

CURRICULUM VITAE

PAUL MELVIN

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BIRTH

13 March 1949 Los Angeles, California

EDUCATION

Degrees: BA 1971 Haverford College
 PhD 1977 U.C. Berkeley (in Topology with R. Kirby)

Fellowships: Woodrow Wilson 1971-72 (honorary)
 National Science Foundation 1971-74

FIELD

Geometric and Quantum Topology

POSITIONS

Bryn Mawr College	Professor on the Rachel C. Hale Chair Chairman	1992-present 2000-08 2005-06, 98-99, 93-96
	Associate Professor	1987-92
	Assistant Professor	1981-87
Institute for Advanced Study Math. Sci. Res. Inst. (Berkeley)	Member (Spring), Visitor (Fall) Research Member /Professor	2002-03 2009-10, 1996-97
Stanford University	Visiting Scholar	1994 (Summer)
Newton Institute	SERC Fellow	1992 (Fall)
U.C. Berkeley	Research Associate	1989 (Spring)
Stanford University	Visiting Associate Professor	1988-89
University of Pennsylvania	Visiting Scholar	1985-86
U.C. Santa Barbara	Visiting Assistant Professor	1979-81
U.W. Madison	Assistant Professor	1977-79

GRANTS

National Science Foundation

Research Grants: FRG: Topological invariants of 3 and 4-manifolds (2003-06)

Quantum invariants of 3-manifolds (1992-95)

3-manifold invariants from quantum theory (1991-92)

Transformation groups on 3 and 4-manifolds (1981-83)

4-manifolds and bordism of diffeomorphisms (1978-79)

Conference Grants: Oxtoby Centennial Conference (at Bryn Mawr, October 2010)

Low-dimensional topology (at MSRI, June 1998)

GRANTS (continued)

American Institute of Mathematics Grant: SQuaRE - Legendrian knots (2008-10)

Mellon Foundation Seed Grants:

Tri-College Contact Seminar (2004-05)

Faculty-Student Seminar in Topology (2005-06)

Bryn Mawr College

Enhanced Sabbatical	1996-97
Research/Equipment Grants	1996-97, 1992-93, 90-91
Junior Faculty Research Leave	1985-86

REFEREEING

Papers: Invent. Math., **Math. Ann.**, Topology, **Geometry&Topology**, Journal/Proc./Trans. of the AMS, Math. Proc. of the Camb. Phil. Soc., Pacific J. of Math., Jour. Math. Physics, Amer. Math. Monthly, **Commun. in Anal. and Geom.**, Journal of Knot Theory and its Ramif., Georgia International Conf. Proc., **Mathematics Magazine**

Grants: **National Science Foundation**, Israeli Science Found., Binational Science Found.

INVITED LECTURES (recent years)

Colloquia and Seminars:

University of Pennsylvania (Feb 2011, 2 talks)

“Cohomotopy Theory of 4-manifolds”

Philadelphia Area Contact/Topology Seminar (2010-11, several talks)

“Link concordance” (F10), “Cerf Theory” (S11)

Tulane University Colloquium (Apr 2010)

“Asteroids, triple linking and bicycles”

Mathematical Sciences Research Institute PlayGround (Feb 2010)

“Amphicheiral links”

Berkeley Math Circle (Feb 2010)

“Enhanced linking”

Rice University Colloquium (Dec 2009)

“From asteroids to bicycles”

San Francisco State University Colloquium (Nov 2009)

“From asteroids to bicycles”

Claremont Topology Seminar (at Pomona College, Nov 2009)

“Degree formulas for higher order linking”

Joint Caltech/UCLA/USC Topology Seminar (at USC, Nov 2009)

“Degree formulas for higher order linking”

University of California, Berkeley (Oct 2009)

“Degree formulas for higher order linking”

University of Pennsylvania (Apr 2009)

“Applications of quantum topology to classical topology”

Philadelphia Area Contact/Topology Seminar

“3-dimensional surgery and 4-dimensional handlebodies” (Jan–Feb 2009, 2 talks)

“Topological 4-manifolds with infinite cyclic fundamental group” (Oct 2008)

