

Stephen DeBacker

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Education

- Ph.D. Mathematics, The University of Chicago, Chicago, IL, June 1997.
Dissertation: *On supercuspidal characters of GL_ℓ , ℓ a prime.*
Adviser: Paul J. Sally, Jr.
- S.M. Mathematics, The University of Chicago, Chicago, IL, August 1991.
- B.S. Mathematics and Physics, *summa cum laude*, Santa Clara University, Santa Clara, CA, June 1990.

Appointments, Awards, Fellowships, and Honors

- Visitor, Kyoto University, 2005.
- National Science Foundation Research Award, 2005–2008.
- Visitor, Stanford University, 2004.
- Distinguished Senior Researcher, The Fields Institute for Research in Mathematical Sciences, 2003.
- Appointed Associate Professor, University of Michigan, 2002.
- Senior Member, Institute for Mathematical Science, National University of Singapore, 2002.
- National Science Foundation Research Award, 2002–2005.
- Benjamin Peirce Assistant Professorship, Harvard University, 2001–2003.
- L.E. Dickson Instructorship, The University of Chicago, 1999–2001.
- National Science Foundation Postdoctoral Fellowship, 1998–2001.
- Research Fellow in Mathematics, The University of Chicago, spring 1997.
- College Fellow in Mathematics, The University of Chicago, 1991–1992.
- University Fellow in Mathematics, The University of Chicago, 1990–1991.
- Presidential Scholarship, Santa Clara University, 1988–1990.
- The George W. Evans Memorial Prize in Mathematics, Santa Clara University, 1989, 1990.
- The Orella Prize in Science, Santa Clara University, 1990.
- The IBM Corporation Prize in Physics, Santa Clara University, 1988.
- The Freshman Mathematics Prize, Santa Clara University, 1987.

Publications

- S. DeBacker and M. Reeder, *Depth-zero supercuspidal L -packets and their stability*, Ann. of Math., to appear.
- S. DeBacker, *The Fundamental Lemma: What is it and what do we know?*, Current Developments in Mathematics, 2005, to appear.
- S. DeBacker and D. Kazhdan, *Stable distributions supported on the nilpotent cone for the group G_2* , The Unity of Mathematics; In Honor of the Ninetieth Birthday of I.M. Gelfand (Pavel Etingof, Vladimir

- S Retakh, and I.M. Singer, editors), pp. 205–262, Progress in Mathematics, vol. 244, Birkhäuser Boston, Boston, 2006.
- S. DeBacker, *Homogeneity for reductive p -adic groups: an introduction*, Harmonic Analysis, The Trace Formula and Shimura Varieties; Proceedings of the Clay Mathematics Institute 2003 Summer School (James Arthur, David Ellwood, and Robert Kottwitz, editors), pp. 523–550, Clay Mathematics Proceedings, vol. 4, Clay Mathematics Institute and American Mathematical Society, Cambridge, 2006.
- S. DeBacker, *Parameterizing conjugacy classes of maximal unramified tori via Bruhat-Tits theory*, Mich. Math. J., **54** (2006), pp. 157–178.
- S. DeBacker, *Lectures on harmonic analysis for reductive p -adic groups*, Representations of real and p -adic groups, pp. 47–94, Lecture Notes Series, Institute for Mathematical Sciences, National University of Singapore, vol. 2 (Tan Eng-Chye and Zhu Chen-Bo, editors), Singapore University Press, Singapore, 2004.
- J. Adler and S. DeBacker, *Murnaghan-Kirillov theory for supercuspidal representations of tame general linear groups*, J. Reine Angew. Math. (Crelle’s Journal), **575** (2004), pp. 1–35.
- J. Adler and S. DeBacker, *A generalization of a result of Kazhdan and Lusztig*, Proc. Amer. Math. Soc., **132** (2004), no. 6, pp. 1861–1868.
- J. Adler and S. DeBacker, *Some applications of Bruhat-Tits theory to harmonic analysis on the Lie algebra of a reductive p -adic group*, Mich. Math. J., **50** (2002), no. 2, pp. 263–286.
- S. DeBacker, *Some applications of Bruhat-Tits theory to harmonic analysis on a reductive p -adic group*, Mich. Math. J., **50** (2002), no. 2, pp. 241–261.
- S. DeBacker, *Parameterizing nilpotent orbits via Bruhat-Tits theory*, Ann. of Math., **156** (2002), no. 1, pp. 295–332.
- S. DeBacker, *Homogeneity results for invariant distributions of a reductive p -adic group*, Ann. Sci. École Norm. Sup., **35** (2002), no. 3, pp. 391–422.
- S. DeBacker, *Homogeneity of certain invariant distributions on the Lie algebra of p -adic GL_n* , Compositio Math., **124** (2000), no. 1, pp. 11–16.
- S. DeBacker and P. J. Sally, Jr., *Germ, characters, and the Fourier transforms of nilpotent orbits*, The Mathematical Legacy of Harish-Chandra (R. Doran and V. S. Varadarajan, eds.), Proc. Symp. Pure Math., vol. 68, American Mathematical Society, 2000, pp. 191–221.
- S. DeBacker, *On supercuspidal characters of GL_ℓ , ℓ a prime*, Ph.D. thesis, The University of Chicago, 1997.
- S. Cabaniss and S. DeBacker, *A perfect biembedding on nonorientable surfaces*, Graph theory, combinatorics, and algorithms, Wiley-Intersci. Publ., 1995, pp. 131–160.

