

NATHAN C. GEER

CURRICULUM VITAE

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Mathematics & Statistics
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Citizenship: United States

Education.

UNIVERSITY OF OREGON, EUGENE, Ph.D., Mathematics June 2004
Advisor: Professor Arkady Vaintrob
COLORADO STATE UNIVERSITY, FORT COLLINS, B.S. in Mathematics June 1998

Academic Positions.

Associate Professor, Utah State University August 2015 – Present
Assistant Professor, Utah State University August 2009 – July 2015
Member, Max-Planck Institute for Mathematics, Bonn, Germany August 2008 – July 2009
VIGRE Postdoctoral Fellow, Georgia Institute of Technology August 2004 – July 2008
Graduate Teaching Fellow, University of Oregon August 1998 - June 2004

Invited Research Positions (1 month or longer stays*).

Max-Planck Institute for Mathematics, Bonn, Germany August - September 2015
Paris VII, Jussieu, Paris, France May 2014
Erwin-Schrödinger Institute, Vienna, Austria, (*3 weeks) March 2014
Pisa University, Pisa, Italy (*2 weeks) June 2012
Paris VII, Jussieu, Paris, France April 2012
CTQM, Aarhus University, Aarhus, Denmark June - July 2011
Geneva University, Geneva, Switzerland July 2008 and June 2009
Institut de Recherche Mathématique Avancée, Strasbourg, France May - June 2007
Universit de Bretagne Sud, Vannes, France July 2007 and May 2011

Research Interests. Low Dimensional Topology, Representation Theory and Mathematical Physics.

Research Grants (Principal Investigator).

NSF CAREER Grant DMS-1452093 Sept. 2015 - Aug. 2020
NSF Research Grant DMS-1308196 June 2013 - May 2016
NSF Research Grant DMS-1007197 July 2010 - July 2013
NSF Research Grant DMS-0706725 July 2007 - July 2010

Other Grants and Awards.

CNRS Directeur de Recherches, Paris October-December 2015
Japan Society for the Promotion of Science (JSPS) Research Fellowship December 2015
College of Science Researcher of the Year. Utah State University. January 2013

<i>NSF Conference Grant DMS-1202922</i> , CO-PI with J. Purcell of BYU	May 2012
<i>Thank a Teacher Certificate</i> . Georgia Institute of Technology.	March 2008
<i>AMS/NSF Travel Research Grant</i> , ICM, Madrid, Spain	August 2006

Accepted and Published Research Papers.

