

# CURRICULUM VITAE

Shelly L. Harvey

Department of Mathematics, Rice University  
PO Box 1892, Houston, TX 77251-1892  
shelly@rice.edu <http://math.rice.edu/~shelly>

## APPOINTMENTS

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Associate Professor, Rice University, 2009–present.  
Assistant Professor, Rice University, 2005–2009.  
C.L.E. Moore Instructor, Massachusetts Institute of Technology, 2002–2005 (on leave 2002–2003).  
National Science Foundation Mathematical Sciences Postdoctoral Research Fellow  
· Massachusetts Institute of Technology, 2003–2005  
· University of California at San Diego, 2002–2003

## EDUCATION

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Ph.D. Mathematics, Rice University, May 2002.  
B.S. Mathematics, California Polytechnic State University, San Luis Obispo, June 1997.

## FELLOWSHIPS AND HONORS

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2010 Member of Mathematical Sciences Research Institute, Berkeley, CA  
Program: Homology Theories of Knots and Links, spring semester.  
2008 NSF Faculty Early Career Development (CAREER) Award.  
2006 Alfred P. Sloan Fellow.  
2006 Rice University Nominee for Packard Fellowship.  
2002 NSF Mathematical Sciences Postdoctoral Research Fellow.  
2004 FEW Distinguished Lecturer, University of Pennsylvania.  
2002 Finalist for the American Institute of Mathematics Postdoctoral Research Fellowship.

## RESEARCH SUPPORT

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National Science Foundation Grant (Principal Investigator), CAREER: Algebraic Methods in  
Low-Dimensional Topology, DMS-0748458, 2008–2013.  
National Science Foundation Grant (Principal Investigator), Applications of Noncommutative Algebra to  
Low-Dimensional Topology, DMS-0539044, 2005–2008.  
National Science Foundation Mathematical Sciences Postdoctoral Research Fellow, University of California  
at San Diego, 2002–2003, MIT 2003–2005, NSF DMS-0202488.

## PUBLICATIONS

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1. T. Cochran, S. Harvey, and P. Horn, Higher-order Signature Cocycles for Mapping Class Groups and Homology Cylinders, *Int. Math. Res. Not. IMRN* (2011), 54 pages, doi:10.1093/imrn/rnr149.
2. 2-Torsion in the n-Solvable Filtration of the Knot Concordance Group (joint with T. Cochran and C. Leidy), *Proc. London Math. Soc.*, (3) 102 (2011), no. 2, 257–290.
3. Primary Decomposition and the Fractal Nature of Knot Concordance (joint with T. Cochran and C. Leidy), *Mathematische Annalen* (2010), 66 pages, doi:10.1007/s00208-010-0604-5.
4. Derivatives of Knots and Second-Order Signatures (joint with T. Cochran and C. Leidy), *Algebr. Geom. Topol.*, 10 (2010), 739–787.
5. Homological Stability of Series of Groups (joint with T. Cochran), *Pacific J. Math.*, Vol. 31 (2010), No. 1, 31–47.
6. Knot Concordance and Higher-Order Blanchfield Duality (joint with T. Cochran and C. Leidy), *Geom. Topol.* 13 (2009), no. 3, 1419–1482.
7. On Transverse Knots and Branched Covers (joint with K. Kawamuro and O. Plamenevskaya), *Int. Math. Res. Not. IMRN* (2009), no. 3, 512–546.

