

# Michael Brandenbursky

## PERSONAL DETAILS

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*Birth* July 12, 1976  
*Address* Department of Mathematics  
Ben Gurion University, Beer Sheva, 8410501 , Israel  
*E-Mail* [brandens@bgu.ac.il](mailto:brandens@bgu.ac.il)  
*Webpage* <https://www.math.bgu.ac.il/~brandens/>

## ACADEMIC APPOINTMENTS

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**Senior Lecturer with tenure** May 2018-present  
*Ben-Gurion University, Beer Sheva, Israel*

**Senior Lecturer** May 2017-April 2018  
*Ben-Gurion University, Beer Sheva, Israel*

**Lecturer** October 2015 - April 2017  
*Ben-Gurion University, Beer Sheva, Israel*

**Researcher, CRM/ISM Fellowship** January 2014 - October 2015  
*CRM, Montreal, Canada*

**Visiting Professor** May 2013 - January 2014  
*Max Planck Institute for Mathematics, Bonn, Germany*

**Assistant Professor (NTT)** August 2010 - August 2013  
*Vanderbilt University, Nashville TN, USA*

## SHORT TERM RESEARCH POSITIONS

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- University of Regensburg, Germany (July-September 2021)
- CRM, Canada (July-September 2019)
- University of Regensburg, Germany (August-September 2018)
- University of Regensburg, Germany (July-August 2017)
- University of Regensburg, Germany (August-September 2016)
- MFO, Germany (June-July 2015)
- IHES, France (May-June 2015)
- MFO, Germany (June 2014)
- MFO, Germany (April 2013)
- MFO, Germany (June-August 2012)
- University of Aberdeen, UK (May-August 2011)

## RESEARCH VISITS

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- IMPA, Brazil (August 2019)
- University of Ceara, Brazil (June 2019)
- University of Wroclaw, Poland (April 2019)
- University of Ceara, Brazil (February 2019)
- University of Aberdeen, UK (June 2018)
- University of Bochum, Germany (May 2018)
- University of Bonn, Germany (October 2017)
- IMPA, Brazil (September 2017)
- Universidad Nacional de Colombia, Medellin, Colombia (August 2016)
- University of Regensburg, Germany (February 2016)
- IMPA, Brazil (March 2015)
- Seoul National University, South Korea (October 2014)
- University of Nantes, France (November 2013)
- University of Aberdeen, UK (June 2013)
- University of Aberdeen, UK (May 2012)
- University of Chicago, USA (November 2011)
- University of Chicago, USA (April 2011)
- University of Chicago, USA (October 2009)
- MPI, Bonn, Germany (July 2008)

## EDUCATION

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<b>Ph.D. in Mathematics</b>	2006-2010
<i>Technion-Israel Institute of Technology, Haifa, Israel</i>	
Supervisors: Prof. Michael Entov and Prof. Michael Polyak	
Thesis Title: Knot invariants and their applications	
<b>M.Sc. in Mathematics</b>	2003-2005
<i>Hebrew University, Jerusalem, Israel</i>	
Supervisor: Prof. Emmanuel Farjoun	
Thesis Title: Compact Lie groups	
<b>B.A. in Mathematics &amp; Economics</b>	1999-2003
<i>Hebrew University, Jerusalem, Israel</i>	

## RESEARCH INTERESTS

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### Knot theory

*Finite-type invariants, concordance group, knot Floer and Khovanov homologies*

### Symplectic geometry and low-dimensional topology

*Groups of symplectic and Hamiltonian diffeomorphisms, Hamiltonian dynamics*

### Braid groups, mapping class groups, groups of diffeomorphisms

*Entropy, quasi-morphisms, group cohomology, norms, metrics, distortion, orders*

### Geometric group theory

*Quasi-isometric embeddings of groups, invariant word metrics*

### Algebraic geometry

*Lipschitz geometry of singularities*

## GRANTS

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- Co-PI, Leverhulme Trust Grant RPG-2017-159, (232793 GBP) 2017-2021
- PI, GIF-Young Grant I-2419-304.6/2016, (26000 Euro) 2017
- PI, ESF Grant #4824, (2000 Euro) Hamiltonian actions of discrete groups, CAST Network, 2012