- [1] *The Kontsevich integral and quantized Lie superalgebras*, *Algebr. Geom. Topol.* **5** (2005), no. 45, 1111–1139.
- [2] *The Etingof-Kazhdan quantization of Lie superbialgebras*, *Adv. Math.* **207** (2006), no. 1, 1–38.
- [3] (with B. Patureau-Mirand) *Multivariable link invariants arising from $\mathfrak{sl}(2|1)$ and the Alexander polynomial*, *J. Pure Appl. Algebra* **210** (2007), no. 1, 283–298.
- [4] *Some remarks on quantized Lie superalgebras of classical type*, *J. Algebra* **314** (2007) no. 2, 565–580.
- [5] (with P. Etingof) *Monodromy of the trigonometric KZ equations*, *Int. Math. Res. Not. IMRN* (2007), no. 24.
- [6] (with B. Patureau-Mirand) *On the colored HOMFLY-PT, multivariable and Kashaev link invariants*, *Commun. Contemp. Math.* **10** (2008), suppl. 1, 993–1011.
- [7] (with B. Patureau-Mirand) *An invariant supertrace for the category of representations of Lie superalgebras of type I*, *Pacific J. Math.* **238** (2008), no. 2, 331–348.
- [8] (with B. Enriquez) *Compatibility of quantization functors of Lie bialgebras with duality and doubling operations*, *Selecta Math. (N.S.)* **15** (2009), no. 1, 1–59.
- [9] (with B. Patureau-Mirand and V. Turaev) *Modified quantum dimensions and re-normalized link invariants*, *Compos. Math.* **145** (2009), no. 1, 196–212.
- [10] (with N. Reshetikhin) *On Invariants of Graphs Related to Quantum $\mathfrak{sl}(2)$ at Roots of Unity*, *Letters in Mathematical Physics.* **88** (2009), no. 1-3, 321–331
- [11] (with B. Patureau-Mirand) *Multivariable link invariants arising from Lie superalgebras of type I*, *J. Knot Theory Ramifications* **19** (2010), no. 1, 93–115.
- [12] (with J. Kujawa and B. Patureau-Mirand) *Generalized trace and modified dimension functions on ribbon categories*, *Selecta Math. (N.S.)* **17** (2011), no. 2, 453–504.
- [13] (with B. Patureau-Mirand) *Polynomial $6j$ -Symbols and States Sums*, *Algebraic & Geometric Topology* **11** (2011) 1821–1860.
- [14] (with B. Patureau-Mirand and V. Turaev) *Modified $6j$ -Symbols and 3-Manifold Invariants*, *Advances in Mathematics*, **228** (2011), no. 2, 1163–1202.
- [15] (with R. Kashaev and V. Turaev) *Tetrahedral forms in monoidal categories and 3-manifold invariants*, *J. Reine Angew. Math. (Crelle’s Journal)* **673** (2012), 69–123.
- [16] (with B. Patureau-Mirand and A. Virelizier) *Traces on ideals in pivotal categories*, *Quantum Topology* **4** (2013), no. 1, 91–124.
- [17] (with J. Kujawa and B. Patureau-Mirand) *Ambidextrous objects and trace functions for non-semisimple categories*, *Proceedings of the American Mathematical Society* **141** (2013), no. 9, 2963–2978.
- [18] (with B. Patureau-Mirand) *G-links invariants, Markov traces and the semi-cyclic $U_q(\mathfrak{sl}_2)$ -modules*, *Journal of Knot Theory and Its Ramifications* **22** (2013), no. 11.
- [19] (with B. Patureau-Mirand) *Topological invariants from non-restricted quantum groups*, *Algebraic and Geometric Topology* **13** (2013), no. 6, 3305–3363.
- [20] *The Kontsevich integral and re-normalized link invariants arising from Lie superalgebra*, *Knots in Poland. III. Part 1*, 79–84, *Banach Center Publ.*, 100, Polish Acad. Sci. Inst. Math., Warsaw, 2014.

- [21] (with F. Costantino and B. Patureau-Mirand) *Quantum invariants of 3-manifolds via link surgery presentations and non-semi-simple categories*, accepted for publication in Journal of Topology.
- [22] (with F. Costantino and B. Patureau-Mirand) *Some remarks on the unrolled quantum group of $sl(2)$* , accepted for publication in Journal of Pure and Applied Algebra.
- [23] (with F. Costantino and B. Patureau-Mirand) *Relations between Witten-Reshetikhin-Turaev and non semi-simple $sl(2)$ 3-manifold invariants*, accepted for publication in Algebraic & Geometric Topology

Submitted papers.

- [24] (with C. Blanchet, F. Costantino and B. Patureau-Mirand) *Non semi-simple TQFTs, Reidemeister torsion and Kashaev's invariants*, arXiv:1404.7289.
- [25] (with C. Blanchet, F. Costantino and B. Patureau-Mirand) *Non semi-simple $sl(2)$ quantum invariants, spin case*, arXiv:1405.3490.
- [26] (with Y. Hu and Y. Wu) *Full Dyon Excitation Spectrum in Generalized Levin-Wen Models*, arXiv:1502.03433.

Preprints.

- [27] (with C. Blanchet, B. Patureau-Mirand, and N. Reshetikhin) *Holonomic ribbon categories, biracks and their link invariants*, In preparation.
- [28] (with Y. Hu and Y. Wu) *2D model for symmetry enriched topological phases*, In preparation.

Invited Lectures Series.