- University of Pennsylvania (Apr 2008)
 "Higher order linking invariants"
- Philadelphia Area Contact/Topology Seminar (Feb-Mar 2008, series of 4 lectures)
 "On the Milnor degree"
- University of Pennsylvania (Feb 2008)
 "Topological 4-manifolds"
- Kansas State University: William J. Spencer Lecture (May 2007)
 "Topological 4-manifolds and slice knots"
- Kansas State University: Topology Seminar (May 2007)
 "What does quantum topology tell us about classical topology"
- Philadelphia Area Contact/Topology Seminar (Oct-Nov/2006, series of 4 lectures)
 "Smooth 4-manifolds"
- University of Pennsylvania (Mar 2006)
 "Fertile Legendrian knots"
- Philadelphia Area Contact/Topology Seminar (Nov 2005)
 "Ng's bound for the Thurston-Bennequin number from Khovanov homology"
- University of California, Santa Barbara (Dec 2004)
 "Contact Homology of Legendrian knots"
- University of California, Berkeley (Dec 2004)
 "Contact Homology of Legendrian knots"
- University of Texas, Austin (Oct 2004)
 "Contact Homology of Legendrian knots"
- Tri-College Contact Seminar (Sep 2004)
 "Poincare-Chekanov polynomials for Legendrian knots"
- University of California, Berkeley (Jul 2004)
 "The Nonuniqueness of Chekanov polynomials of Legendrian knots"
- Tri-College Contact Seminar (Apr 2004, series of 4 lectures)
 "Heegaard Floer homology"
- University of Pennsylvania (Jan 2004)
 "Combinatorial aspects of Ozsvath-Szabo theory"
- Bryn Mawr / Haverford Colloquium (Sep 2003)
 "Enhancing the Alexander polynomial: an introduction to Ozsvath-Szabo theory"
- Elizabethtown College (May 2003)
 "Enhancing the Alexander polynomial"
- Columbia University (Apr 2003)
 "The Milnor degree and quantum orders of 3-manifolds"
- University of California, Berkeley (Apr 2003)
 "The Milnor degree and quantum orders of 3-manifolds"
- Princeton University (Apr 2003)
 "The Milnor degree and quantum orders of 3-manifolds"
- Rice University Colloquium (Mar 2003)
 "Holomorphic disks and topology: the work of Ozsvath-Szabo"
- CUNY Graduate Center, Einstein Chair Seminar (Mar 2001, series of 3 talks)
 "Finite type invariants in low-dimensional topology"
- Microsoft Corporation (Dec 2000, 2 talks)
 "Analyticity of quantum invariants"
- Haverford College Colloquium (Oct 2000)
 "Who wants to be a millionaire: The Poincaré Conjecture"

University of Pennsylvania (Apr 2000)
 "The topology of complex surfaces"
 SUNY Buffalo Colloquium (Nov 1999)
 "Topology of complex surfaces"
 University of Pennsylvania (Feb 1999)
 "Quantum cyclotomic orders of 3-manifolds"
 Istanbul: Feza Gursey Institute (May 1998)
 "The space of 3-manifolds"
 Rice University Colloquium (Mar 1998)
 "Quantum topology and the theory of finite type invariants"
 University of Pennsylvania (Nov 1997)
 "Finite type invariants of 3-manifolds from quantum topology"
 Rutgers University (Nov 1997)
 "Finite type invariants of 3-manifolds"
 Mathematical Sciences Research Institute, Berkeley (1996-97, series of 7 talks)
 "On the combinatorial classification of finite type invariants"

Conference Talks:

Wesleyan University (AMS Sectional Meeting Oct 2008)
 "Topological 4-manifolds with infinite cyclic fundamental group"
 Gokova, Turkey (FRG Workshop June 2005)
 "Contact Homology of Legendrian knots"
 Gokova, Turkey (FRG Workshop June 2004, several lectures)
 "Khovanov cohomology and the Milnor conjecture"
 Banff, Canada (BIRS: Knots and their manifold stories May 2004)
 "Knot Floer homology: Enhancing the Alexander polynomial"
 Banff, Canada (BIRS: "Floer Homology" Nov 2003)
 "The Maslov index"
 Gokova, Turkey (FRG Workshop, June 2003, several lectures)
 "Knot Floer homology"
 Louisiana State University (Louisiana Topology, Nov 1998)
 "Quantum cyclotomic orders of 3-manifolds"
 Boise State University (Cascade Topology, Nov 1998)
 "The theory of finite type invariant and the analyticity of quantum invariants"
 Gokova, Turkey (Topology/Geometry, May 1998)
 "Analyticity of quantum invariants and Reidemeister torsion"

Conference Organization:

Bryn Mawr College (coorganizer) "Oxtohy Centennial Conference" October 2010
 American Institute of Mathematics, SQuaRE Workshops (coorganizer)
 "Augmentations, Rulings, and Generating Families" June 2009 and May 2010
 Gokova, Turkey "FRG Workshops on Ozsvath-Szabo Theory" June 2003/04/05
 Microsoft "Topological Aspects of Gauge Theory" (January 2003)
 Mathematical Sciences Research Institute (co-organizer, chaired sessions)
 "Low-dimensional Topology" (the "Kirby Fest") June 1998

