

Miller Fellow
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Scott Morrison - Resume

Employment

Miller Fellowship, UC Berkeley.

July 2009-present. I am currently a Miller Fellow at UC Berkeley, in the mathematics department.

Post-doctoral research, Microsoft Station Q.

April 2007-June 2009. Station Q is a multidisciplinary research group, focusing on *topological quantum computing*. The research interests of the group cover *condensed matter physics*, especially topological phases and the fractional quantum hall effect, and *quantum topology*, a field of mathematics describing topological quantum field theories (TQFTs) and their applications. My research has primarily been on *extensions of TQFT* which introduce ideas from homological algebra, and on *the classification of TQFTs* related to von Neumann algebras and quantum groups.

Education

University of California, Berkeley, Doctor of Philosophy (Mathematics).

2001-2007. Worked with Prof. Vaughan Jones. Received the 2007 Herbert Alexander Prize for Outstanding Dissertation in Pure Mathematics. Received the Outstanding Graduate Student Instructor Award, 2004.

University of New South Wales, Bachelor of Science (Hons.)

1998-2001, Sydney, Australia. First class honours in Mathematics, and the University Medal.

Publications

Cyclotomic integers, fusion categories, and subfactors

Joint with Frank Calegari and Noah Snyder, with an appendix by Victor Ostrik. Submitted to *Communications in Mathematical Physics*, available at [arXiv:1004.0665](https://arxiv.org/abs/1004.0665).

The blob complex

Joint with Kevin Walker. Preliminary draft available at <http://tqft.net/blobs>.

Non-cyclotomic fusion categories

Joint with Noah Snyder. Submitted to *International Mathematical Research Notices*, available at [arXiv:1002.0168](https://arxiv.org/abs/1002.0168).

Constructing the extended Haagerup planar algebra

Joint with Stephen Bigelow, Emily Peters and Noah Snyder. Submitted to the *Acta Mathematica*, available at [arXiv:0909.4099](https://arxiv.org/abs/0909.4099).

Man and machine thinking about the smooth 4-dimensional Poincaré conjecture

Joint with Michael Freedman, Robert Gompf and Kevin Walker. In press *Quantum Topology*, available at [arXiv:0906.5177](https://arxiv.org/abs/0906.5177).

Knot polynomial identities and quantum group coincidences

Joint with Emily Peters and Noah Snyder. In press *Quantum Topology*, available at [arXiv:1003.0022](https://arxiv.org/abs/1003.0022).

The braid group surjects onto G_2 tensor space

In press *Pacific Journal of Mathematics*, available at [arXiv:0907.0256](https://arxiv.org/abs/0907.0256).

Skein theory for the D_{2n} planar algebras

Joint with Emily Peters and Noah Snyder, *Journal of Pure and Applied Algebra* Vol. 214, No. 2 (2010) pp. 117-139. Available at DOI:10.1016/j.jpaa.2009.04.010 or arXiv:0808.0764.

A Diagrammatic Category for the Representation Theory of $U_q(\mathfrak{sl}_n)$

Ph.D. thesis, available at <http://tqft.net/thesis> and arXiv:0704.1503.

Fixing the functoriality of Khovanov homology

Joint with David Clark and Kevin Walker, *Geometry and Topology* 13 (2009) 1499-1582. Available at DOI:10.2140/gt.2009.13.1499 or arXiv:math.GT/0701339.

On Khovanov's cobordism theory for \mathfrak{su}_3 knot homology

Joint with Ari Nieh, *Journal of Knot Theory and its Ramifications* Vol. 17, No. 9 (2008). Available at DOI:10.1142/S0218216508006555 or arXiv:math.GT/0612754

The Karoubi Envelope and Lee's Degeneration of Khovanov Homology

Joint with Dror Bar-Natan, *Algebraic & Geometric Topology* 6 (2006) 1459-1469. Available at DOI:10.2140/agt.2006.6.1459 or arXiv:math.GT/0606542.

Classifying Spinor Structures

BSc. honours thesis at UNSW. Available at arXiv:math-ph/0106007.

Conferences

Quantum Topology in Wellington

With David Gauld, I organised the Quantum Topology session of a joint NZMS/AMS meeting in Wellington, New Zealand, December 2007.

Subfactors in Maui

I organised a week long conference on subfactors and topology in Maui, July 2007.

Khovanov Homology in Austin

I participated as a plenary speaker at the UT Austin Winter School on Knot Theory and Representations, January 2007.

Teaching

University of California, Berkeley

Outstanding Graduate Student Instructor Award, 2004. Teaching Assistant for 9 semesters, for MATH 1B (Introductory Calculus), 53 (Multivariable Calculus), 54 (Linear Algebra), 53H (Honors), 54H (Honors), 110 (Linear Algebra), and 121A (Mathematical Methods for the Physical Sciences).

University of New South Wales

Tutor ("Teaching Assistant") for 2 semesters, introductory calculus.

My current teaching statement is available online.

Selected talks

Blob Homology

- *AMS Annual meeting, Washington DC*, January 6 2009. (slides)
- *Georgia Topology Conference*, May 15 2008.

The Cappell-Shaneson spheres and the s-invariant

- *Knots in Washington* January 9 2009. (slides)
- UC San Diego, topology seminar, December 4 2008. (slides)

Khovanov homology of rational tangles

AMS Annual meeting, Washington DC, January 8 2009. (slides)

Skein theory for the D_{2n} subfactors

- University of Tokyo operator algebras seminar, October 16 2008.
- University of New South Wales, pure mathematics seminar, October 7 2008.
- Pennsylvania State University, noncommutative geometry seminar, September 16 2008.
- *Planar Algebras and Subfactors* at Vanderbilt, April 18-20 2008.

Lasagna composition for Khovanov Homology

- *Quantum Topology Special Session of the joint NZMS/AMS Wellington meeting*, December 12-15 2007. (slides)
- *Quantum Topology in Hanoi*, Vietnam, August 6-10 2007. (slides)
- *Oporto conference on Link Homology*, Portugal, July 5-8 2007. (slides)

Spiders for $U_q(\mathfrak{sl}_n)$

Station Q Seminar, UC Santa Barbara, October 2 2007. (slides)

Functoriality and duality in Khovanov homology

Kyoto, May 23 2007. (notes)

Genus bounds and spectral sequences made easy

Kyoto, May 15 2007. (slides)

A new proof of the Rasmussen's genus bounds

- UC Davis Student Topology Seminar, February 22 2007.
- UC Berkeley Topology Seminar, February 21 2007.
- UT Austin *Winter School on Knot Theory and Representations*, January 11-14 2007.

A topological categorification of \mathfrak{su}_3

University of Oregon colloquium, December 4 2006. (slides)

Disoriented and confused: fixing the functoriality of Khovanov homology

- Columbia, gauge theory seminar, November 17 2006. (slides)
- Invited speaker at *Categorification in Algebra and Topology*, Uppsala, September 7-10, 2006. (slides)
- *Park City Mathematics Institute*, July 3 2006. (slides)
- *Knots in Washington*, May 6 2006. (slides)

A cobordism theory for \mathfrak{sl}_3 knot homology

University of California, Santa Barbara, topology seminar, April 11 2006. (slides)

Local Khovanov Homology

Workshop on Geometric Methods in the Topology of 3-Dimensional Manifolds (NZ Mathematics Research Institute), Taipa, New Zealand, January 2006. (slides)

Generators and relations for $Rep(U_q(\mathfrak{sl}_n))$ as a pivotal category

University of Cologne, algebra seminar, November 2005, and at *Quantum Topology AMS Meeting*, Snowbird, Utah, June 2005. (slides)