Publications (not refereed)

- S. DeBacker, Featured Review for *Intégrales orbitales nilpotentes et endoscopie pour les groupes classiques non ramifiés* by Jean-Loup Waldspurger, Math. Reviews, 2002h:22014, August 2002, pp. 5614–5616.
- S. DeBacker, *The Hales-Moy-Prasad conjecture for Sp_4* , Analyse harmonique sur le group Sp_4 (Centre International de Rencontres Mathématiques, Luminy, June, 1998), edited by P. J. Sally, Jr., University of Chicago Lecture Notes in Representation Theory, 1999.
- S. DeBacker, *Moy-Prasad filtrations and harmonic analysis: an example*, Representation theory of real and p -adic reductive groups (University of Washington, Seattle, 1997), Proceedings, <http://moy.math.lsa.umich.edu/seattle/>, 1997.

Book edited

- Harish-Chandra, *Admissible invariant distributions on reductive p -adic groups*, Preface and notes by S. DeBacker and P. J. Sally, Jr., University Lecture Series, **16**, American Mathematical Society, Providence, RI, 1999.

Preprints

S. DeBacker and D. Kazhdan, *Murnaghan-Kirillov theory for depth zero supercuspidal representations: reduction to Lusztig functions*, preprint.

Presentations

Harmonic analysis on reductive p -adic groups, Mathematics Department Colloquium, University of Maryland, College Park, MD, November 2007.

Generalized r -facets: a primer, Lie Group and Representation Theory Seminar, University of Maryland, College Park, MD, November 2007.

“ L -packets” done incorrectly, Representation Theory Seminar, University of Utah, Salt Lake City, UT, October 2007.

Harmonic analysis on reductive p -adic groups, Department Colloquium, University of Utah, Salt Lake City, UT, October 2007.

Teaching with technology: using computers to help students visualize mathematics, Emeritus Faculty and Friends Luncheon, University of Michigan, Ann Arbor, MI, May 2007.

L -packets done incorrectly, Automorphic Forms and Representation Theory Seminar, Purdue University, West Lafayette, IN, May 2007.

What your math major needs to know, University of Michigan Department of Mathematics Awards Ceremony, University of Michigan, Ann Arbor, MI, April 2007.

Using “clickers” in UM’s MATH 215 (Calculus III) course: goals, challenges, and results, presented with Alexei Kolesnikov in the Seminar on Teaching Mathematics, University of Michigan, Ann Arbor, MI, March 2007.

L -packets done incorrectly, Lie Group and Representation Theory Seminar, University of Maryland, College Park, MD, February 2007.

On characters, Representation Theory of p -adic Groups, University of Iowa, Iowa City, IA, October, 2006.