Additional Invited Conference Participation:

- Mathematical Sciences Research Institute
 "Homology Theories of Knots and Links", Jan 2010
 "Symplectic and Contact Geometry and Topology", Aug 2009
 "Low Dimensional Topology" Aug 2008
 American Institute of Mathematics in Palo Alto, California Workshop
 "Legendrian and Transverse Knots" Sep, 2008
 Park City Mathematics Institute "Low Dimensional Topology" June-July, 2006
 Gokova, Turkey "Geometry and Topology" May 2003/04/05, 1998
 Clay Institute Workshop in Budapest
 "Floer homology, gauge theory and low-dimensional topology" June, 2004
 Warwick Mathematics Institute "Workshop on Geometry and Topology" July 2000/02
 UC San Diego "The Influence of Physics on Topology" Aug 2000
 Mathematical Sciences Research Institute "Four Dimensional Manifolds" Jan 1997
 "Computational and Algorithmic Methods in Three Dim'l Topology" Mar 1997
 "Knots and 3-manifolds" Aug 1997
 "Combinatorics and Low-dimensional Topology" Aug 1997

PUBLICATIONS

1. *Slice knots and property R* (with R. Kirby), *Invent. Math.* **45** (1978), 57-59.
2. *Bordism of Diffeomorphisms*, *Topology* **18** (1979), 173-175.
3. *On 4-manifolds with singular torus actions*, *Math. Ann.* **256** (1981), 255-276.
4. *Tori in the diffeomorphism groups of simply connected 4-manifolds*, *Math. Proc. Camb. Phil. Soc.* **91** (1982), 305-314.
5. *Algebraic knots are algebraically dependent* (with C. Livingston), *Proc. Amer. Math. Soc.* **87** (1983), 179-180.
6. *2-sphere bundles over compact surfaces*, *Proc. Amer. Math. Soc.* **92** (1984), 567-572.
7. *4-dimensional oriented bordism*, *Contemp. Math.* **35** (1984), 399-405.
8. *Abelian invariants of satellite knots* (with C. Livingston), in "Geometry and Topology" (Maryland 1984), Springer Lecture Notes 1167 (1985), 217-227.
9. *The Smale invariant of a knot* (with J. Hughes), *Comment. Math. Helv.* **60** (1985), 615-627.
10. *4-manifolds with large symmetry groups* (with J. Parker), *Topology* **25** (1986), 71-83.
11. *Fibred knots of genus 2 formed by plumbing Hopf bands* (with H. R. Morton), *J. London Math. Soc.* **34** (1986), 159-168.
12. *3-dimensional bordism* (with W. Kazez), *Mich. Math. J.* **36** (1989), 251-260.
13. *Evaluations of the 3-manifold invariants of Witten and Reshetikhin-Turaev for $sl(2, \mathbb{C})$* (with R. Kirby), *London Math. Soc. Lecture Notes* 151 (1990), 101-114.
14. *The 3-manifold invariants of Witten and Reshetikhin-Turaev for $sl(2, \mathbb{C})$* (with R. Kirby), *Invent. Math.* **105** (1991), 473 - 545.
15. *Templates and framed braids* (with N. Tufillaro), *Phys. Rev. A* **44** (1991), 3419-3422.
16. *Quantum invariants of lens spaces and a Dehn surgery formula* (with R. Kirby), *Abstracts Amer. Math. Soc.* **12** (1991), 435.

