Curriculum Vitae
Serge Tabachnikov

Department of Mathematics
Pennsylvania State University,
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Education

Ph.D.: Moscow State University, 1987. Advisors: D. Fuchs and A. Fomenko.
Dissertation title: Geometrical applications of the cohomology of infinite-dimensional Lie algebras

M.S.: Moscow State Pedagogical University, 1978, with Honors

Positions Held

Permanent positions

Mathematics Teacher, Special High School for Mathematics No 2, Moscow, 1978–80
Assistant Professor and Program Coordinator, School of Mathematics by Correspondence ("Gelfand's School"), Moscow State University, 1979–88
Head of Mathematics Department, "Kvant" magazine, USSR Academy of Sciences, Moscow, 1988–90
Assistant Professor of Mathematics, University of Arkansas, 1990–95
Associate Professor of Mathematics, University of Arkansas, 1995–2000
Associate Professor of Mathematics and MASS Director, Pennsylvania State University, 2000–2002
Professor of Mathematics and MASS Director, Pennsylvania State University, 2002–

Visiting positions

Centre de Physique Theorique, Luminy: May, September 1992; April 1995; June 2000
ENS de Lyon: June–July 1992
Université Louis Pasteur, Strasbourg: October 1992
IHES, Bur-sur-Yvette: November 1992
ETH, Zurich: December 1992–January 1993, May–July 2003
University of Cambridge and I. Newton Institute: 1994-95
MSRI, Berkeley: May–June 1995; May–July 1997
Max-Planck-Institut, Bonn: 1995–96; July-September 1998; May-August 1999; June-July 2001
Tel Aviv University: December 1996–January 1997; May 2000; December 2001
Université de Rennes: January, 1998
Université Catholique de Louvain: June 1998
Oberwolwach, RiP program: August 1999, July-August 2003
Fields Institute, Toronto: May 2001
Institut de Mathématiques de Luminy: May–June 2002

Grants

NSF Grants, 1992, 97, 98, 99: organizing an annual mathematical conference at UARK
Wolfson College, University of Cambridge fellowship, 1994–95
NSF Research Grants, 1994–97, 1998–01, 2003–05 (sole investigator)
Volkswagen-Stiftung RiP-program at Oberwolfach (with V. Ovsienko), summer 1999, summer 2003
BSF Research Grant, 2001–2004 (with M. Farber and S. Weinberger)
UARK Research Incentive Grants, 1992–93, 1993–94, 1997–98, 1998–99
Arkansas Science and Technology Authority Research Grant, 1993–94
SILO Grant (undergraduate research, with J. Reed), 1998-99

Research Publications

Books and parts of books

1. Billiards. Société Mathématique de France, 1995 (Russian translation in preparation)
2. Rational billiards and flat structures (with H. Masur). Handbook of Dynamical Systems, v. 1A, North-Holland, 2002, 1015–1089
3. Projective differential geometry, old and new: from Schwarzian derivative to cohomology of diffeomorphism groups (with V. Ovsienko), Cambridge Univ. Press, to appear