Renormalized Quantum Invariants and Categorification Workshop Engelberg, Switzerland (4 hours)	September 2015
Quantum Algebra and Topology Workshop Pisa University, Pisa, Italy (3 hours)	June 2012
Workshop on Quantum Invariants from non-semi-simple categories. Institute of Mathaematics de Jussieu, Pairs, France (3 hours, with B. Patureau)	April 2012
Volume Conjecture, Invariants and geometry of knots Waseda University, Tokyo, Japan (3 hours)	January 2010
Representation of $U_q(\mathfrak{sl}(2))$ and the Alexander invariant Institut Fourier Grenoble, France (3 hours)	December 2008

Invited Conference Lectures.

Quantum Topology, Euler Institute, St. Petersburg, Russia	July, 2015
Categorification in Algebra, Geometry and Physics, Cargese Corsica, France	May, 2015
Modern trends in topological quantum field theory, ESI, Vienna, Austria	March, 2014
Wasatch Topology Conference, Park City, UT	August, 2013
Spring School in Geometry and Quantum Topology, Les Diablerets, Switzerland	March, 2011
FRG-Chern-Simons Workshop, Berkeley, CA	January, 2011
Quantum Geometry and Topology, Luminy, France	July, 2010
AMS Sectional Meeting, St. Paul, MN	April, 2010

MAA Sectional Meeting, Logan, UT	March, 2010
Lie Groups and Moduli Spaces, Geneva, Switzerland	June 2009
Cascade Topology Seminar, Boise, Idaho	October 2007
International Conference on Quantum Topology, Ha-Noi, Vietnam	August 2007
International Congress of Mathematicians, Madrid, Spain	August 2006
Pure Mathematics Symposium, University of Zurich, Switzerland	June 2006
AMS National Meeting, San Antonio, TX	January 2006
Joint Meeting of AMS, DMV, and MG, Mainz, Germany	June 2005
Workshop on Representation Theory and Geometry, UC, Berkeley	May 2005
AMS National Meeting, Atlanta, GA	January 2005
AMS National Meeting, Phoenix, AZ	January 2004

Selected Recent Invited Colloquia and Seminar Lectures.

Universit de Toulouse, Topology Seminar	October, 2015
University of Utah, Commutative Algebra Seminar	October, 2014
Universit de Bretagne Sud, Vannes, France, Seminaire du LMAM	July 2014
Jussieu Institute of Mathematics, Paris, France, Topology Seminar	May 2014
Universit de Bretagne Sud, Vannes, France, Seminaire du LMAM	July 2013
University of Utah, Max Dehn Seminar	November, 2012
Universit de Bretagne Sud, Vannes, France, Seminaire du LMAM	March 2012
University of California, Berkeley, Geometry, Representations, And Some Physics	October 2011
University of Utah, Representation Theory Seminar	September, 2011
Georgia Institute of Technology, Geometry Topology Seminar	April, 2011
Utah State University, Colloquium	March 2011
University of Miami, Colloquium	February 2011
Boise State University, Topology Seminar	December 2010
University of Montpellier 2, Montpellier, France, Topology Seminar	July 2010
Brigham Young University, Topology Seminar	March 2010
Universit de Bretagne Sud, Vannes, France, Seminaire du LMAM	May 2009
Jussieu Institute of Mathematics, Paris, France, Topology Seminar	April 2009
University of Oxford, Oxford, UK, Representation Theory Seminar	February 2009
IRMA, Strasbourg, France, Seminaire Quantique	January 2009
University Bielefeld, Bielefeld, Germany, Oberseminar Eichtheorie und Topologie	November 2008
Max-Planck Institute for Mathematics, Bonn, Germany, Topic in Topology	October 2008
Max-Planck Institute for Mathematics, Bonn, Germany, MPI-Oberseminar	September 2008
University of Geneva, Geneva, Switzerland, Topology Seminar	July 2008