17. *Relative Rotation Rate Package* (with A. Lorentz and N. Tufillaro), Appendix G in "An Experimental Approach to Nonlinear Dynamics and Chaos" by N. Tufillaro, T. Abbott and J. Reilly, Addison-Wesley (1992), 314-322.
18. *Quantum invariants at the sixth root of unity* (with R. Kirby and X. Zhang), *Commun. Math. Phys.* **151** (1993), 607-617.
19. *Dedekind sums, μ -invariants and the signature cocycle* (with R. Kirby), *Math. Ann.* **299** (1994), 231-267.
20. *The coloured Jones function* (with H. R. Morton), *Commun. Math. Phys.* **169** (1995), 501-520.
21. *Perturbative invariants* (with R. Kirby), *k-slice 2-knots* (with T. Cochran), and other contributions to *Problems in low-dimensional topology*, in "Geometric Topology", Vol. 2, W.H. Kazez (editor), Amer. Math. Soc. and International Press (1997), pp.127-8, 258, 276, 347-351.
22. *Canonical framings for 3-manifolds* (with R. Kirby), *Turk. J. of Math.* **23** (1999), 89-115, (math.GT/9903056); also in: Proc. Gokova Geometry-Topology Conf. 1998
23. *The E_8 -manifold, singular fibers and handlebody decompositions* (with R. Kirby), *Proceedings of the Kirby Fest, Geometry & Topology Monographs* **2** (1999), 233-258 (math.GT/9911253).
24. *Finite type invariants of 3-manifolds* (with T. Cochran), *Invent. Math.* **140** (2000), 45-100 (math.GT/9805026).
25. *Quantum cyclotomic orders of 3-manifolds* (with T. Cochran), *Topology* **40** (2001), 95-125, (math.GT/9809129).
26. *A geometric interpretation of Milnor's triple linking numbers* (with B. Mellor), *Algebraic & Geometric Topology* **3** (2003), 557-568 (math.GT/0110001).
27. *Local surgery formulas for quantum invariants and the Arf invariant* (with R. Kirby), *Proceedings of the Casson Fest, Geometry & Topology Monographs* **7** (2004), 213-233 (math.GT/0410358).
28. *The nonuniqueness of Chekanov polynomials of Legendrian knots* (with S. Shrestha '07 BMC), *Geometry & Topology* **9** (2005), 1221-1252 (math.GT/0411206)
29. *A topological menagerie*, *Amer. Math. Monthly* **113** (2006), 348-351 (math.GT/0412486)
30. *A non-smoothable four-manifolds with infinite cyclic fundamental group* (with S. Friedl, I. Hambleton and P. Teichner), *Int. Math. Res. Not.* **2007** (rnm31) (math.GT/0611077)
31. *Triple linking numbers, ambiguous Hopf invariants and integral formulas for three-component Links* (with D. DeTurck, H. Gluck, R. Komendarczyk, C. Shonkwiler and S. Vela-Vick), *Matematica Contemporanea (DoCarmo Festschrift)* **34** (2009), 251-283 (arXiv:0901.1612)
32. *The Milnor degree of a 3-manifold* (with T. Cochran), *Journal of Topology* **3** (2010), 405-423 (arXiv:0902.1731)

Submitted:

33. *Pontryagin invariants and integral formulas for Milnor's triple linking number* (with D. DeTurck, H. Gluck, R. Komendarczyk, C. Shonkwiler and S. Vela-Vick)

Preprints:

34. *Cohomotopy theory of 4-manifolds* (with R. Kirby and P. Teichner)

Papers in preparation:

35. *Analyticity of Reidemeister torsion* (with T. Cochran)

BRYN MAWR COLLEGE ACTIVITIES**Department**

Chair	2005-06, 98-99, 93-96
Graduate Advisor	2001-02, 99-00, 81-92
Colloquium Coordinator	2006-07, 04-05, 00-01, 97-98, 81-90
Putnam Club Advisor	2003-04
Computer Coordinator	2005-06, 04-05
Supervised Summer Research	
Undergraduates (Characteristic Classes, Dynamical Systems, Legendrian Knot Theory, Plane curves)	2004-06, 00, 90
Graduates (Lie Theory, Quantum Groups, Tait Conjectures, Homology, Representation Theory, Khovanov Homology)	2004-06, 98-01, 94, 91
PhD Theses Supervised	
Jennifer Hom <i>Heegaard Floer Invariants and Cabling</i>	2008-11
Jonah Swann <i>Relative Khovanov-Jacobbson Classes for Spanning Surfaces</i>	2006-10
Gowri Meda <i>Sewn up and Surgered Sewn-up Link Exterior: Surgery Presentations & Formulas for Lescop's Invariant</i>	1992-97
Master Theses Supervised	
Aditi Vashist <i>Torsion in Khovanov Homology</i>	2007-08
Cristina Nistor <i>Tangling Legendrian Knots</i>	2004-05
Ben Allen <i>Reidemeister and Whitehead Torsion</i>	2001-02
Rachael Thomas <i>Weight Systems</i>	2000-01
Zvezdelina Stankova <i>Forbidden Subsequences</i>	1991-92
Bo Liang <i>Lie Algebras and Representation Theory</i>	1991-92
Gowri Meda <i>Classification of Semisimple Lie Algebras</i>	1991-92
Julia Malik <i>Knot Theory: The New Polynomial Invariants</i>	1990-92
Becky Plassman <i>The Thom-Pontryagin Construction and its Applications</i>	1987-88

Marshall Theses Supervised

Cristina Nistor	
<i>Legendrian Knot Theory</i>	2004-05
Zvezdelina Stankova	
<i>Representation Theory of Semisimple Lie Algebras</i>	1991-92