8. Link Concordance and Generalized Doubling Operators (joint with T. Cochran and C. Leidy), *Algebr. Geom. Topol.*, 8 (2008), 1593–1646.
9. Homology and Derived p-Series of Groups (joint with T. Cochran), *J. Lond. Math. Soc.*, Vol. 8 part 3 (2008), 677–692.
10. Homology Cobordism Invariants and the Cochran-Orr-Teichner Filtration of the Link Concordance Group, *Geom. Topol.*, Vol. 12 (2008), 387–430.
11. Homology and Derived Series of Groups II: Dwyer’s Theorem (joint with T. Cochran), *Geom. Topol.*, Vol. 12 (2008), 199–232.
12. Non-commutative Multivariable Reidemeister Torsion and the Thurston Norm (joint with S. Friedl), *Algebr. Geom. Topol.*, Vol. 7 (2007), 755–777.
13. New Phenomena in Knot and Link Concordance (joint with T. Cochran and C. Leidy), Workshop on “Four-Dimensional Manifolds,” *Oberwolfach Reports*, Volume 3, Issue 3 (2006).
14. Monotonicity of Degrees of Generalized Alexander Polynomials of Groups and 3-Manifolds, *Math. Proc. Cambridge Philos. Soc.* 140 (2006), no. 3, 431–450.
15. Homology and Derived Series of Groups (joint with T. Cochran), *Geom. Topol.*, Vol. 9 (2005) no. 49, pp. 2159–2191.
16. Higher-Order Polynomial Invariants of 3-Manifolds Giving Lower Bounds for the Thurston Norm, *Topology*, Vol. 44, Iss. 5 (2005), 895–945.
17. On the Cut Number of a 3-Manifold, *Geom. Topol.*, Vol. 6 (2002) Paper no. 15, pp. 409-424.

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## PREPRINTS

1. Graph Floer Homology (with D. O’Donnol), in preparation.
2. Filtering Smooth Concordance Classes of Topologically Slice Knots (joining with T. Cochran and P. Teichner), in preparation.

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## OTHER PUBLICATIONS

1. A Research Experience for Undergraduates (joint with A. Ritter), *Notices*, Vol. 45, No. 2 (1998) pp. 267-269.

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## RESEARCH STUDENTS AND FELLOWS

### Graduate Students

1. Carolyn Otto (doctoral student, 2006–2011).
2. Taylor Coon (doctoral student, 2007–present).
3. Taylor McNeill (doctoral student, 2008–present).
4. Katherine Poulsen (doctoral student, 2011–present).

### Postdoctoral Fellows

1. Keiko Kawamuro (G.C. Evans Instructor, 2006–2009).
2. Elena Pavelescu (G.C. Evans Instructor, 2008–2011).
3. Danielle O’Donnol (G.C. Evans Instructor, 2008–2011).
4. Prudence Heck (VIGRE-Lovett Instructor, 2009–present).
5. Eamonn Tweedy (G.C. Evans Instructor, 2011–present).

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## CONFERENCES AND MEETINGS

1. Co-organizer of the AMS Special Session on Knot Theory at the Joint Math Meetings, Boston, MA, January 4–7, 2012.
2. Co-organizer of the Special Session on Low Dimensional Topology and Geometry at the AMS Fall Southeastern Section Meeting, Wake Forest University, Winston-Salem, NC, September 24–25, 2011.
3. Co-organizer of the AMS Special Session on Knot Theory at the Joint Math Meetings, New Orleans, LA, January 8–9, 2011.
4. Co-organizer of the Special Session on Low Dimensional Topology at the AMS Fall Eastern Section Meeting, Middletown, CT, October 11–12, 2008.

5. Co-organizer of the Third Louisiana Texas Topology Retreat (LTTR) held at Rice University, February 9–10, 2008.
6. Co-organizer of the Fall 2006 Texas Geometry and Topology Conference (TGTC) held at Rice University, October 27–29, 2006.
7. Co-organizer of the Second Louisiana Texas Topology Retreat (LTTR) held at Louisiana State University, February 3–4, 2007.

#### SERVICE TO THE PROFESSION

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1. Referee for the following journals: Geometry and Topology, Journal of Topology, Proceedings of the London Mathematical Society, Transactions of the American Mathematical Society, Algebraic and Geometric Topology, and Bulletin of the London Mathematical Society.
2. Invited lecturer at More Examples of Groups, a NSF sponsored summer school to familiarize graduate students with classes of groups that appear in geometric group theory, Ohio State University, May 11–16, 2009. Gave two lectures on *Groups associated to knots and 3-manifolds*.
3. Panelist for the National Science Foundation.
4. Mentor for the Association for Women in Mathematics Mentor Network, 2007-present.
5. Inaugural Undergraduate Colloquium Speaker at University of Pennsylvania, October 2004, *Knot Theory and Twisting of 3-Dimensional Spaces*.
6. Mentor for the Student Teaching Mentoring Program at MIT, Fall 2003.
7. Invited speaker, Arkansas Women in Statistics and Mathematics, April 2003, *Becoming a successful woman in mathematics*.

