

CURRICULUM VITAE

Full name: MICHAEL POLYAK
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EDUCATION

1988 - 1992 Tel-Aviv University, Israel. Ph.D. in mathematics. Submitted July 1992; date of award June 1993. Advisor: **Prof. M. Farber**
1980 - 1985 Moscow State University, Russia. M.Sci. in mathematics. Date of award June 1985. Advisor: **Acad. S. P. Novikov**

ACADEMIC APPOINTMENTS

2012 - present Technion (Israel Institute of Technology)
Department of Mathematics. Professor.
2001 - 2012 Technion (Israel Institute of Technology)
Department of Mathematics. Associate Professor.
2007 - 2008 Max-Planck-Institut für Mathematik, Germany
Visiting professor.
1997 - 2001 Tel-Aviv University
School of Mathematics. Senior Lecturer.
1996 - 1997 IHES, Bures-sur-Yvette, France
Visiting Professor.
1995 - 1996 Hebrew University of Jerusalem
Department of mathematics. Post-doc.
1994 - 1995 Max-Planck-Institut für Mathematik, Germany
Visiting professor.
1993 - 1994 University of California, Berkeley CA
Department of mathematics. Adj. Assistant Professor
1992 - 1993 University of California, Berkeley CA
Department of mathematics. Rotshild Research Fellow and
MSRI, Berkeley CA Member.
1988 - 1992 Tel-Aviv University, Israel
Department of mathematics. Tutor and Teaching Assistant

SHORT-TERM VISITING POSITIONS

- 2012, 2013 Max-Planck-Institut, Germany. Visiting professor.
- 2006 IHES, France. Visiting Professor.
- 2006 CTQM, Aarhus University, Denmark. Visiting Professor.
- 2006 University of Lyon, France. Visiting Professor.
- 2005 IHES, France. Visiting Professor.
- 2002 Max-Planck-Institut, Germany. Visiting Professor.
- 2002 University of Bourgogne, France. Visiting professor.
- 2001 RIMS, Kyoto, Japan Visiting professor.
- 2001 Max-Planck-Institut, Germany. Visiting professor.
- 2001 University of Strasbourg, France. Visiting professor.
- 2000 Newton Institute, Cambridge, UK. Visiting professor.
- 2000 University of Bourgogne, France. Visiting professor.
- 1999 Mittag-Leffler Institute, Sweden. Visiting professor.
- 1998 Uppsala University, Sweden. Visiting Professor.
- 1997 Max-Planck-Institut, Germany. Visiting professor.
- 1997 MSRI, Berkeley CA. Member.

PROFESSIONAL EXPERIENCE

- 1985 - 1987 State Oceanographical Institute, USSR
 Engineer. Statistics, numerical methods and computer simulation in hydrodynamics.

RESEARCH INTERESTS

Low-dimensional topology, knot theory, algebraic geometry, quantum physics:

- Graphs and curves on surfaces
- Finite type invariants
- Real enumerative geometry
- Configuration spaces and compactifications
- Quantum Chern-Simons theory
- Feynman diagrams
- Virtual and Legendrian links, tangles
- Invariants of 3-manifolds
- Tropical geometry
- Dimers and cluster algebras
- Gauge theories, 2d Yang-Mills
- Topological Quantum Field Theories

AWARDS AND FELLOWSHIPS

- 2003** Grant of the President of the Technion
- 2001** ISF: Friedenberg Foundation Prize for "excellence in research"
- 1993 - 1995** Modern Analysis post-doc fellowship, Berkeley CA
- 1992 - 1993** Rotshild fellowship, Israel

