mathematics, Cambridge, MA

2000–2003, NSF Postdoctoral Fellow.

Institute for Advanced Study, School of Mathematics, Princeton, NJ

1998–2000, Member.

SELECTED
INVITED TALKS

Lie Groups Seminar, MIT, May 2019, *Detecting Reducible Characteristic Cycles of Harish Chandra Modules.*

Lie Groups Seminar, Cornell University, April 2018, *Reducible Characteristic Cycles of Harish Chandra Modules.*

Lie Groups Seminar, Hong Kong University of Science and Technology, February 2018, *Character Theory for Extended Groups.*

Atlas of Lie groups workshop, University of Utah, July, 2017, Three lecture series: Cohomological Induction, Harish Chandra Cells, and Associated Varieties.

Representation Theory XII, Dubrovnik, Croatia, June 2017. Title: *Coincidences among derived functor modules.*

Colloquium, University of Texas-Austin, April 2017, *Duality for real nilpotent orbits.*

Tsinghua International Mathematics Forum, Sanya, China, December 2016. Talk entitled *Duality for real nilpotent orbits* delivered at the workshop "Harmonic Analysis on Lie Groups and Group Algebras of Locally Compact Groups."

Algebra Seminar, University of Washington, April 2016, *Character theory for* $\mathrm{GL}(n,\mathbb{C}), \mathrm{GL}(n,\mathbb{R})$, *and the graded affine Hecke algebra.*

Reductive Groups, Franken-Akademie, Germany, July 2015. Lecture series: *Derived Functor Modules I-V.*

Mathematics Matters in Education, Workshop in honor of Roger Howe, Texas A&M, March, 2015.

Graduate Winter School, University of Tokyo, Japan, January 2015. Lecture series: *Unitary representation of reductive Lie groups I–III.*

Representation Theory of Reductive Groups, MIT, May, 2014, *Relationships between unitary representations of real and p-adic groups.*

Taipei Winter School, Academia Sinica, Taiwan, December 2013, *Dirac operators for graded affine Hecke algebras.*

Lisbon Summer School, Lisbon, Portugal, July, 2013, *Lectures on representation theory I-V.*

Lie groups seminar (Sophus Lie Lecture II), Cornell University, February, 2013, *Computing signatures of invariant forms on Harish-Chandra modules.*

Colloquium (Sophus Lie Lecture I), Cornell University, February, 2013, *Unitary representations of reductive Lie groups.*

Tsinghua International Mathematics Forum, Sanya, China, January, 2013, *Unitary representations of reductive Lie groups.*

Colloquium, Brigham Young University, October, 2012, *Unitary representations of reductive Lie groups.*

Lie groups seminar, University of Maryland, April, 2012, *Characters of discrete series representations of graded affine Hecke algebras.*

Seminar on Analysis on Lie Groups, Max Planck Institute, Bonn, Germany, August 2011. Lectures: *Unitary representations of reductive Lie groups, I-II.*

Workshop on Quantization and Representation Theory, Fields Institute, Toronto, Canada, March, 2011. Lecture: *Spin representations of Weyl groups and nilpotent orbits.*

Workshop on Nilpotent Orbits and Representation Theory, Kyushu University, Japan, March, 2011. Lecture: *Spin representations of Weyl groups and nilpotent orbits.*

Atlas of Lie groups workshop, University of Utah, July, 2010, Lecture series: *Dirac cohomology for graded affine Hecke algebras I-IV.*

Georgia Summer School, University of Georgia, May, 2010. Lecture series: *Geometry of representations of GL(n) I–IV.*

University of Hokkaido, Japan, February, 2010. Title: *Enhanced Kazhdan-Lusztig cells.*

Zuckerman birthday conference, Yale University, October, 2009. Title: *Functors for unitary representations of real and p-adic groups.*

Porto Summer School, Porto, Portugal, September, 2009, *Lectures on representation theory I-V.*

Computational theory of real reductive groups, University of Utah, July 2009. Lecture series: *Symmetric subgroups and geometry of flag varieties I–V.*

Graduate Spring School, University of Tokyo, Japan, February 2009. Lecture series: *Introduction to the theory of special unipotent representations I–V.*

Lie Algebras, Lie groups, and their representations, University of California, Santa Cruz, April, 2008. TItle: *Local Langlands correspondence for GL(n,F).*

University of Hokkaido, Japan, March 2007. Lecture series: *Matching the geometry of Lusztig's unipotent representations of p-adic groups with partial flag varieties I-II.*

RIMS and Kyoto University, Japan, March 2006. Lecture series: *Computing associated varieties of Harish-Chandra modules I–V.*

Lie Groups and Representations Theory Conference, University of Southern Denmark, August 2004. Title: *Unipotent representations of* $\mathrm{Sp}(p,q)$ *and* $\mathrm{SO}^*(2n)$.