Senior Honors Theses Supervised

Bethie Azuma	
<i>Computer Graphics</i>	2010-11
Melanie Edwalds	
<i>Molecular Chirality</i>	2007-08
Katie Haymaker	
<i>Conway's Theory of Quadratic Forms</i>	2006-07
Cara Petonic	
<i>Intrinsic Linking</i>	2006-07
Danny Tang	
<i>Legendrian Link Theory and the Thurston-Bennequin Number</i>	2006-07
Aditi Vashist	
<i>Lie Algebras and Representation Theory</i>	2006-07
Emma Haddad	
<i>Representation Theory</i>	2001-02
Debbie Ciucci	
<i>Random Walks on String Links</i>	2000-01
Anna Hu	
<i>Unknotting Numbers of Rational Knots</i>	2000-01
Cecilia Diniz	
<i>Quantum Spin Invariants of Lens Spaces</i>	1998-99
Suzanne Drennon	
<i>The Wedderburn Structure Theorem and Homology</i>	1995-96
Amy Sekara	
<i>Galois' Dream: Differential Equations on Covering Spaces</i>	1995-96
Rebecca Buchanan	
<i>The Homfly Polynomial and Related Link Invariants</i>	1994-95
Rochelle Lao	
<i>Knot Theory and Statistical Mechanics</i>	1994-95
Amy Lorentz	
<i>Dehn Surgery Constructions for Lens Spaces</i>	1991-92
Gwen Lloyd	
<i>Topological Invariants and Gauss Sums</i>	1990-91
Tina Hughes	
<i>Polynomial Invariants of Knots and Links</i>	1989-90
Rebecca Earle	
<i>Finiteness of the Ideal Class Group</i>	1984-85
Susan Shannon	
<i>Projective Measured Foliations and the Compactification of Teichmuller Space</i>	1982-83

Committees

Search for Dean of Graduate Studies (ad hoc)	2009
Graduate Council	2005-09 (convener 07-08)

Advisory Council	2007-08
Curriculum Committee	2005
Committee for Coordination of the Sciences	2005-06, 98-99, 93-96
Review of the Dean of A&S (ad hoc)	2004
Promotion of D. Kumar (ad hoc)	2004 (chair)
Undergraduate Awards and Fellowships	2003-04
Awards and Grants	1998-2001 (chair 2000-01)
Selection for the Gail Schweitzer Prize	1994
Parents Day Committee	1990
1902 Lectures Committee	1989-90
Admissions Committee	1986-88
Bicollege Curriculum Committee	1987
Solomon Amendment	1984-85
Search Committees	
Physics Department	2006-07, 04-05
Keck Fellowship	2001-02
Noether Lectureship	1997-98 (cochair)
Bryn Mawr Math Searches	2010-11, 08-09, 04-5, 00-1/92-3 (chair), 87-91
Bryn Mawr Computer Science Search	1992-93 (chair)
Haverford Math Searches	1994-95, 85-86
PhD Supervising Committees	
Elliott Tamaro (Physics)	2008-11 (chair)
Jen Hom (Math - U. Penn)	2008-11 (director)
Adam Levine (Math - Columbia U.)	2010 (outside member)
Linda Houser (Social Work)	2006-present (chair)
Chris Mickelwright (Math)	2009-present
Daniel Wisniewski (Math)	2006-10
Ayako Fukui (Math)	2006-09
Jonah Swann (Math)	2004-10 (director)
Beth Campbell (Math)	2004-06
Sherry Teti (Math)	2004-08
Jill Jordan (Math)	2003-05
Michael Jay McClure (Art History)	2003-06 (chair)
John Matulis (Math)	2002-04 (director)
Jennifer Dalton (Math)	2001-09
Cathy Battiste (Math)	1999-2005
Bogdan Butoi (Math)	1997-2001
Kathryn Racette (Psychology)	1994-99 (chair)
Amber Salzman (Math)	1993-2002
Tanya Schmah (Math)	1993-96 (director)
Gowri Meda (Math)	1992-97 (director)
Jean Mastrangeli (Math)	1992-97
Pamela Seida (Chemistry)	1992-94 (chair)
Regina Cohen (Math)	1991-93
Sister Ann Heath (Math)	1990-92
Chris Palmer (Physics)	1990-91 (chair)

Other

Solo and Chamber Music Recitals at Bryn Mawr (several/year)	1984-2010
Panelist and Performer in "A Conversation with Emanuel Ax"	2006
Cofounder of Chamber Music Society at Bryn Mawr	1985
Faculty Research Evening Lecture	1993
Prospectives Lecture	1990
Panelist for Gathering of High School Counselors	1987
Panelist for Alumni Gathering	1983