## ACADEMIC AWARDS

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- Humboldt research fellowship, Germany, May 2021-October 2023
- Simons CRM Scholar, Canada, July 2019-September 2019
- Mittag-Leffler fellowship, Sweden, November 2015 (declined)
- CRM-ISM fellowship, Canada, January 2014-October 2015
- Oberwolfach Leibniz fellowship (twice), Germany, June-August 2012, April 2013, May 2014, June-July 2015
- Coleman-Cohen fellowship, UK, May-August 2011

## OTHER AWARDS

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- Second prize, Moscow mathematical Olympiad 1989

## PUBLICATIONS

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1. Michael Brandenbursky and Egor Shelukhin. On the entropy norm on  $Ham(S^2)$ . *to appear in Ann. Math. Québec*, 2020
2. Michael Brandenbursky and Jarek Kędra. Fragmentation norm and relative quasimorphisms. *to appear in Proc. Amer. Math. Soc.*, 2020

3. Michael Brandenbursky and Arpan Kabiraj. On the entropy norm on the group of diffeomorphisms of closed oriented surface. *J. Topol. Anal.*, 12(1):105–111, 2020
4. Michael Brandenbursky and Michał Marcinkowski. Entropy and quasimorphisms. *J. Mod. Dyn.*, 15:143–163, 2019
5. Michael Brandenbursky and Michał Marcinkowski. Aut-invariant norms and Aut-invariant quasimorphisms on free and surface groups. *Comment. Math. Helv.*, 94(4):661–687, 2019
6. Michael Brandenbursky, Jarek Kedra, and Egor Shelukhin. On the autonomous norm on the group of Hamiltonian diffeomorphisms of the torus. *Commun. Contemp. Math.*, 20(2):1750042, 27, 2018
7. Michael Brandenbursky and Egor Shelukhin. The  $L^p$ -diameter of the group of area-preserving diffeomorphisms of  $S^2$ . *Geom. Topol.*, 21(6):3785–3810, 2017
8. Michael Brandenbursky and Jarek Kędra. The autonomous norm on  $Ham(\mathbf{R}^{2n})$  is bounded. *Ann. Math. Québec*, 41:63–65, 2017
9. Michael Brandenbursky. Concordance of certain 3-braids and Gauss diagrams. *Topology Appl.*, 214:180–185, 2016
10. Michael Brandenbursky, Światosław R. Gal, Jarek Kędra, and Michał Marcinkowski. The cancellation norm and the geometry of bi-invariant word metrics. *Glasg. Math. J.*, 58(1):153–176, 2016
11. Michael Brandenbursky and Egor Shelukhin. On the  $L^p$ -geometry of autonomous Hamiltonian diffeomorphisms of surfaces. *Math. Res. Lett.*, 22(5):1275–1294, 2015
12. Michael Brandenbursky and Jarek Kędra. Concordance group and stable commutator length in braid groups. *Algebr. Geom. Topol.*, 15(5):2861–2886, 2015
13. Michael Brandenbursky. Bi-invariant metrics and quasi-morphisms on groups of Hamiltonian diffeomorphisms of surfaces. *Internat. J. Math.*, 26(9):1550066, 29 pages, 2015
14. Michael Brandenbursky. Link invariants via counting surfaces. *Geom. Dedicata*, 173:243–270, 2014
15. Michael Brandenbursky. Coloring link diagrams and Conway-type polynomial of braids. *Topology Appl.*, 161:141–158, 2014
16. Michael Brandenbursky and Jarek Kedra. Quasi-isometric embeddings into diffeomorphism groups. *Groups Geom. Dyn.*, 7(3):523–534, 2013
17. Michael Brandenbursky. Invariants of closed braids via counting surfaces. *J. Knot Theory Ramifications*, 22(3):1350011, 21 pages, 2013
18. Michael Brandenbursky and Jarek Kedra. On the autonomous metric on the group of area-preserving diffeomorphisms of the 2-disc. *Algebr. Geom. Topol.*, 13(2):795–816, 2013
19. Michael Brandenbursky. Quasi-morphisms and  $L^p$ -metrics on groups of volume-preserving diffeomorphisms. *J. Topol. Anal.*, 4(2):255–270, 2012
20. Michael Brandenbursky. On quasi-morphisms from knot and braid invariants. *J. Knot Theory Ramifications*, 20(10):1397–1417, 2011

