Tomasz S. Mrowka
Curriculum Vitae

May 2015

Current Address:
Department of Mathematics rm 2-367
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Cambridge, MA 02139
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Personal Data:

Born Sept 8, 1961. US citizen.

Research Interests:

Partial differential equations, differential topology of three and four dimensional manifolds, knot theory, mathematical aspects of gauge theories.

Education:

Ph.D. in Mathematics, University of California, Berkeley, 1988
Thesis title, "A Local Mayer Vietoris Principle for Yang-Mills Moduli Spaces" written under the direction of Prof. C.H. Taubes.
S.B. in Mathematics, Massachusetts Institute of Technology, 1983.

Positions Held:

Fellow, Radcliffe Institute of Advanced Studies, class of 2013.

Singer Professor of Mathematics, Massachusetts Institute of Technology, 2009-present.

Simons Professor of Mathematics, Massachusetts Institute of Technology, 2006-2009.

Member, Institute for Advanced Studies, 2003-2004 academic year.

Professor of Mathematics, Massachusetts Institute of Technology, 1996-2006.

Visiting Professor of Mathematics, Massachusetts Institute of Technology, Fall 1995.

Clay Visiting Professor of Mathematics, Harvard University, Spring 1995.

Professor of Mathematics, California Institute of Technology, 1994-1996.

Associate Professor of Mathematics, California Institute of Technology, 1992-1994.

Visiting Assistant Professor of Mathematics, California Institute of Technology, 1991-1992.

Szego Assistant Professor of Mathematics, Stanford University, 1989-1991.

Research Fellow, Mathematical Sciences Research Institute, 1988-1989.

Department Service:

Head of the Department, Massachusetts Institute of Technology, Nov. 2014-Present

Interm Head of the Department, Massachusetts Institute of Technology, June 2014- Nov. 2014

Chair of the Pure Mathematics Committee, Massachusetts Institute of Technology, 2004-2009 AY, 2011-present.

Chair of the Graduate Student Committee, Massachusetts Institute of Technology, 1999-2002.

Awards and Honorary Societies:

Elected National Academy of Sciences, class of 2015.
Fellow of the Radcliffe Institute of Advanced Studies, class of 2013
Doob Prize of the AMS, joint recipient with P. Kronheimer, 2011.
Guggenheim Fellow, class of 2010.
American Academy of Arts and Sciences, class of 2007.
Oswald Veblen Prize in Geometry of the AMS, joint recipient with P. Kronheimer, 2007.
Sloan Foundation Fellow 1993-1995.
National Young Investigator 1993-1998.

Joint Managing Editor for:

Journal of Symplectic Geometry.
Advances in Mathematics.
Journal of the American Mathematical Society.

Editorial Board Memberships:

Mathematics Research Letters. 1994-present
Geometry and Topology. 1997-present
Les Publications Mathmatiques de l'IHS 2011-2015

Service to the Community

Sloan Research Foundation Fellowship in Mathematics selection committee. 2011-2016

AMS Steele Prize selection committee. 2013-present. Chair 2014.

Nation Science Foundation Committee of Vistors for the Division of Mathematical Sciences. Approx 1996 and 2000.

Ph. D. Students

Name	Institution	Year
Yongbin Ruan	University of California, Berkeley	1991
Christopher Herald	University of California, Berkeley	1992
Graham Taylor	University of California, Berkeley	1994
Baozhen Yu	University of California, Berkeley	1994
Qing Yang	California Institute of Technology	1999
Carmen Young	Massachusetts Institute of Technology	2000
Anda Degeratu	Massachusetts Institute of Technology	2001
Edward Goldstein	Massachusetts Institute of Technology	2001
Yue Lei	Massachusetts Institute of Technology	2001
Lenhard Ng	Massachusetts Institute of Technology	2001
Aleksey Zinger	Massachusetts Institute of Technology	2002
Eun Soo Lee	Massachusetts Institute of Technology	2003
Benoit Charbonneau	Massachusetts Institute of Technology	2004
Lawrence Guth	Massachusetts Institute of Technology	2005
Fangyun Yang	Massachusetts Institute of Technology	2007
Maksim Lipyanskiy	Massachusetts Institute of Technology	2008
William Lopes	Massachusetts Institute of Technology	2010
Bernard Mares	Massachusetts Institute of Technology	2010
Timothy Nguyen	Massachusetts Institute of Technology	2011
Steven Sivek	Massachusetts Institute of Technology	2011
Tirasan Khandawit	Massachusetts Institute of Technology	2013
Lucas Culler	Massachusetts Institute of Technology	2014