RESEARCH GRANTS

- 2010 - 2014** ISF grant 1343/10 "*Gauss diagrams, links, and 3-manifolds*"
- 2006 - 2008** MOST grant for Israel-Russia joint research "*Invariants and algorithmic classification of 3-manifolds*", with S. Matveev
- 2005 - 2009** ISF grant 1261/05 "*Finite type invariants*"
- 2001 - 2004** ISF grant 86/01 "*Feynman diagrams and finite type invariants*", with D. Bar-Natan
- 2001 - 2003** INTAS grant for an advanced post-doc support, with Y. Burman
- 2001 - 2002** BSF grant 2000334 "*Finite type invariants*", with S. Garoufalidis, J. Levine
- 1998 - 2001** BSF grant 97-00398 "*Mapping class group and FTI*", with S. Garoufalidis, J. Levine

GRADUATE STUDENTS

- current** MSc student **Natalia Skorokhod**, *Topology*.
- current** MSc student **Baruch Epstein**, *Topology*.
- current** PhD student **Eran Calderon**, *Topology*.
- PhD 2012** PhD student **Sergei Lanzat**, *Symplectic quasi-morphisms and quasi-states for non-compact symplectic manifolds*.
- PhD 2010** PhD student **Michael Brandenbursky**, *Knot Invariants and Their Applications*.
- MSc 2007** MSc student (Summa Cum Laude) **Sergei Lanzat**, *Configuration Spaces and Real Enumerative Geometry*.
- PhD 2006** PhD student **Ozgur Ceyhan**, *Moduli of Real Curves*. Joint supervision agreement with the University of Strasbourg, France.
- PhD 2005** PhD student **Anna Klebanov**, *Knot Theory and 3-Manifolds*.

INVITED ADDRESSES AT CONFERENCES since 1999

- Low dimensional topology, knots, and groups (Rolfsenfest), Luminy, July 2013, “*Dimers, clusters and knot invariants*”
- Quantum Topology and Hyperbolic Geometry, Nha Trang, May 2013, “*Invariants of 3-manifolds via the mapping class group and planar graphs*”
- Israeli Math. Union annual meeting, May 2012, “*Knots, dimers, and clusters*”
- Swiss Knots, Thun, May 2011, “*Knots, trivalent graphs and graph cohomology*”
- Real Enumerative Questions in Complex and Tropical Geometry, Oberwolfach, April 2011, “*Enumerating real rational curves with tangency conditions*”
- Quantum Topology, Les Diablerets, March 2011, “*Invariants of 3-manifolds by counting surfaces*”
- Mathematical Physics, Les Diablerets, February 2011, “*Open-closed Conway-type TQFT for tangles*”
- Knots in Poland III, Bedlewo, August 2010, “*Conway-type invariants for tangles and open-closed TQFT*”
- Knots Theory and Ramifications, Warsaw, July 2010, “*Enumerative geometry, knots and finite type invariants*”
- Israeli Math. Union annual meeting, June 2010, “*Alexander-Conway TQFT for tangles*”
- (minicourse) Why Knot?, Technion, September 2009, “*Knot invariants*”
- Mathematical Physics, Les Diablerets, February 2009, “*Invariants of 3-manifolds via trivalent graphs mappings*”
- The Moshe Flato Memorial Meeting, Sde Boqer, November 2008, “*Invariants of 3-manifolds by counting arrow diagrams*”
- (minicourse) Group Theory, Chelyabinsk, August 2008, “*Gauss diagrams for knots and 3-manifolds*”
- Perspectives in Analysis, Geometry and Topology, Stockholm, May 2008, “*Enumerative geometry and finite type invariants*”
- Invariants in Low Dimensional Topology, Oberwolfach, May 2008, “*Simple formulas for 3-manifold invariants*”