### Papers in conference proceedings

1. Michael Brandenbursky and Egor Shelukhin. On the large scale geometry of the  $L^p$ -metric on the symplectomorphism group of the two-sphere. *IHES Preprints, IHES/M/15/09*
2. Michael Brandenbursky. On the autonomous metric on groups of Hamiltonian diffeomorphisms of closed hyperbolic surfaces. *Oberwolfach Preprints, OWP 2013-18*

### Submitted

- Lev Birbrair, Michael Brandenbursky, and Andrei Gabrielov. Lipschitz geometry of surface germs in  $\mathbb{R}^4$ : metric knots. *arXiv:2009.13920*
- Michael Brandenbursky and Michal Marcinkowski. Bounded cohomology of transformation groups. *arXiv:1902.11067*

## TEACHING EXPERIENCE

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### Instructor, Ben-Gurion University

- Topics in geometry and topology, Fall 2020
- Single-variable calculus for electrical engineering, Fall 2020
- Single-variable calculus for electrical engineering, Fall 2019
- Workshop for math majors, Fall 2019
- Reading course on "Cohomology theories", Spring 2019
- Single-variable calculus for electrical engineering, Fall 2018
- Workshop for math majors, Fall 2018
- Topics in geometry and topology, Fall 2017
- Single-variable calculus for electrical engineering, Fall 2017
- Differential geometry, Spring 2017
- Single-variable calculus for electrical engineering, Fall 2016
- Linear algebra for mechanical engineering, Fall 2016
- Multi-variable calculus for mechanical engineering, Spring 2016
- Algebraic structures, Fall 2015

### Instructor, McGill University

- Linear algebra and geometry, Fall 2014
- Multi-variable calculus 3, Fall 2014
- Single-variable calculus 2, Fall and Summer 2014

### Instructor, Vanderbilt University

- Single-variable calculus, Fall 2011 and Spring 2012
- Multi-variable calculus, Spring 2011 and Spring 2013
- Advanced multi-variable calculus, Fall 2012

## **SUPERVISION OF POSTDOCTORAL FELLOWS**

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- Dr. Arpan Kabiraj, 2017-2018
- Dr. Michal Marcinkowski, 2017

## **M.SC. STUDENTS**

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- Rishi Kumar, 2019-2020

## **LECTURE SERIES**

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- **Quasi-morphisms and bi-invariant metrics in algebra and geometry**-3 lectures, Sde Boker, Israel, February 2019
- **Entropy, metrics and quasi-morphisms**-3 lectures, Aberdeen University, UK, June 2018
- **Knots, braids and quasi-morphisms**-3 lectures, University of Regensburg, Germany, July 2017
- **Quasi-morphisms in algebra and geometry**-3 lectures, McGill University, Canada, March 2015
- **Quasi-morphisms and applications**-3 lectures, Seoul National University, South Korea, October 2014

## **TALKS IN CONFERENCES AND COLLOQUIUMS**

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- Simplicial volumes and bounded cohomology, Germany, September 2020
- Manifolds and groups, Germany, February 2020
- Conservative Dynamics and Symplectic Geometry, Brazil, August 2019
- Cohomological methods, Poland, April 2019
- IMU-PMS Meeting, Poland, September 2018
- Bochum-Cologne-Munster seminar, Germany, May 2018
- Colloquium, Hebrew University, Israel, November 2017
- IMU Meeting, Israel, May 2017
- Colloquium, Universidad Nacional de Colombia, Medellin, August 2016
- Colloquium, Universidad de los Andes, Colombia, August 2016
- Encuentro de Topologia, Geometria y Teoria de Representaciones, Colombia, July 2016
- Joint International Meeting of MMS and IMU, Mexico, September 2015
- Joint International Meeting of AMS and IMU, Israel, June 2014
- Algebraic Structures in Low-dimensional Topology, Germany, May 2014