Functional Analysis VIII, Dubrovnik, Croatia, June 2003. Title: *Unipotent representations and the theta correspondence.*

National University of Singapore, August 2002. *Title: L-formalism for nonlinear groups.*

Midwest Conference on Representation Theory and Automorphic Forms, University of Chicago, July 2000. Title: *Leading term cycles of Harish-Chandra modules.*

Workshop on the theta correspondence and the geometry of nilpotent orbits, Kyoto, Japan, January/February 2000. Lecture Series: Kazhdan-Lusztig theory and the theta correspondence, I–III.

Millican Lecture, University of North Texas, December 1999. Title: *Numerical invariants attached to semisimple Lie algebras.*

Workshop on geometric methods in representation theory, Harvard University, May 1999. Title: *Joseph polynomials and characteristic cycles.*

IAS Park City Math Institute, Graduate School Lecturer, July 1998 Lecture series: *Representation theory of semisimple Lie groups I–V.*

Departmental Colloquia at: BYU, Cornell, Haverford, Massachusetts, Maryland, Melbourne, Texas-Arlington, Texas-Austin, Utah (2), Washington, Wisconsin.

Research Seminars at: American Institute of Mathematics (5), AMS Sectional Meetings (4), Brandeis, Cornell (5), Fields Institute (Toronto), Hong Kong University of Science and Technology (2), IAS, Idaho State, Iowa, Maryland (5), Massachusetts (2), MIT (6), Melbourne, Michigan (3), MSRI (2), New Mexico State, Northwestern, Oklahoma State (3), Pennsylvania, Princeton, Rutgers (2), Sydney, UCSD, Utah (9), Washington (2), Western Michigan, Wisconsin (3), Yale.

PUBLICATIONS

- Unitary representations of real reductive groups (with Jeffrey Adams, Marc van Leeuwen, and David Vogan), to appear in *Astérisque*

- Reducible characteristic cycles for U(p,q) and the Kashiwara-Saito singularity, with L. Barchini and P. Somberg, *Comm. Algebra*, **47** (2019), no. 12, 4874-4888.

- Twisted Dirac Index and Applications (with Dan Barbasch and Pavle Pandžić), *Transactions of the AMS*, **371** (2019), no. 3, 1701-1733.

- Laplacians on Spheres (with Henrik Schlichtkrull and David Vogan), *Sao Pao Journal of Mathematical Sciences*, **12** (2018), 295-358.

- Codimension one connectedness of the graph of associated varieties (with Kyo Nishiyama and Akihito Wachi), *Tohuku Journal of Math. (2)* **68** (2016), no. 2, 199-239.

- Appendix to: Small representations, string instantons, and Fourier modes of Eisenstein series by Michael B. Green, Stephen D. Miller, and Pierre Vanhove (with Dan Ciubotaru), *Journal of Number Theory*, **146** (2015), 187-309.

- Algebraic and analytic Dirac induction for graded affine Hecke algebras (with Dan Ciubotaru and Eric Opdam), *Journal de l'Institute de Mathematiques de Jussieu (JIMJ)*, **13** (2014), no. 3, 447-486.

- Characters of Springer representations on elliptic conjugacy classes (with Dan Ciubotaru), *Duke Mathematical Journal*, **162** (2013), no. 2, 201–223

- Dirac cohomology for graded affine Hecke algebras (with D. Barbasch and D. Ciubotaru), *Acta Mathematica*, **209** (2012), no. 2, 197–227.

• The exotic Robinson-Schensted correspondence (with Anthony Henderson), *Journal of Algebra*, **370** (2012), 32–45.

• Duality for nonlinear real groups (with J. Adams), *Compositio Mathematica*, **148** (2012), no. 3, 931–965.

• Stable linear combinations of special unipotent representations (joint with D. Barbasch), *Contemp. Math*, **557** (2011), 213–228/.

• Duality between $GL(n, \mathbf{R})$ and the degenerate affine Hecke algebra (joint with D. Ciubotaru), *American J. Math.*, **134** (2012), no. 1, 141-170.

• Regular orbits of symmetric subgroups on partial flag varieties (joint with D. Ciubotaru and K. Nishiyama), in *Representation Theory, Complex Analysis, and Integral Geometry Vol. 2*, Progress in Mathematics, Birkhauser, 2012, 61–86..

• Functors for unitary representations of real and p-adic groups (joint with D. Ciubotaru), *Advances in Math.*, **227** (2011), no. 4, 1585-1611.