Invited Lectures (Incomplete List):

"A local Mayer-Vietoris Principle for Yang-Mills Moduli Spaces" and "Non-Complex Irreducible Four Manifolds", Topology of Four Manifolds Conference, McMaster University, Hamilton Ontario Canada, July 1990.

"Embedded Surfaces in Four-Manifolds" Michigan Topology Conference, Michigan State University, East Lasing Michigan, May 1991.

"Embedded Surfaces in Four-Manifolds," Meeting of the Western Section of the American Mathematical Society Los Angeles CA, November 1991.

Southern California Topology Conference, California Insitute of Technology, Pasadena CA, March 7, 1992.

"Spectral Flow and the Maslov Index," Taniguchi symposium on the geometry and topology of low dimensional manifolds. Kyoto Japan, January 8-13 1993.

"The Structure of Donaldson's Polynomial Invariants," Georgia Topology Conference, Athens Georgia, July 1993.

"The Structure of Donaldson's Polynomial Invariants," 1994 International Congress of Mathematicians, 45 minute invited address in the geometry section. Zurich Switzerland, August 3-11, 1994.

"The Thom Conjecture," Southern California Topology Colloquium at UCLA. Los Angeles CA, December 10 1994.

"The Seiberg-Witten Invariants and the Topology of Embedded Surfaces in Four-Manifolds," Conference on the mathematical developements stemming from the Seiberg-Witten invariants. Princeton NJ, February 12-13 1995.

"The Seiberg-Witten Invariants and the Topology of Embedded Surfaces in four-manifolds," Tenth Annual Geometry Conference. Stony Brook NY, April 29-30 1995.

"The Seiberg-Witten Invariants and the Topology of Embedded Surfaces in Four-Manifolds," The Arbeitstagung, Max Planck Institute for Mathematics. Bonn Germany, June 14-20 1995.

"The Seiberg-Witten Invariants and the Differential Topology of Four-Manifolds," NATO advanced study institute on gauge theory and symplectic geometry. Montral, Canada July 1-15 1995.

"Gauge Theory and Low Dimensional Topology: Past, Present and Future," Marston Morse Lectures at the Institute of Advanced Studies, Princeton, NJ March 28,29 and April 1,1999.

Distinguished Visiting Professor Lecture Series at Stanford University, January 2000.

"What is Floer homology and what is it good for? " New York University Colloquium, New York NY, November 20, 2004.

"Floer's homology groups, Witten's conjecture and three manifold topology" University of Pennsylvania Colloquium, Philadelphia CA, Jan 21, 2004.

"Gabai + (Thurston-Eliashberg) + Witten + (Feehan-Leness) + Floer + Giroux + Eliashberg = Property P" Rutgers University Colloquium, New Brunswick NJ, March 21, 2004

"From foliations of three manifolds to representations of their fundamental groups", Princeton University Colloquium, Princeton NJ April 7, 2004.

"Floer's Instanton Homology and Representations of Three Manifold Fundamental Groups" and "Witten's Conjecture and Property P", Joseph Fels Ritt Lectures at Columbia University, April 15 and 16 2004.

23rd Friends of Mathematics Lecture at Kansas State University, April 2005.

"Progress and Prospects in Floer Homology for 3-manifolds," The Seventh Andrzej Jankowski Memorial Lecture. Kraków Poland, June 27 2005.