#### SERVICE TO THE COMMUNITY

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1. Director of the Rice University Mathematical Institute for Young Women; a summer math enrichment program for rising 10<sup>th</sup> and 11<sup>th</sup> grade girls from the greater Houston community, 2008-2013.
2. Panelist on the University and District-Level Panel at NSF and Rice sponsored Mathematics Leadership Institute Lessons Learned Conference, June 24, 2009, Pin Oak Middle School.
3. Presented lectures to the lead high school teachers on Knot Theory, Braid Theory, and "Rational Tangles" the NSF and Rice sponsored Mathematical Leadership Institutes Summer Lecture Series, June 2005, June 2007 and June 2009.
4. Presenter in Rice University's Summer Math Days, a fun and educational program for all high school students entering grades 10-12, June 29– July 1, 2009. Title: All Tangled Up In Knots.
5. Plenary lecturer at the Sonya Kovalevsky High School Mathematics Day held at Indiana University, Bloomington, March 8, 2009.
6. Presenter in the West Harris County Branch AAUW Expanding Your Horizons in Science and Mathematics Workshop for middle school girls All Tied up in Knots, February 2006, March 2007, and March 2008.
7. Presented a lecture to 70 undergraduate and faculty at Sam Houston State University on "Knots in 4-Dimensional Space" in the Piney Woods Lecture Series (funded by the Tensor Foundation and the Mathematical Association of America) and met with prospective undergraduate women math majors at SHSU, September 12, 2007.

#### SERVICE TO THE UNIVERSITY

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1. Member of the NSF ADVANCE Recruitment Committee, 2010-2011.
2. Member of the Committee on Faculty and Staff Benefits, 2009-present.
3. Member of the NSF ADVANCE Retention and Climate Committee, 2007-2010.
4. Member of the Dean of Natural Sciences Search Committee, 2007-2008.
5. Faculty Associate of Brown College, 2006-2010.
6. Member of the Rice Ally Program, providing support to GLBT persons, 2005-present.
7. Freshman orientation week advisor, Fall 2006 and 2007.
8. Member of the NSF ADVANCE committee to establish a mentoring program, 2006-2007.

9. Panel member of the NSF ADVANCE workshop “Building Your Lab and Getting the Most from a Mentor” during the conference “Negotiating the Ideal Faculty Position,” Fall 2006.

#### SERVICE TO THE DEPARTMENT

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1. Member of the appointments committee, 2009-present.
2. Chair, Evans instructor hiring committee, 2005-present.
3. Coordinator for the Women in Mathematics group, 2005-present.
4. Chair, Bochner lectures committee, 2005-2009.
5. Chair, Wolfe lectures committee, 2006-2007.
6. Member of the graduate committee, 2005-2006.