• Pattern avoidance criteria for rational smoothness for K orbit closures in the flag variety (joint with W. M. McGovern), *Journal of Algebra*, **322** (2009), 2713–2730.

• *Representation Theory of Real Reductive Groups*, co-edited with J. Arthur and W. Schmid, Contemporary Math, **472** (2008), AMS (Providence, RI).

• Integrals over the Springer fiber for $\mathfrak{sl}(n, \mathbf{C})$, appendix to the paper of L. Barchini, R. Zierau, Certain components of Springer fibers and associated cycles for discrete series representations of $SU(p,q)$, *Represent. Theory*, **12** (2008), 403-434.

• Shimura correspondences for split real groups (with J. Adams, D. Barbasch, A. Paul, D. Vogan), *Journal of the AMS*, **20** (2007), 701-751.

• Leading terms cycles of Harish-Chandra modules and partial orders on components of the Springer ber, *Compositio Math.*, **143** (2007), 515-540.

• Derived functor modules arising as large constituents of degenerate principal series (with H. Matumoto), *Compositio Math.*, **143** (2007), 222-256.

• Some small unipotent representations of indefinite orthogonal groups and the theta correspondence (with A. Paul), *University of Aarhus Publication Series*, **48** (2007), 103-125.

• Kazhdan-Lusztig algorithm for nonlinear groups and applications to Kazhdan-Patterson lifting, joint with David Renard, *American J. Math.*, **127** (2005), 911-971.

• Richardson orbits for real groups, *J. Algebra*, **286** (2005), 361-385

• Symplectic and orthogonal Robinson-Schensted algorithms, *J. Algebra*, **286** (2005), 384-404.

• Some small unipotent representations of indefinite orthogonal groups, *J. Funct. Anal.*, **213** (2004), 290-320.

• Special unipotent representations and the Howe correspondence, *University of Aarhus Publication Series*, **47** (2004), 210-230.

• Irreducible characters of the metaplectic group II: functoriality, joint with David Renard, *J. Reine Angew. Math.*, **557** (2003), 121-158.

• One-dimensional representations of $U(p,q)$ and the Howe correspondence, *J. Funct. Anal.*, **195** (2002), no. 1, 129-166.

• Annihilators and associated varieties of $A_q(\lambda)$ modules for $U(p,q)$, *Compositio Math.*, **129** (2001), no. 1, 1-45.

• Nash equilibria for an evolutionary language game, joint with Martin Nowak, *J. Math. Biol.*, **41** (2000), 172-188.

• Irreducible genuine characters of the metaplectic group: Kazhdan-Lusztig algorithm and Vogan duality, joint with David Renard, *Representation Theory*, **4**(2000), 245-295.

• Representations of semisimple Lie groups, joint with Tony Knapp, in *Representation theory of Lie groups (Park City, UT, 1998)*, IAS/Park City Math. Ser., **8** (2000), 7-87

• Generalized Robinson-Schensted algorithms for real groups, *International Mathematical Research Notices*, **1999**, no. 15, 803-832

• The adjoint representation in rings of functions, joint with Eric Sommers, *Representation Theory*, **1** (1997), 182-189.

• Fourier series of radial functions in several variables (with M. Pinsky and N. Stanton), *J. Funct. Anal.*, **116** (1993), no. 1, 111-132.

PREPRINTS

• Unipotent representations of Sp(p,q) and SO*(2n), with Dan Barbasch, arxiv.RT 1806.07770

FUNDING

2006-2008.

- National Science Foundation Grant, Principal Investigator, DMS-00300106, "Local Langlands Theory for Real Reductive Groups," 2003-2006.

- National Science Foundation Postdoctoral Fellow, Harvard University, 2000-2003.

- National Science Foundation Graduate Fellow, MIT, 1993-1998.

CONFERENCES
ORGANIZED

- Co-organizer (with J. Adams, A. Paul, M. van Leeuwen, D. Vogan), *Workshop on Unitary Repesentations of Real Reductive Groups*, University of Utah, July, 2017.

- Co-organizer (with D. Ball, S. Freidburg, J. Lewis, D. Stylianou, H.-H. Wu, D. Yong), *Critical Issues in Math Education*, MSRI, Berkeley, March, 2014.

- Co-organizer (with R. Bezrukavninov, P. Etingof, G. Lusztig, M. Nevins), *Representation Theory of Reductive Groups (in honor of David Vogan)*, MIT, May, 2014.

- Co-organizer (with B. Kroetz, E. Opdam, H. Schlichtkrull), *Representation Theory and Analysis of Reductive Groups: Spherical Spaces and Hecke Algebras*, Oberwolfach, Germany, January, 2014.