- Surfaces in low dimensional manifolds, Eilat, March 2007, “*Real Enumerative Geometry and Finite Type Invariants*”
- Quantum Moduli Spaces and TQFT, Aarhus, August 2006, “*Real Enumerative Geometry and Finite Type Invariants*”
- Arithmetics and geometry around quantisation, Istanbul, June 2006, “*Real Enumerative Geometry and Finite Type Invariants*”
- Israeli Math. Union annual meeting, May 2006, “*Counting trees and one-loop graphs in tangle diagrams*”
- GAP III, Perugia, July 2005, “*Configuration spaces, intersections, and finite type invariants*”
- Quantum Topology, Snowbird, June 2005, “*Configuration spaces, intersections, and finite type invariants*”
- Geometry and Physics, Gökova, May 2005, “*Configuration spaces, homology intersections and finite type invariants*”
- Knot Theory, Bendlevo, July 2003, *Polynomials and Cubic Complexes*
- Singularities, Edinburgh, May 2003, *Polynomials and cubic complexes in topology*
- (plenary talk) Israeli Math. Union annual meeting, May 2003, “*Polynomials and Cubic Complexes in Topology*”
- Israeli Math. Union annual meeting, May 2002, “*Polynomials and Cubic Complexes in Topology*”
- Quantum Topology, Warwick, March 2002, “*Finite type invariants and cubic complexes*”
- Knots and 3-manifolds, Kyoto, September 2001, “*Milnor μ -invariants and planar rooted trees*”
- New techniques in TQFT, Calgary, August 2001, “*Taming the Zoo of the finite type invariants*”
- (minicourse) Geometry and Physics, Glanon, July 2001, “*Feynman diagrams for mathematicians*”
- (minicourse) Graphs and Patterns (Sullivan’s DennisFest), SUNY, June 2001, “*Quantum Field Theory and Topology*”

- Links and 3-manifolds, Siegen, January 2001, “*New formulas for Milnor’s μ -invariants*”
- Topology of quantum fields, Cambridge, October 2000, “*Vassiliev invariants via configuration spaces*”
- Deformation quantization, Dijon, September 2000, “*Deformation quantization and degrees of maps*”
- Homotopy theory, Haifa, June 2000, “*On configuration spaces*”
- Quantum groups and Knot theory, Strasbourg, September 1999, “*On the arrow diagrams*”
- Singularities, Oberwolfach, May 1999, “*Finite-type invariants of virtual knots*”
- Israeli Math. Union annual meeting, May 1999, “*Virtual knots*”
- Geometry and Physics of Fields, MLI Stockholm, March 1999, “*Virtual knots and arrow diagrams*”

ORGANIZATION OF CONFERENCES

- Why Knot?, September 2009, Technion.
- Different approaches to complexity in mathematics and mathematical physics, June 2007, Technion.
- EckmannFest, April 2007, Technion.
- Geometry and Topology section of the Israeli Math. Union annual meeting, May 2005, Neve Ilan.
- Geometry and Topology section of the Israeli Math. Union annual meeting, May 2004, Kibbutz Shefayim.

LIST OF PUBLICATIONS

1. M. Polyak, *On 1-dim Hamiltonian systems of hydrodynamical type dependent on x* , Uspekhi Mat. Nauk USSR, **42:3** (1987), 195–196
2. S. N. Ovsienko, M. Polyak, *On Monte-Karlo method in prognosis of spreading of oil slick* (in Russian), Prognosis of ocean and sea pollution, Goskomgidromet, Leningrad (1987)
3. M. Polyak, *Graphical approach to the 3-manifold invariants of Turaev-Viro*, J. Knot Theory, bf 1:3 (1992), 219–240