- AMS Sectional Meeting, USA, March 2014
- Colloquium, University of Hawaii, USA, February 2014
- Colloquium, University of Iowa, USA, January 2014
- Colloquium, University of Haifa, Israel, December 2013
- Colloquium, Ben-Gurion University, Israel, December 2013
- Colloquium, University of Cologne, Germany, November 2013
- Colloquium, Gottingen University, Germany, November 2013
- Colloquium, Groningen University, Netherlands, September 2013
- Knots, Manifolds, and Group Actions, Poland, September 2013.
- Rolfsenfest-Low Dimensional Topology, Knots, and Orderable Groups, CIRM, France, July 2013
- Colloquium, Heriot-Watt University, UK, May 2013
- Mapping Class Groups and Categorification, Canada, April 2013
- Colloquium, University of Manitoba, Canada, February 2013
- Geometric Groups on the Gulf Coast, USA, April 2012
- Spring Topology and Dynamics Conference, Mexico, March 2012
- Knots in Washington, USA, December 2011
- Research School and Workshop on Braids, Vietnam, January 2011
- Knots in Washington, USA, December 2010
- Geometric Group Theory, Hyperbolic Dynamics and Symplectic Geometry, Germany, July 2010
- Summer school on link homology, France, July 2009

## **TALKS IN SEMINARS**

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- University of Illinois at Chicago, USA, September 2019
- University of Toronto, Canada, September 2019
- McGill University, Canada, September 2019
- UQAM, Canada, September 2019
- University of Ceara, Brazil, June 2019
- Wroclaw University, Poland, April 2019
- Tel Aviv University, Israel, March 2019
- Aberdeen University, UK, June 2018
- Tel Aviv University, Israel, May 2018

- Technion, Israel, December 2017
- BGU, Israel, November 2017
- IMPA, Brazil, September 2017
- University of Haifa, Israel, June 2017
- University of Regensburg, Germany, September 2016
- Tel Aviv University, Israel, April 2016
- Technion, Israel, November 2015
- Lille University, France, May 2015
- MIT, USA, May 2015
- Tulane University, USA, April 2015
- IMPA, Brazil, March 2015
- McGill University, Canada, November 2014 and February 2014
- CAIST, South Korea, October 2014
- Syracuse University, USA, April 2014
- Universite du Quebec a Montreal, Canada, mini-course, March 2014
- Universite de Montreal, March 2014
- MPIM, Bonn, January 2014
- University of Nantes, France, mini-course, November 2013
- Universite Paris 7, France, November 2013
- University of Cologne, Germany, October 2013
- University of Virginia, USA, April 2013
- University of Haifa, Israel, December 2012 and May 2012
- Universite du Quebec a Montreal, Canada, November 2012
- University of Illinois at Chicago, USA, October 2012 and October 2009
- Vanderbilt University, USA, October 2012, September 2011 and September 2010
- Aberdeen University, UK, May 2012
- Hebrew University, Israel, May 2012
- University of Chicago, USA, November 2011, April 2011 and October 2009
- Vanderbilt University, USA, mini-course, October 2011
- Caltech, USA, October 2009
- University of Indiana at Bloomington, USA, October 2009
- Columbia University, USA, October 2009
- SUNY at Stony Brook, USA, September 2009
- Technion, Israel, mini-course, July 2008



## **ORGANIZATION OF CONFERENCES**

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- Workshop on Complex and Symplectic geometry, BGU, May 2018
- Geometry and Topology section of the Israeli Mathematical Union annual meeting, June 2016

## **ACADEMIC SERVICES**

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- Referee for Geometry & Topology, International Journal of Algebra and Computation, Journal of Topology and Analysis, Annales mathématiques du Québec
- Ph.D. thesis evaluation of Mr. Roque Marqueza-doctoral student at Cinvestav, Mexico, November 2017
- Member of departmental hiring committee, 2018-2019
- Colloquium organizer in BGU, 2017-present
- Member of Israeli mathematical union, 2015-present

## **MISCELANEOUS**

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- **Languages:** Russian (Native), Hebrew (Native), English (fluent), Spanish (fluent), German (basic)