- Co-organizer (with J. Adams and D. Vogan), *Conference on Representations of Reductive Groups*, University of Utah, July, 2013.

- Co-organizer (with J. Adams and D. Vogan), *Workshop on Unitary Representations of Reductive Lie Groups*, University of Utah, July, 2013.

- Co-organizer (with B. Casselman, D. Goldfeld, M. Kisin, D. Miličić, S. Miller, S.T. Yau), *Representation Theory, Automorphic Forms, and Complex Geometry (in honor of Wilfried Schmid)*, Harvard University, May, 2013.

- Co-organizer (with Dan Ciubotaru), Special Session "Reductive groups and Hecke algebras," 201 Fall Western Section Meeting of the AMS, Salt Lake City, October, 2011.

- Co-organizer (with J. Adams, S. Salamanca, J. Stembridge, and D. Vogan) of conference "Representation Theory of Real Reductive Groups," July 2009.

- Co-organizer (with J. Adams, S. Salamanca, J. Stembridge, and D. Vogan) of minicourse "Computational Theory of Reductive Groups," July 2009.

- Co-organizer (with D. Milicic and W. Casselman) of minicourse on $SL(2, \mathbf{R})$, May 2006.

- Co-organizer (with J. Arthur and W. Schmid) of NSF-funded AMS conference at Snowbird, UT, "Representation Theory of Real Reductive Groups", June 2006.

GRADUATE
STUDENTS
SUPERVISED

• Charlotte Erikson, Masters Thesis, 2006, "Generalized Robinson-Schensted algorithms for $U(p,q)$."

• Scott Crofts, Ph.D. Thesis, 2009, "Duality for universal covers of indefinite spin groups."

• Casey P. Johnson, Ph.D. Thesis, 2010, "Nilpotent representations of enhanced cyclic quivers."

• Benjamin Trahan, Ph.D. Thesis, 2011, "Functors for genuine representations of the metaplectic group and graded affine Hecke algebras."

• Matthew Housley, Ph.D. Thesis, 2011, "Polynomial representations and associated cycles for indefinite unitary groups."

• Kei Yuen Chan, Ph.D. Thesis, 2014, "Extensions between modules for the graded affine Hecke algebra."

•

• Adam Brown, Ph.D. Thesis, 2019, "Arakawa-Suzuki functors for Whittaker modules."

• Sean McAfee, Ph.D. Thesis, 2019, "Twisted cells for real reductive groups."

• Current Ph.D. student: Chengyu Du.

COURSES
TAUGHT AT
UTAH

• Math 1010, College Algebra (2007, 2010 twice)

• Math 1090, Business Algebra (2002, 2007)

• Math 1100, Quantitative Analysis (2001)

• Math 6210, Real Analysis (2004, 2009)

• Math 6220, Complex Analysis (2005)

• Math 6240, Lie Groups and Lie Algebras I (2007, 2018)

• Math 6310-6320, Modern Algebra (2003-4, 2005-6)

• Math 7890, Topics in Representations Theory (2010)

AWARDS,
ADVISORY
BOARDS AND
SERVICE

• Fellow of the American Mathematical Society, 2019

• Member, Math Taskforce, Utah System of Higher Education, 2014-15

• Member, Standards Review Steering Committee, Utah State Office of Education, 2014-15

• Member, Governor's Standards Review Panel, Office of the Governor of Utah Chair, Math Technical Working Group, 2014-15

- Member, Advisory Board, Math Teachers' Circle Network, American Institute of Mathematics (AIM), Palo Alto, CA, 2014–
- Chair, Arnold Ross Lecture Selection Committee, AMS, 2014-2015
- Member, Advisory Board, National Association of Math Circles, Berkeley, CA, 2013–
- Director, National Association of Math Circles, Mathematical Sciences Research Institute (MSRI), Berkeley, CA, 2013-4
- Member, AMS Committee on Committees, 2013-14
- Director, Utah High School Math Circle, 2001–2016 (except 2002-3, 2008-9, 2011-12)
- Director, Utah High School Teacher's Math Circle , 2007-2008
- Director, Utah High School Math Summer Program, 2010

EDITORAL
SERVICE

- Editor, *Representation Theory*, an electronic journal of the American Mathematical Society, 2009-2019; Managing Editor, 2015-2019.

ADMINISTRATION

- 2011–2017, Chair, Department of Mathematics, University of Utah.
- 2016–2017, Presidential Fellow, University of Utah.
- 2017–18, Special Assistant to the Dean, College of Science, University of Utah.
- 2018–2019, Chair, Department of Physics & Astronomy, University of Utah.
- 2019– , Dean, College of Science, University of Utah.