4. J. Mattes, M. Polyak, N. Reshetikhin, *On invariants of 3-manifolds derived from abelian groups*, Quantum topology **2**, ed. L.Kauffman, R.Baadhio, World Scientific (1993) 324–338.
5. S. Matveev, M. Polyak, *A geometrical presentation of the surface mapping class group and surgery*, Comm. Math. Phys. **160** (1994), 537–556
6. S. Matveev, M. Polyak, *On a tangle presentation of the mapping class groups of surfaces*, Contemp. Math. **164** (1994), 219–229
7. M. Polyak, O. Viro, *Gauss diagram formulas for Vassiliev invariants*, Int. Math. Res. Notices **11** (1994), 445–454
8. M. Polyak, *On the Bennequin invariant of Legendrian curves and its quantization*, Comp. Rend. Ac. Sci. Paris **322**, Série I (1996), 77–82
9. M. Polyak, G. Mikhalkin, *Whitney formula in higher dimensions*, J. Diff. Geom. **44** (1996), 583–594
10. M. Polyak, *On Milnor’s triple linking number*, Comp. Rend. Ac. Sci. Paris **325**, Série I (1997), 77–82.
11. M. Polyak, N. Reshetikhin, *On 2d Yang-Mills theory and invariants of links*, Math. Phys. Studies **20** (1997), 223–248.
12. M. Polyak, *Invariants of curves and fronts via Gauss diagrams*, Topology **37** (1998), 989–1009.
13. M. Polyak, *Shadows of Legendrian links and J-theory of curves*, Progress in Math. **162** (1998), 435–458.
14. M. Polyak, *New Whitney-type formulae for plane curves*, Transl. AMS (2) **190**, (1999), 103–111.
15. M. Goussarov, M. Polyak, O. Viro, *Finite type invariants of virtual and classical knots*, Topology **39** (2000), 1045–1068.
16. M. Polyak, *On the algebra of arrow diagrams*, Let. Math. Phys. **51** (2000) 275–291.
17. S. Garoufalidis, M. Goussarov, M. Polyak *Calculus of clovers and finite type invariants of 3-manifolds*, Geometry and Topology **5** (2001) 75–108.
18. M. Polyak, O. Viro, *On the Casson knot invariant*, J. Knot Theory, **10** (2001) 711–738.

19. M. Polyak, *Generalized Crofton formulas*, Russian Math. Surveys, **56** (2001) 589–591.
20. S. Matveev, M. Polyak, *Cubic complexes and finite type invariants*, Geometry and Topology Monographs, **4** (2002) 215–233.
21. S. Matveev, M. Polyak, *Finite type invariants of cubic complexes*, Acta Applic. Math., **75** (2003) 125–132.
22. M. Polyak, *Quantization of linear Poisson structures and degrees of maps*, Let. Math. Phys., **66** (2003) 15–35.
23. Y. Burman, M. Polyak, *Geometry of Whitney-type formulas*, Moscow Math. J., **3** (2003) 823–832.
24. M. Polyak, *Skein relations for Milnor’s μ -invariants*, Alg. Geom. Topology **5** (2005) 1471–1479.
25. M. Polyak, *Feynman diagrams for mathematicians and pedestrians*, Proc. Symp. Pure Math. **73** (2005) 15–42.
26. S. Matveev, M. Polyak, *A simple formula for the Casson-Walker invariant*, J. Knot Theory, **18** (2009) 841–864.
27. S. Chmutov, M. Polyak, *Elementary combinatorics of the HOMFLYPT polynomial*, Int. Math. Res. Notices **2010** (2010), doi:10.1093/imrn/rnp137 480–495.
28. M. Polyak, *Minimal generating sets of Reidemeister moves*, Quantum Topology **1** (2010) doi:10.4171/QT/10, 399–411.
29. Y. Burman, M. Polyak, *Whitney’s formulas for curves on surfaces*, Geometriae Dedicata **151** (2011) doi:10.1007/s10711-010-9521-8, 97–106.
30. O. Kravchenko, M. Polyak, *Diassociative algebras and Milnor’s μ -invariants for tangles*, Let. Math. Phys. **95** (2011) doi:10.1007/s11005-010-0459-4, 297–316.
31. S. Lanzat, M. Polyak, *Counting real curves with passage/tangency conditions*, J. London Math. Soc. **85** (2012) doi:10.1112/jlms/jdr070, 838–854.
32. S. Lanzat, M. Polyak, *Integrating curvature: from Umlaufsatz to $J+$ invariants*, Topology and Appl. **160** (2013) doi:10.1016/j.topol.2013.01.016.
33. M. Polyak, *On 2-dimensional Topological Field Theories*, J. Knot Theory, to appear.
34. M. Polyak, *Alexander-Conway invariants for tangles*, preprint arXiv:1011.6200, submitted for publication.