#### INVITED ADDRESSES

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1. Special session on Invariants in Knot Theory and Low-Dimensional Topology at the 2011 AMS Central Sectional Meeting in Lincoln, NE, October 2011, *Combinatorial Floer homology for spatial graphs*.
2. Invited Address, AMS Southeastern Sectional Meeting in Winston-Salem, NC, September 2011, *4-dimensional equivalence relations on knots*.
3. Special Session on Knots, Surfaces and 3-manifolds at the 2011 AMS Western Sectional Meeting in Las Vegas, NV, April 2011, *Filtering smooth concordance classes of topologically slice knots*.
4. Semi-plenary speaker at the 45<sup>th</sup> Spring Topology and Dynamics Conference, Tyler, TX, March 2011, *Filtering smooth concordance classes of topologically slice knots*.
5. Knot Concordance and Homology Cobordism Workshop, Wesleyan University, July 19–23, 2010, *Towards a  $p$ -primary decomposition of the  $n$ -solvable quotients of the knot concordance group*.
6. Connections for Women: Homology Theories of Knots and Links at Mathematical Sciences Research Institute, Berkeley, CA, January 21–22, 2010, *Knot and Link Concordance*.
7. Los Angeles Joint Topology Seminar (at Caltech), December 4, 2009, *Filtrations of the Knot Concordance Group*.
8. Cascade Topology Seminar (bi-annual meeting), University of Oregon, October 24–25, 2009, *Torsion in the knot concordance group*.
9. 2009 Georgia International Topology Conference, May 18–29, 2009, *Torsion in the knot concordance group*.
10. More Examples of Groups, Ohio State University, May 11–16, 2009, *Groups associated to knots and 3-manifolds*.
11. 10<sup>th</sup> annual CombinaTexas: Combinatorics in the South-central US conference, University of Houston, April 25–26, 2009, *A survey of knot theory and its combinatorial invariants*.
12. Colloquium, University of Indiana, Bloomington, March 7, 2009, *Subgroups of the mapping class group and higher-order signature cocycles*.
13. 2009 Spring Texas Geometry and Topology Conference, University of Houston, February 20–22, 2009, *Subgroups of the mapping class group and higher-order signature cocycles*.
14. Colloquium, University of California, Riverside, December 3, 2008, *Filtrations of the Knot Concordance Group*.
15. Topology Seminar, Brandeis University, November 11, 2008, *Signature Cocycles for the Torelli Group*.
16. Conference on “Fifty Years Since Fox and Milnor: A Conference on Knot Concordance in Honor of the Memory of Jerry Levine,” Brandeis University, June 4, 2008, *Filtrations of the Knot Concordance Group*.
17. Special Session on Geometric Group Theory at the 2008 AMS Spring Southeastern Meeting, Baton Rouge, LA, March 30, 2008, *Higher-Order Signature Cocycles for Subgroups of the Torelli Group*.
18. Special Session on Knot and 3-Manifold Invariants at the 2008 AMS Spring Southeastern Meeting, Baton Rouge, LA, March 28, 2008, *The  $(n)$ -Solvable Filtration of the Knot Concordance Group*.
19. Topology Seminar, UT Austin, November 26, 2007, *Infinite Generation in the COT Filtration of the Knot Concordance Group*.
20. MIT Geometry Seminar, October 22, 2007, *Structure in the Knot Concordance Group*.
21. Colloquium, Wesleyan University Math Department, October 18, 2007, *On the Enormity of the Knot Concordance Group*.

22. Columbia University Geometric Topology Seminar, October 12, 2007, *Knot Concordance and Blanchfield Duality*.
23. William Rowan Hamilton Geometry and Topology Workshop, Hamilton Mathematics Institute, Trinity College, Dublin, Ireland, September 7, 2007, *Iterated Torsion-Free Abelian Covers and  $L^2$ -Betti Numbers of 3-Manifolds*.
24. Workshop on 3-Manifold Geometry and Topology, Warwick Mathematics Institute, Coventry, England, July 10, 2007, *Homology and Derived  $p$ -Series of Groups*.
25. Geometric Topology Conference, Peking University, Beijing, China, June 19, 2007, *Classical Knot Concordance and Blanchfield Duality*.
26. University of Chicago Geometry and Topology Seminar, May 24, 2007, *Knot Concordance and Blanchfield Duality*.
27. Louisiana Texas Topology Retreat, February 3, 2007, *The  $(n)$ -Solvable Filtration of the Knot Concordance Group*.
28. Workshop on “4-Dimensional Manifolds,” Mathematisches Forschungsinstitut, Oberwolfach, Germany, August 7, 2006, *New Phenomena in Knot and Link Concordance*.
29. Conference on “Knots, Groups and 3-Manifolds,” Marseille, France, May 22, 2006, *Group Theoretic Invariants of Links and 3-Manifolds*.
30. Workshop on “3-manifolds After Perelman,” Edinburgh, Scotland, March 2006, *Group Theoretic Invariants of Links and 3-Manifolds*.
31. Plenary Lecture Series at the Third KAIST Geometric Topology Fair, Gyeongju, South Korea, June 2005, *I. Non-commutative Invariants of 3-manifolds giving Lower Bounds for the Thurston Norm II. Homology and Derived Series of Groups and Rank Invariants of Links III. Homology Cobordism of Invariants of Links and 3-manifolds via  $L^2$ - $\rho$  Invariants*.
32. Conference on “Submanifolds, Singular Varieties and Stratified Spaces” in honor of Julius Shaneson, Courant Institute, March 2005, *Homology Cobordism of Manifolds and  $L^2$ -Signatures*.
33. Symplectic Geometry Seminar, Michigan State University, November 2004, *Homology Cobordism of 3-Manifolds*.
34. Conference on Low-Dimensional Topology, University of Virginia, Dec 2004, *Homology Cobordism of 3-Manifolds*.
35. Geometry and Topology Seminar, University of Pennsylvania, October 2004, *Homology and Derived Series of Groups*.
36. BIRS conference on Knots and Their Manifold Stories, May 2004, *Homology Equivalence of Groups and Spaces*.
37. University of Pennsylvania Topology Seminar, March 2004, *New Homology Cobordism Invariants*.
38. Brandeis University Topology Seminar, March 2004, *Homology and Derived Series of Groups*.
39. Rice University Colloquium, February 2004, *Homology Equivalence of Groups and Spaces*.
40. Harvard Gauge Theory Seminar, February 20, 2004, *Algebraic Invariants Obstructing Symplectic Structures*.
41. MIT Algebraic Topology Seminar, December 1, 2003, *HigherOrder Invariants of 3-manifolds*.
42. Brandeis University Topology Seminar, October 2003, *Invariants of 3-manifolds from Noncommutative Algebra*.
43. BIRS (Banff International Research Station) Conference on Topology in and Around Dimension Three, Banff, Canada, Sept 13-18, 2003, *Invariants of 3-manifolds from Noncommutative Algebra*.
44. Midwest Geometry Conference, Washington University in St. Louis, May 2003, *Noncommutative generalizations of the Alexander Polynomial of a 3-manifold*.
45. University of Arkansas Spring Lecture Series, The Andrews-Curtis Conjecture and the Poincare Conjecture, April 2003, *Some remarks on the Virtual Betti Number of a 3-manifold*.
46. University of California, Santa Barbara, Topology Seminar, February 2003, *Monotonicity of Some 3-manifold Invariants*.
47. Joint Caltech/USC Geometry and Topology Seminar, November 2002, *Higher-order Invariants of 3-manifolds with Applications to 3 and 4-manifolds*.
48. Wasatch Topology Conference, University of Utah, October 2002, *Some 3-manifold invariants and their applications to 4-manifolds*.
49. University of Illinois at Chicago Three Manifolds Seminar, October 2002, *Higher-order 3-manifold*