Please keep the primes neat and clean, Undergraduate Math Club, University of Michigan, Ann Arbor, MI, September 2006.

The seven color theorem, Akron REU, University of Akron, Akron, OH, June 2006.

Counting rational classes in geometric classes, AMS Meeting #1016, Central Section, Special Session on Topics in Representation Theory, Notre Dame, South Bend, IN, April, 2006.

The Fundamental Lemma: What does it say and what do we know?, Current Developments in Mathematics, Harvard University, Cambridge, MA, November 2005.

Harmonic analysis on reductive p -adic groups, Brandeis-Harvard-MIT-Northeastern Joint Mathematics Colloquium, MIT, Cambridge, MA, November 2005.

Distributions attached to cuspidal local systems, MIT Lie Groups Seminar, MIT, Cambridge, MA, November 2005.

Distributions attached to cuspidal local systems, Recent Trends in Endoscopy and Representation Theory, a conference in honor of the 60th birthday of E.-W. Zink, Humboldt University, Berlin, Germany, October 2005.

Hex and the Brouwer fixed-point theorem, Undergraduate Math Club, University of Michigan, Ann Arbor, MI, September 2005.

The seven-color theorem, keynote speech at Michigan REU Conference, Grand Valley State University, Grand Rapids, MI, July 2005.

Murnaghan-Kirillov theory for depth zero supercuspidal representations, Department of Mathematics, Faculty of Science, Kyoto University, Kyoto, Japan, April 2005.

Tamely ramified Langlands correspondence for unramified p -adic groups: regular semisimple parameters, Department of Mathematics, Faculty of Science, Kyoto University, Kyoto, Japan, April 2005.

- The seven-color theorem*, Math and Science Lecture Series, Fall 2004, Saline High School, Saline, MI, December 2004.
- Distinguished, but not even*, AMS Meeting #1001, Central Section, Special Session on Representation Theory of Reductive Groups, Northwestern University, Evanston, IL, October 2004.
- Murnaghan-Kirillov theory for depth zero supercuspidal representations*, Conference on automorphic forms and the trace formula, in honour of James Arthur on the occasion of his 60th birthday, The Fields Institute for Research in Mathematical Sciences, Toronto, Canada, October 2004.
- Murnaghan-Kirillov theory for depth zero supercuspidal representations*, Group Theory/Lie Theory Seminar, University of Michigan, Ann Arbor, MI, October 2004.
- What's on the lobby floor anyway?* Undergraduate Math Club, University of Michigan, Ann Arbor, MI, September 2004.
- Murnaghan-Kirillov theory for depth zero supercuspidal representations*, Harmonic Analysis and Number Theory, LMS regional meeting and workshop, University of Exeter, Exeter, United Kingdom, September 2004.
- What I wish I had been told when I was your age*, Guest speaker, Who Wants to be a Mathematician?, AMS outreach program, University of Michigan, Ann Arbor, MI, May 2004.
- Nilpotent orbits and Bruhat-Tits theory: a second look*, Workshop on the Representation Theory of p -adic Groups (supported by The Fields Institute), University of Ottawa, Ottawa, Canada, May 2004.
- Stability for G_2* , Automorphic Forms and Representation Theory Seminar, Purdue University, West Lafayette, IN, February 2004.
- The seven-color theorem*, Undergraduate Math Club, University of Michigan, Ann Arbor, MI, February 2004.
- Parameterizations via Bruhat-Tits theory*, Joint India-AMS Mathematics Meeting, Special Session on Reductive Groups: Arithmetic, Geometry and Representation Theory, Bangalore, India, December 2003.
- An explicit example of the local Langlands Correspondence*, International Conference on Algebra and Number Theory, University of Hyderabad, Hyderabad, India, December 2003.
- Tamely ramified Langlands correspondence for unramified groups: regular semisimple parameters*, Formes Automorphes et Formules des Traces, Colloque de l'honneur de Jean-Pierre Labesse, Institut Henri Poincaré, Paris, France, September 2003.
- An introduction to homogeneity with applications*, Clay Mathematics Institute Summer School on Harmonic Analysis, The Trace Formula and Shimura Varieties, The Fields Institute for Research in Mathematical Sciences, Toronto, Canada, June 2003.
- Some applications of Bruhat-Tits theory to harmonic analysis*, CMS Winter Meeting, Special Session: Representation Theory of Real and p -adic Groups, Ontario, Canada, December 2002.
- Classifying p -adic objects via Bruhat-Tits theory*, Lie Groups Seminar, Yale University, New Haven, CT, November 2002.
- An introduction to homogeneity (with an application)*, Geometric Langlands Seminar, The University of Chicago, Chicago, IL, November 2002.
- On some connections between finite and p -adic groups*, Brown Algebra Seminar, Brown University, Providence, RI, October 2002.
- Parameterizations via Bruhat-Tits theory*, Representation Theory of Lie Groups, Institute for Mathematical Sciences, National University of Singapore, Singapore, August 2002.
- Homogeneity Results for reductive p -adic groups*, Representation Theory of Lie Groups, Institute for Mathematical Sciences, National University of Singapore, Singapore, August 2002.
- Harmonic analysis on reductive p -adic groups*, Fellowship of the Ring, Brandeis University, Waltham, MA, April 2002.
- Homogeneity (with applications)*, Midwest workshop in Lie theory, representation theory and automorphic forms, The University of Notre Dame, South Bend, IN, April 2002.