"What do we know about four dimensional manifolds?" McGill University Colloquium. Montreal Cananda March 9, 2007.

"Reflections on Homological Invariants for Knots," Address, Joint Polish Mathematical Society-American Mathematical Society meeting , Warsaw Poland, August 1, 2007 .

"Reflections on Homological Invariants for Knots," University of Michigan Colloquium, Dec 4, 2007.

"Reflections on Homological Invariants for Knots," Michigan State University Colloquium, Dec 6th, 2007

"Instanton Invariants for Knots," Viro 60th Birthday Conference. Mittag Leffler Institute, Stockholm Sweden, May 24th 2008.

"Knots, Sutured Manifolds and Instantons," University of Indiana Colloquium. Bloomington Indian, Jan 23, 2009.

"Knots, 3-manifolds and Gauge Theories," University of Massachusetts, Amherst Colloquium. Amherst MA, April 19 2009.

"Knots, 3-manifolds and gauge theories", Kuwait Foundation Lectures, Department of Pure Mathematics and Mathematical Statistics, Cambridge University, Cambridge England, March 3, 2009.

"Khovanov Homology is an Unknot Detector I & II", MSRI, Berkeley CA, February 16 &19, 2010.

"How to Detect Unknottedness using Instantons and Khovanov Homology", MSRI Evans Lecture Series, UC Berkeley, Berkeley CA, February 22, 2010.

"Knot theory as seen by Geometry, Physics and Algebra.", Dipartimento di Matematica e Informatica, Universita' di Trieste, Trieste Italy, 7 July 2011.

"Knots and Instanton Floer Theory." ICTP, Treiste Italy, 13 July 2011.

"Instantons, Knots and Khovanov", 1 week lecture course at Centre for Quantum Geometry of Moduli Spaces, Aahrus University, Aarhus Denmark, August 1-5, 2011.

"Instantons and their impact in low dimensional topology", Graduate student lecture, Texas Geometry and Topology Conference at the University of Houston, February 17-19, 2012.

"Instanton Floer homology for trivalent graphs." Texas Geometry and Topology Conference at the University of Houston, February 17-19, 2012.

Publications

Books

1. Morgan, J. W., T. Mrowka, and D. Ruberman (1994). *The L^2-moduli space and a vanishing theorem for Donaldson polynomial invariants*. Monographs in Geometry and Topology, II. Cambridge, MA: International Press, pp. ii+222.
2. Kronheimer, P. and T. Mrowka (2007). *Monopoles and three-manifolds*. Vol. 10. New Mathematical Monographs. Cambridge: Cambridge University Press, pp. xii+796. http://dx.doi.org/10.1017/CBO9780511543111.

Refereed research papers

1. Mrowka, T. (1985). A short proof of the Birkhoff-Smale theorem. *Proc. Amer. Math. Soc.* **93**(2), 377–378.
2. Morgan, J. W. and T. S. Mrowka (1992). A note on Donaldson's polynomial invariants. *Internat. Math. Res. Notices* (10), 223–230.
3. Gompf, R. E. and T. S. Mrowka (1993). Irreducible 4-manifolds need not be complex. *Ann. of Math. (2)* **138**(1), 61–111.
4. Kronheimer, P. B. and T. S. Mrowka (1993). Gauge theory for embedded surfaces. I. *Topology* **32**(4), 773–826.
5. Morgan, J. W. and T. S. Mrowka (1993). On the diffeomorphism classification of regular elliptic surfaces. *Internat. Math. Res. Notices* (6), 183–184.
6. Kronheimer, P. B. and T. S. Mrowka (1994). Recurrence relations and asymptotics for four-manifold invariants. *Bull. Amer. Math. Soc. (N.S.)* **30**(2), 215–221.
7. Kronheimer, P. B. and T. S. Mrowka (1994). The genus of embedded surfaces in the projective plane. *Math. Res. Lett.* **1**(6), 797–808.
8. Akbulut, S., T. Mrowka, and Y. Ruan (1995). Torsion classes and a universal constraint on Donaldson invariants for odd manifolds. *Trans. Amer. Math. Soc.* **347**(1), 63–76.
9. Kronheimer, P. B. and T. S. Mrowka (1995). Embedded surfaces and the structure of Donaldson's polynomial invariants. *J. Differential Geom.* **41**(3), 573–734.