Papers

1. On invariant differential operators in general position. Func. Anal. Appl., 16, No 3 (1982), 86-87
2. On characteristic classes of homogeneous foliations. Russ. Math. Surv., 39, No 2 (1984), 189-190
3. On homology in general position of the Lie algebra of vector fields on the line. Soviet Math. Dokl., 275, No 2 (1984), 310-314
4. Characteristic classes of Grassman foliations. Func. Anal. Appl., 19, No 1 (1985), 83-84
5. Characteristic classes of parabolic foliations and symmetric functions. Serdica, 11 (1985), 86-95
6. Characteristic classes of parabolic foliations of series B, C, D and degrees of isotropic Grassman manifolds. Func. Anal. Appl., 20, No 2 (1986), 84-85
7. Geometrical applications of cohomology of infinite-dimensional Lie algebras. Dissertation, Moscow, 1987 (translation to French: University of Lyon, 1994)
8. An invariant of submanifolds transversal to a distribution. Russ. Math. Surv., 43, No 3 (1988), 193-194
9. Calculation of the Bennequin invariant of a Legendrian curve by the geometry of its front. Func. Anal. Appl., 22, No 3 (1988), 89-90
10. Characteristic classes of Lagrangian foliations. Func. Anal. Appl., 23, No 2 (1989), 90-91
11. Two remarks on the asymptotic Hopf invariant. Func. Anal. Appl., 24, No 1 (1990), 84-85
12. Around four vertices. Russ. Math. Surv., 45, No 1 (1990), 191-192
13. Numerical study of dual billiards: the case of a semicircle (with I. Monroe). UARK Technical Report, 1992
14. Geometry of Lagrangian and Legendrian 2-webs. Diff. Geom. Appl., 3 (1993) 265-284
15. Poncelet's theorem and dual billiards. L'Enseign. Math., 39 (1993), 189-194
16. Outer billiards. Russ. Math. Surv., 48, No 6 (1993), 75-102
17. Commuting dual billiard maps. Geom. Dedicata, 53 (1994), 57-68
18. A cone eversion. Amer. Math. Monthly, 102 (1995), 52-56
19. On the dual billiard problem. Advances in Math., 115:2 (1995), 221-249
20. The four vertex theorem revisited – two variations on the old theme. Amer. Math. Monthly, 102 (1995), 912-916
21. Asymptotic dynamics of the dual billiard transformation. J. Stat. Phys., 83 (1996), 27-38
22. Invariants of smooth triple point free plane curves. Knot Theory and Ramifications, 5 (1996), 531-552
23. Sturm theory, Ghys theorem on zeroes of the Schwarzian derivative and flattening of Legendrian curves (with V. Ovsienko). Selecta Math. (NS), 2 (1996), 297-307
24. Projective connections, group Vey cocycle and deformation quantization. Int. Math. Res. Notes. 1996, No 14, 705-722
25. Introducing projective billiards. Ergod. Theory and Dynam. Syst., 17 (1997), 957-976
26. Invariants of Legendrian and transverse knots in the standard contact space (with D. Fuchs). Topology, 36 (1997), 1025-1053
27. On zeroes of the Schwarzian derivative. Topics in singularity theory, 229-239, AMS Transl., ser. 2, v. 180, 1997
28. Parameterized curves, Minkowski caustics, Minkowski vertices and conservative line fields. L'Enseign. Math., 43 (1997), 3-26
29. On functions with zero mean over a finite group. Func. Anal. Appl., 31, No 1 (1997), 93-94
30. Estimates for the Bennequin number of Legendrian links from state models for knot polynomials. Math. Research Lett., 4 (1997), 143-156
31. Exact transverse line fields and projective billiards in a ball. Geom. and Funct. Anal., 7 (1997), 594-608
32. More on paperfolding (with D. Fuchs). Amer. Math. Monthly, 106 (1999), 27-35