- The 7-color theorem*, Undergraduate Mathematics Colloquium, Harvard University, Cambridge, MA, March 2002.
- Quixotic quests*, Workshop on Representations of Reductive p -adic Groups, Pacific Institute for Mathematical Sciences, Banff Centre, Banff, Canada, February 2002.
- A sharp domain for the Harish-Chandra–Howe local character expansion*, Lie Group and Representation Theory Seminar, University of Maryland, College Park, MD, February 2002.
- Homogeneity results for reductive p -adic groups*, Number Theory Seminar, Boston College, Chestnut Hill, MA, January 2002.
- Parameterizations via Bruhat-Tits theory*, Representation Theory Seminar, University of Massachusetts at Amherst, Amherst, MA, December 2001.
- Parameterizations via Bruhat-Tits theory*, Automorphic Forms and Representations of p -adic Groups, MSRI Workshop, Banff Centre, Banff, Canada, November 2001.
- Homogeneity results for reductive p -adic groups*, MIT Lie Groups Seminar, MIT, Cambridge, MA, October 2001.
- Harmonic analysis on reductive p -adic groups*, The University of Michigan Mathematics Colloquium, University of Michigan, Ann Arbor, MI, October 2001.
- The “fundamental lemma”: homogeneity and stable distributions on the nilpotent set*, Group Theory/Lie Theory Seminar, University of Michigan, Ann Arbor, MI, October 2001.
- Compactly supported distributions and the Iwahori Hecke algebra*, Algebra Seminar, The University of Notre Dame, South Bend, IN, February 2001.
- Harmonic analysis on reductive p -adic groups*, Colloquium, The University of Notre Dame, South Bend, IN, February 2001.
- Harmonic analysis on reductive p -adic groups*, Talk, University of Toronto, Toronto, Canada, February 2001.
- Homogeneity results for invariant distributions of a reductive p -adic group*, UM Group Theory/Lie Theory Seminar, University of Michigan, Ann Arbor, MI, October 2000.
- Homogeneity results for invariant distributions of a reductive p -adic group*, Analyse harmonique et représentations des groupes p -adiques, Institut Henri Poincaré, Paris, France, June 2000.
- Parameterizing nilpotent orbits via the Bruhat-Tits building*, Automorphic Forms and L-functions, University of Minnesota, Minneapolis, MN, April 2000.
- An affine Bala-Carter theory – a classification scheme for nilpotent orbits in the Lie algebra of a reductive p -adic group*, Algebra Seminar, The University of Notre Dame, South Bend, IN, November 1999.
- Counting degenerate cosets*, UM Group Theory/Lie Theory Seminar, University of Michigan, Ann Arbor, MI, October 1999.
- The utility of G -domains*, Workshop on Representations of Reductive p -adic Groups, Centre de Recherches Mathématiques, Montreal, Canada, May 1999.
- The utility of G -domains*, HAAR Seminar, The Ohio State University, Columbus, OH, April 1999.
- Characters of reductive p -adic groups: an introduction to the conjecture of Hales, Moy, and Prasad*, Automorphic Forms and Group Representation Theory Seminar, Purdue University, West Lafayette, IN, April 1999.
- Parameterization of nilpotent orbits: the (nearly) affine situation*, Algebra and Algebraic Geometry Seminar, Princeton University, Princeton, NJ, March 1999.
- The Hales-Moy-Prasad conjecture for Sp_4* , Représentations du groupe p -adique Sp_4 , Centre International de Rencontres Mathématiques, Luminy, France, June 1998.
- Moy-Prasad filtrations and harmonic analysis on G* , AMS Meeting #932, Central Section, Special Session: Lie groups, algebraic groups, their arithmetic and representation theory, Kansas State University, Manhattan, KS, March 1998.
- On a conjecture of Moy and Prasad*, Number Theory and Lie Groups Seminar, University of Toronto, Toronto, Canada, October 1997.

