

# Marina Prokhorova

## Curriculum Vitae

### Personal Data

Born: Sverdlovsk (now Yekaterinburg), Russia, USSR. Maiden name: Marina Lev  
 Citizenship: Russian; Israeli (from 09/2016)  
 Address: Mathematics Department, Technion, Haifa, 32000, Israel  
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### Current Research Interests

Global analysis, index theory, elliptic operators and elliptic boundary value problems, topology, mathematical physics

### Academic Positions

10/2020 - now Postdoc at the Department of Mathematics, Technion – Israel Institute of Technology

#### Previous positions in Yekaterinburg, Russia:

09/2009 – Senior Researcher (part-time) at the Ural Federal University  
 09/2016  
 03/2008 – Senior Researcher at Algebra and Topology Department  
 09/2016 (Institute of Mathematics and Mechanics of Ural Branch of Russian Academy of Sciences)  
 11/1994 – Junior Researcher, Researcher, Senior Researcher at Department of Applied Problems  
 02/2008 (Institute of Mathematics and Mechanics of Ural Branch of Russian Academy of Sciences)

In 2016 I had to emigrate from Russia to Israel for personal reasons. Because of my professional isolation during my research career in Yekaterinburg (1994-2016), I did not have at that time a strong enough academic profile and a strong list of publications in high level international journals. This made getting a permanent position at a strong research university in Israel impossible at the time of my emigration, which led me to restart my professional career by receiving a second PhD degree, now in Pure Mathematics (my first PhD was in Applied Mathematics), at the Technion – Israel Institute of Technology.

### Education

10/2016 – **PhD Studies in Pure Mathematics**, Technion – Israel Institute of Technology  
 09/2020  
 Supervisor: Prof. Simeon Reich  
 Thesis: “Spectral Flow and Family Index for Self-Adjoint Elliptic Local Boundary Value Problems on Compact Surfaces”  
 Degree eligibility date: October 11, 2020.

05/1997 **PhD Degree**, Ural State University (now Ural Federal University), Yekaterinburg, Russia  
 Thesis: “Some Analytic Methods of Investigation of Nonlinear Boundary Problems of Mathematical Physics”

11/1990 – **PhD studies in Applied Mathematics**, Institute of Mathematics and Mechanics  
 10/1994 of Ural Branch of Russian Academy of Sciences, Yekaterinburg, Russia)  
 Supervisor: Prof. Anatoly Sidorov  
 (11/1990 – 10/1991: child care leave)

09/1984 – **MSc (Summa cum Laude) in Mathematics (specialization in Applied Mathematics)**,  
 06/1990 Ural State University (now Ural Federal University), Yekaterinburg, Russia  
 Supervisor: Dr. Valery Mansurov  
 Thesis: “Dendrite Growth in Overcooled Melt”  
 (09/1988 – 08/1989: child care leave)

## Visiting Positions

03–05/2016	Einstein Institute of Mathematics (The Hebrew University of Jerusalem, Israel)
10–11/2015	Einstein Institute of Mathematics (The Hebrew University of Jerusalem, Israel)
03/2014	Max Planck Institute for Mathematics (Bonn, Germany)
05–06/2013	Laboratory of Algebraic Geometry and its Applications (National Research University “Higher School of Economics”, Moscow, Russia)
04–06/2012	Laboratory of Algebraic Geometry and its Applications (National Research University “Higher School of Economics”, Moscow, Russia)
04/2011	Institute of Molecules and Materials (Radboud University, Netherlands)
03–04/2010	Max Planck Institute for Mathematics (Bonn, Germany)
10–11/2007	IHES (Bur-sur-Yvette, France)

## Invited Talks

2022	Conference “Noncommutative Analysis at the Technion” (Haifa, Israel)
2014	Conference “Geometric Structures and Spectral Invariants” (Berlin, Germany)