Microsoft research Station Q, Q-Seminar	June 2008
University of Georgia, Algebra Seminar	April 2008
University of Southern California, Geometry/Topology Seminar	April 2008
University of California, Riverside, Colloquium	November 2007
Indiana University, Topology Seminar	October 2007
University of California, Berkeley, Subfactor Seminar	October 2007
University of California, Davis, Geometry/Topology Seminar	October 2007
University of California, Santa Cruz, Algebra and Number Theory Seminar	October 2007
University of Oregon, Basic Notions Seminar	October 2007
Massachusetts Institute of Technology, Infinite-Dimensional Algebra Seminar	September 2007
University of Wisconsin-Madison, Lie Theory Seminar	September 2007
Universit de Bretagne Sud, Vannes, France, Seminaire du LMAM	July 2007
IRMA, Strasbourg, France, Seminaire Quantique	May 2007
Boise State University, Colloquium	March 2007
University of Calgary, Calgary, Canada, Colloquium	March 2007
University of Nantes, Nantes, France, Topology Seminar	April 2006
Jussieu Institute of Mathematics, Paris, France, Topology Seminar	April 2006
University of Oregon, Colloquium	March 2006
Emory University, Topology Seminar	February 2006
University of Georgia, Topology/Geometry Seminar	January 2006

Outreach/Conference Organization.

<i>Co-Organizer Moab Topology Conference</i> , Moab Utah. http://www.math.usu.edu/~geer/conference2015/	Spring 2015
<i>Co-Organizer Moab Topology Conference</i> , Moab Utah. http://www.math.usu.edu/~geer/conference/	Spring 2012
<i>Organizer of a research section for MAA conference</i> , Utah State University	Spring 2010
<i>Organizer of Topics in Topology</i> , Max-Planck Institute, Bonn, Germany	2008–2009
<i>Organizer of Geometry and Topology Seminar</i> , Georgia Institute of Technology	2005–2006
<i>Co-Organizer of Cascade Topology Seminar</i> , Eugene, Oregon	Fall 2003

Advising and Mentoring.

- (1) Ph.D. Advisor, Clinton Reece, current, Department of Mathematics, USU.
- (2) Ph.D. committee member, 2015, Jeffrey S Hazboun, Department of Physics, USU.
- (3) MS committee member 2015, Tom Apedaile, Department of Mathematics, USU.
- (4) Ph.D. committee member 2014, Juan Trujillo, Department of Physics, USU.

Utah State University Service.

- (1) Chair of Calculus Committee, Fall 2014 to Present.
- (2) Colloquium Committee, Fall 2010 to Present.
- (3) Faculty Search Committee, Fall 2013–Spring 2014.
- (4) Faculty Search Committee, Fall 2010–Spring 2011.
- (5) University New Faculty Panel, Fall 2010.
- (6) Calculus Text Book Committee, Fall 2009.

Teaching Experience. I have taught over twenty courses during my academic career as a graduate student at the University of Oregon and as a Postdoctoral Fellow at Georgia Institute of Technology. I have also taught twelve courses at Utah State University. In particular, I have been the lead instructor for the following classes:

Introduction to Modern Algebra	senior level course; topics include: Sylow theory for finite groups factorization theory for commutative rings, and Galois theory	Spring 2014, 2013 & 2011 USU
Introduction to Algebraic Structures	first course in theory of algebraic structures; topics include elementary group and ring theory	Fall 2010, Fall 2012: USU
Lie Algebras and Representation Theory	graduate course taught to PhD students; topics included: representations of Lie algebras, universal enveloping algebras of Lie algebras and the classification theorem for semi-simple Lie algebras	Fall 2006: GaTech
Ordinary Differential Equations	an introduction to the theory of ODEs, included linear systems of ODEs and power series solutions of ODEs	Spring 2002: UofO
Honors Calculus	calculus for students in the Honors Program	Fall 2011: USU
Calculus (all levels)	taught all levels of calculus multiple times; was responsible for writing lesson plans, giving lectures, supervising TAs and graders, writing exams, determining grades and creating different activities for the class; class sizes ranged from 25 to 180	Fall 2000— present: USU, UofO, GaTech