10. Kronheimer, P. B. and T. S. Mrowka (1995). Gauge theory for embedded surfaces. II. *Topology* **34**(1), 37–97.

11. Morgan, J. W. and T. S. Mrowka (1995). "The smooth classification of elliptic surfaces". In: *Geometry, topology, & physics*. Conf. Proc. Lecture Notes Geom. Topology, IV. Int. Press, Cambridge, MA, pp.246–292.

12. Kronheimer, P. B. and T. S. Mrowka (1997). Monopoles and contact structures. *Invent. Math.* **130**(2), 209–255.

13. Kronheimer, P. B. and T. S. Mrowka (1997). Scalar curvature and the Thurston norm. *Math. Res. Lett.* **4**(6), 931–937.

14. Morgan, J. W., T. S. Mrowka, and Z. Szabó (1997). Product formulas along T^3 for Seiberg-Witten invariants. *Math. Res. Lett.* **4**(6), 915–929.

15. Mrowka, T., P. Ozsváth, and B. Yu (1997). Seiberg-Witten monopoles on Seifert fibered spaces. *Comm. Anal. Geom.* **5**(4), 685–791.

16. Feehan, P. M. N., P. B. Kronheimer, T. G. Leness, and T. S. Mrowka (1999). PU(2) monopoles and a conjecture of Mariño, Moore, and Peradze. *Math. Res. Lett.* **6**(2), 169–182.

17. Kronheimer, P. B. and T. S. Mrowka (2004). Witten's conjecture and property P. *Geom. Topol.* **8**, 295–310 (electronic).

18. Mrowka, T. and Y. Rollin (2006). Legendrian knots and monopoles. *Algebr. Geom. Topol.* **6**, 1–69 (electronic).

19. Kronheimer, P., T. Mrowka, P. Ozsváth, and Z. Szabó (2007). Monopoles and lens space surgeries. *Ann. of Math. (2)* **165**(2), 457–546.

20. Kronheimer, P. and T. Mrowka (2010). Instanton Floer homology and the Alexander polynomial. *Algebr. Geom. Topol.* **10**(3), 1715–1738.

21. Kronheimer, P. and T. Mrowka (2010). Knots, sutures, and excision. *J. Differential Geom.* **84**(2), 301–364.

22. Mrowka, T. S. and K. Wehrheim (2010). L^2-topology and Lagrangians in the space of connections over a Riemann surface. *Geom. Funct. Anal.* **20**(5), 1278–1305.

23. Kronheimer, P. B. and T. S. Mrowka (2011). Khovanov homology is an unknot-detector. *Publ. Math. Inst. Hautes Études Sci.* (113), 97–208.

24. Kronheimer, P. B. and T. S. Mrowka (2011). Knot homology groups from instantons. *Journal of Topology* **4**(4), 835–918. eprint: `http://jtopol.oxfordjournals.org/content/4/4/835.full.pdf+html`.

25. Kronheimer, P. B. and T. S. Mrowka (2013). Gauge theory and Rasmussen's invariant. *Journal of Topology* **6**(3), 659–674. eprint: `http://jtopol.oxfordjournals.org/content/6/3/659.full.pdf+html`.

26. Kronheimer, P. and T. Mrowka (2014). Filtrations on instanton homology. *Quantum Topol.* **5**(1), 61–97.

27. Mrowka, T., D. Ruberman, and N. Saveliev (2014). Index theory of the de Rham complex on manifolds with periodic ends. *Algebr. Geom. Topol.* **14**(6), 3689–3700.