## Selected seminar talks

2023	Noncommutative Geometry Seminar (St Johns University, New York City, USA)
2020	Analysis and Geometry Seminar (Northeastern University, Boston, USA) GAMP/QMATH Seminar (University of Copenhagen, Denmark)
2019	Operator Algebras/Operator Theory Seminar (Ben Gurion University, Israel) Geometry and Topology Seminar (University of Haifa, Israel)
2015	Seminar of Laboratory of Algebraic Geometry and its Applications (National Research University “Higher School of Economics”, Moscow, Russia) Geometry and Topology Seminar (Weizmann Institute, Israel) Operator and System Theory Seminar (Ben Gurion University, Israel) Nonlinear Analysis and Optimization Seminar (Technion, Israel) Seminar on geometry and its applications (Hebrew University of Jerusalem, Israel)
2014	Mathematical Physics Seminar (Angers University, France)
2013	Colloquium of the Faculty of Mathematics (National Research University “Higher School of Economics”, Moscow, Russia)
2012	Seminar of Laboratory of Algebraic Geometry and its Applications (National Research University “Higher School of Economics”, Moscow, Russia)
2010	Seminar on Algebra, Geometry and Physics (Max Planck Institute, Bonn, Germany) Research seminar Global Analysis (University of Bonn, Germany) Mathematical Physics Seminar (Angers University, France) Theory of Condensed Matter Seminar (Radboud University, Netherlands) Geometry and Topology Seminar (Weizmann Institute, Israel) Nonlinear Analysis and Optimization Seminar (Technion, Israel)
2009	V.A. Rokhlin Topology Seminar (St. Petersburg, Russia)
2008	Seminar “Homological aspects of geometry of differential equations” (Moscow, Russia)

## Organization of International Conferences

- 2012 – 2016 International School-Conferences for young scientists (Yekaterinburg, Russia), member of the program committee and chair of the Topology and Geometry section.
- 2011 International School on Algebra and Algebraic Geometry (Yekaterinburg, Russia), organizer.
- 2011 International Conference on Algebra and Geometry (Yekaterinburg, Russia), member of the organizing committee.

## Supervising and Mentoring Activities

### MSc Student Advising (Ural Federal University):

- 01/2010 – 06/2011 Maxim Mornev (currently a SNSF Ambizione postdoc at EPFL, number theory)
- 09/2008 – 06/2011 Daniil Aizenshtein

### Supervising of learning seminars:

- 02/2008 – 11/2014 Algebraic Topology learning seminar (Inst. of Mathematics and Mechanics UrBr RAS)
- 03/2011 – 05/2012 Category Theory learning seminar (Ural Federal University)

## Teaching Experience

### MSc courses (Ural Federal University):

- 09/2013 – 05/2014 Differential topology (one-year course)
- 09/2009 – 06/2011 Algebraic geometry (two-year course)

### Mini-courses (5-6 hours):

#### International School-Conference for young scientists (Yekaterinburg, Russia):

- 01/2016 Poncelet's porism and elliptic curves
- 01/2015 K-theory: topology, analysis, algebra

#### The Summer School "Contemporary Mathematics" (Dubna, Russia):

- 07/2014 Nonstandard analysis
- 07/2013 Smooth manifolds and homotopy groups of spheres
- 07/2011 Eight faces of the Poincare homology 3-sphere
- 07/2010 3-dimensional manifolds

## Prizes and Awards

- 2021 The project proposal "Family Index and Spectral Flow" submitted under the Horizon 2020's Marie Skłodowska-Curie actions call H2020-MSCA-IF-2020 has been awarded a "Seal of Excellence" by the European Commission (scored 91.4 out of 100)
- 2002 Research Grant of the project "Young Scientists of Russia"
- 1997-1999 State Research Grant of Russian Federation for young scientists
- 1996, 2005 Results were included in the list of the best results of the Ural Branch of Russian Academy of Sciences
- 1996 The Prize of the Ural Mathematical Society
- 1987 First Prize of the All-USSR National Undergraduates Contest in Mathematics
- 1987 First Prize of the Ural Undergraduates Contest in Theoretical Mechanics
- 1988 First Prize of the Regional (Ural, Siberia and Far East) Undergraduates Contest in Computer Sciences
- 1983 First Prize of the All-USSR National High School Contest in Mathematics
- 1984 Second Prize of the All-USSR National High School Contest in Mathematics