*Invariants and their Applications.*

50. University of California at San Diego Topology/Geometry Seminar, September 2002, *Higher-Order 3-manifold Invariants and their Applications, Part I, II, III.*
51. ICM 2002 Beijing Satellite Conference in Geometric Topology, Shaanxi Normal University, Xi'an, China, August 2002, *Higher-Order 3-manifold Invariants with Applications to the Thurston Norm and Symplectic 4-manifolds.*
52. Ohio State University Topology Seminar, April 2002, *New Polynomial Invariants of 3-manifolds Using Noncommutative Algebra.*
53. Spring Topology and Dynamics Conference, University of Texas at Austin, March 2002, *On the Cut Number of a 3-manifold.*
54. University of Pennsylvania Geometry/Topology Seminar, February 2002, *New 3-manifold Invariants Giving Lower Bounds for the Thurston Norm.*
55. Columbia Geometric Topology Seminar, February 2002, *New 3-manifold Invariants Giving Lower Bounds for the Thurston Norm.*
56. University of Texas at Austin Geometry/Topology Seminar, February 2002, *A Resolution of the Cut Number Question.*
57. Brown University Colloquium, January 2002, *New 3-manifold Invariants with Applications to the Thurston Norm.*
58. AMS/MAA Joint Mathematical Meetings, San Diego, January 2002, *Higher-Order Polynomial 3-Manifold Invariants Giving Lower Bounds for the Thurston Norm.*
59. 2001 Georgia International Topology Conference, May 21–June 1, 2001, *New Polynomial Invariants of 3-manifolds Giving Lower Bounds for the Thurston Norm.*
60. Lehigh Geometry and Topology Conference, Summer 2001, *Higher-Order 3-Manifold Invariants with Applications to Fibered 3-Manifolds.*
61. Topology Seminar, UC San Diego, Summer 2001, *3-Manifold Invariants Giving Lower Bounds for the Thurston Norm.*
62. Spring Topology and Dynamical Systems Conference, Morelia, MX, Spring 2001, *Polynomial Invariants of 3-Manifolds Giving Lower Bounds for the Thurston Norm.*