On a conjecture of Moy and Prasad, UM Group Theory/Lie Theory Seminar, University of Michigan, Ann Arbor, MI, October 1997.

Moy-Prasad filtrations and harmonic analysis: an example, AMS-IMS-SIAM joint summer research conference: Representation theory of real and p -adic reductive groups, University of Washington, Seattle, WA, July 1997.

Supercuspidal characters of GL_ℓ , Michigan Group and Lie Theory Seminar, University of Michigan, Ann Arbor, MI, November 1995.

Perfect biembeddings on nonorientable surfaces, SCU Mathematics Colloquium, Santa Clara University, Santa Clara, CA, October 1988.

Funding

NSF Research Awards DMS-0500667

Amount: \$125,000 (approximate)

Dates: July 2005 – June 2008

Project Title: Topics in harmonic analysis for reductive p -adic groups

NSF Research Awards DMS-0200542 and DMS-0345121

Amount: \$100,000 (approximate)

Dates: June 2002 – May 2005

Project Title: Topics in harmonic analysis for reductive p -adic groups

NSF postdoctoral fellowship DMS-9804375

Amount: \$90,000

Dates: October 1998 – September 2001

Project Title: Homogeneity for representations of p -adic $GL_n(F)$

Teaching Experience

Associate Professor of Mathematics, University of Michigan, Ann Arbor, MI

Taught the following courses: *Theory of Algebraic Numbers*, 2006(F) [4.33/3.25]¹; *Honors Mathematics II*, 2005(W) [4.95/1.05]; *Calculus III* 2005(W) [4.15/2.87], 2005(F) [4.41/2.65], 2006(W) [4.5/2.63], 2006(F) [4.72/2.00], 2007(W) [4.71/1.88]; *Honors Mathematics I*, 2004(F) [4.87/1.21], 2007(F); *Advanced Topics in Algebra, Representation Theory of Reductive p -adic Groups*, 2004(W) [4.9/4.88]; *Matrix Algebra I*, 2003(F) [3.35/3.35]; *Advanced Calculus I*, 2003(F) [4.6/2.75], 2004(W) [4.77/1.94]. Fully responsible for all instruction and grading in courses which were not sectioned.

Faculty, Michigan Math and Science Scholars, Ann Arbor, MI

Taught a two week summer course for high school students titled *Games and Geometry* (2005,2006). Completely responsible for course.

Benjamin Peirce Assistant Professor of Mathematics, Harvard University, Cambridge, MA

Taught the following courses: *Sets, Groups, and Topology*, 2003; *Representation Theory of Reductive p -adic Groups*, 2002–2003; *Algebra*, 2001; *Calculus, series, and differential equations*, 2001–2002. Fully responsible for all instruction and grading in courses which were not sectioned.