**Published**

1. *Modeling of solutions of the heat equation and of the Stefan problem with dimension decrease.* Russian Academy of Sciences Doklady Mathematics 58 (1998), no.1, 88-90.
2. *On relative near-standardness in IST.* Siberian Mathematical Journal 39 (1998), no.3, 518–521.
3. *On the existence of factor sets by external equivalence relations in IST.* Siberian Mathematical Journal 43 (2002), no.4, 708-713.
4. *External sets properties in IST.* The Bulletin of Symbolic Logic. 8 (2002), Issue 1, 155-156.
5. *Heat equation on Riemann manifolds: morphisms and factorization to smaller dimension.* Proceedings of Institute of Mathematics of NAS of Ukraine, 43 (2002), 194–200.
6. (with M.I. Katsnelson) *Zero-energy states in corrugated bilayer graphene.* Physical Review B, 77 (2008), 205424; arXiv:0802.1409.
7. *Homeomorphism problems arising in the theory of grid generation.* Proceedings of the Steklov Institute of Mathematics 261 (2008), suppl. 1, S165–S182.
8. *Criteria of homeomorphism in the theory of grid generation.* Zh. Vychisl. Mat. i Mat. Fiz. 52 (2012), no.5, 878–882 (in Russian); arXiv:1504.01087 [math.GT] (English translation).
9. *The spectral flow for Dirac operators on compact planar domains with local boundary conditions.* Communications in Mathematical Physics, 322 (2013), no. 2, 385–414; arXiv:1108.0806.
10. *Factorization of the Reaction-Diffusion Equation, the Wave Equation, and Other Equations.* Proceedings of the Steklov Institute of Mathematics 287 (2014), suppl. 1, S156–S166.
11. *The structure of the category of parabolic equations. I.* CEUR Workshop Proceedings 1662 (2016), 121–133 (<http://ceur-ws.org/Vol-1662/top1.pdf>)
12. *The structure of the category of parabolic equations. II.* CEUR Workshop Proceedings 1662 (2016), 134–147 (<http://ceur-ws.org/Vol-1662/top2.pdf>)
13. *Self-adjoint local boundary problems on compact surfaces. I. Spectral flow.* Journal of Geometric Analysis, 31 (2021), no. 2, 1510–1554; arXiv:1703.06105.
14. *Self-adjoint local boundary problems on compact surfaces. II. Family index.* Journal of Noncommutative Geometry, 16 (2022), no. 4, 1213–1257; arXiv:1809.04353.

**Accepted for publication**

15. *Spectral sections.* Israel Journal of Mathematics, to appear; arXiv:2008.04672 [math.SP] (2020), 37 pp.

**Preprints**

16. *Spaces of unbounded Fredholm operators. I. Homotopy equivalences.* arXiv:2110.14359 [math.KT] (2021), 24 pp.
17. *The continuity properties of discrete-spectrum families of Fredholm operators.* arXiv:2201.09869 [math.FA] (2022), 4 pp.
18. *From graph to Riesz continuity.* arXiv:2202.03337 [math.DG] (2022), 20 pp.

1. *The shape of a growing dendrite.* Journal of Engineering Physics and Thermophysics 61 (1991), no. 5, 1394–1400.
2. *Self-similar solutions of the Stefan problem.* Journal of Engineering Physics and Thermophysics 63 (1992), no. 4, 1032–1036.
3. (with L.D. Zabezhinskii, V.V. Prokhorov, M.N. Mil'shtein, S.G. Stakheev) *Statement and personal-computer-aided realization of the conjugate problem of heat transfer in a power-technological boiler with a moving bed of dispersed heat-transfer agent.* Journal of Engineering Physics and Thermophysics 70 (1997), no. 5, 744–748.