Counselor, SESAME EAST, Boston, MA

This program is designed to provide middle school teachers with a more solid theoretical mathematical grounding. We also supply them with interesting exercises that they can take back to their classrooms. 2001–2003.

L.E. Dickson Instructor of Mathematics, The University of Chicago, Chicago, IL

Taught the following courses: *Basic Algebra*, 2001; *Analysis in \mathbb{R}^n* , 1999–2000. Fully responsible for all instruction and grading.

¹These numbers represent the “median” scores on the questions “Overall, the instructor was an excellent teacher” (5 = Strongly Agree ... 1 = Strongly Disagree) and “The workload for this course was (5 = LIGHT ... 1 = HEAVY)”.

Lecturer, The University of Chicago, Chicago, IL

Taught the following courses: *Fundamental Mathematics*, 1996–1997; *Mathematical Methods for Biological or Social Sciences*, 1995–1996; *Calculus*, 1993–1995; *Elementary Functions and Calculus*, 1992–1993. Fully responsible for all instruction and grading.

College Fellow, The University of Chicago, Chicago, IL

Assisted in *Analysis in \mathbb{R}^n* , 1991–1992. Conducted all problem sessions, graded exams, lectured.

Service

2007–2008

Grader, Putnam Competition.
 Undergraduate Program Director.
 Undergraduate Advising (Chair).
 Director, Michigan Math and Science Scholars Program.
 Course Coordinator for Math 215 (Calculus III).
 Undergraduate Scholarship Committee.
 Recruitment activities.
 Referee work.

2006–2007

Grader, Putnam Competition.
 Panelist, “Creating and Sustaining Active Math Clubs”, Project NExT Panel Discussion, Joint Mathematics Meetings, New Orleans.
 Director, Michigan Math and Science Scholars Program.
 Course Coordinator for Math 215 (Calculus III).
 Undergraduate Math Club Committee (chair).
 Undergraduate Scholarship Committee.
 Undergraduate Advising.
 Thesis Defense Committee for Bryden Cais.
 Thesis Defense Committee for Ellen Veomett.
 Recruitment activities.
 Referee work.

2005–2006

Co-organizer, Thirtieth Anniversary Midwest Representation Theory Conference (Chicago, March).
 Organizer, Midwest Representation Theory Conference (Ann Arbor, November).
 Course Coordinator for Math 215 (Calculus III).
 Graduate Admissions and Fellowship Committee.
 Undergraduate Scholarship Committee.
 Undergraduate Math Club Committee.
 Thesis Defense Committee for Trevor Arnold.
 Thesis Defense Committee for Krzysztof Klosin.
 Recruitment activities.
 Referee work.

2004–2005

Undergraduate Math Club Adviser.
 Mathematics Department Executive Committee.
 Honors Committee.
 Grader, algebra qualifying exam (May).
 Thesis Defense Committee for Sreekar M. Shastry.

Thesis Defense Committee for Tong Liu.

Recruitment activities.

Referee work.

2003–2004

Guest Speaker, Who wants to be a mathematician?, AMS outreach program, May.

Marshal, Winter graduation ceremony.

Colloquium Committee (chair).

Graduate School Discussion Panel.

Thesis Defense Committee for Elliot Lawes.

Referee work.

2001–2003 (Harvard)

Colloquium Committee, cochair, Spring 2002, Fall 2002.

Graduate School Discussion Panel, 2002.

Graduate Admissions Committee, 2001–2002.

Referee work.

Advising

Undergraduate advising (Winter 2007–).

Advising of undergraduate scholarship recipients (2005–).

REU Advisor, one advisee (2006).

Mentor for postdoc Loren Spice (2004–2008).

Second Ph.D. Thesis Adviser (The University of Chicago), one advisee (2000–2004).

Senior Thesis Adviser (Harvard), two advisees (2001–2003).

Intensive Undergraduate Advising (Harvard) (2002).

Professional and Honor Societies

Alpha Sigma Nu

American Mathematical Society

Mathematical Association of America

Phi Beta Kappa

Pi Mu Epsilon

Sigma Pi Sigma

Sigma Xi