33. Geometry of exact transverse line fields and projective billiards. Differential and symplectic topology of knots and curves, 131-152, AMS Transl., ser. 2, v. 190, 1999
34. Projectively equivalent metrics, exact transverse line fields and the geodesic flow on the ellipsoid. Comm. Math. Helv., 74 (1999), 306-321
35. Fagnano orbits of polygonal dual billiards. Geom. Dedicata, 77 (1999), 279-286
36. Remarks on the geometry of exact transverse line fields. Differential topology, infinite-dimensional Lie algebras and applications, 247-260, AMS Transl., ser. 2, v. 194, 1999
37. Going in circles: variations on the Money-Coutts theorem. Geom. Dedicata, 80 (2000), 201-209
38. A four vertex theorem for polygons. Amer. Math. Monthly, 107 (2000), 830-833
39. Projective geometry of polygons and discrete 4-vertex and 6-vertex theorems (with V. Ovsienko). L'Enseign. Math., 47 (2001), 3-19
40. Billiards in Finsler and Minkowski geometries (with E. Gutkin). J. Geom. and Phys., 40 (2002), 277-301
41. Ellipsoids, complete integrability and hyperbolic geometry. Moscow Math. J., 2 (2002), 185-198
42. Topology of cyclic configuration spaces and periodic orbits of multi-dimensional billiards (with M. Farber). Topology, 41 (2002), 553-589
43. Periodic trajectories in 3-dimensional convex billiards (with M. Farber) Manuscripta Mat., 108 (2002), 431-437
44. Dual billiards in the hyperbolic plane. Nonlinearity, 15 (2002), 1051-1072
45. On polygonal dual billiard in the hyperbolic plane (with F. Dogru). Reg. Chaotic Dynamics, 8 (2003), 67-82
46. Topological robotics: motion planning in projective spaces (with M. Farber and S. Yuzvinsky). Int. Math. Res. Notes, 2003, No 34, 1853-1870
47. On skew loops, skew branes and quadratic hypersurfaces. Moscow Math. J., 3 (2003),
48. Totally skew embeddings of manifolds (with M. Ghomi). Preprint
49. Remarks on magnetic flows and magnetic billiards, Finsler metrics and a magnetic analog of Hilbert's fourth problem. Preprint
50. On three-periodic trajectories of multi-dimensional dual billiards. Preprint

Expository Publications.

Books, (in Russian)

1. Instructive Games (with A. To'om). Moscow State Univ. Math. School by Correspondence, 1987
2. Polynomials. Phasis, Moscow, 1996; second edition 2000

Articles in "Kvant" magazine (in Russian)

1. Mathematical radio club. 1983, No 3
2. Mistakes in geometrical proofs. 1984, No 3 (in English: Quantum, 1998, No 6)
3. Considerations of continuity. 1987, No 9. (in English : Quantum, 1990, No 2)
4. Geometry of equations. 1988, No 10
5. On plane curves. 1988, No 11-12
6. On curvature. 1989, No 5
7. On self-referential sentences. 1989, No 6
8. Archimedes' law from the viewpoint of a mathematician. 1989, No 10 (in English: in "Geometry, Analysis and Mechanics", World Sci. Publ., 1995, 215-218)
9. Differential geometry around us. 1989, No 11
10. How many roots does a polynomial have? 1989, No 12
11. Polynomials least different from zero. 1990, No 6 (in English: Quantum, 1994, No 1 and Kvant Selecta: algebra and analysis, II, 161-165)
12. Web geometry. 1990, No 7
13. Chebyshev's nets (with Yu. Kotov). 1990, No 7
14. Segments of constant areas (with D. Fuchs). 1990, No 8. (in English: Quantum, 1992, No 2)
15. Which is larger? 1990, No 10
16. Nazism and mathematics. 1990, No 11. (in Japanese: Basic Sugaku, 1991)
17. Variations on Escher's theme. 1990, No 12

Other

1. Monthly Mathematical Radio Show. All-Union Radio Station, Moscow, 1981-82 (10 scripts)
2. Encyclopedia of Mathematical Physics, Nauka, Moscow, 1997. 17 articles on contact geometry
3. Solution to a problem by Coxeter. Summer Geometry Institute Problem Book, Smith College, 1993
4. A problem. Math. Intelligencer, 13 (1991), No 2
5. Problem No 10724, Amer. Math. Monthly, 106 (1999); solution: 108 (2001), 472-473
6. Preface to Kvant Selecta, AMS Math. World, v. 14 (1999)
7. Personal note on D. Fuchs, Differential topology, infinite-dimensional Lie algebras and applications, 309-311, AMS Transl., ser. 2, v. 194, 1999
8. Outer billiards (in Russian). Mat. Prosv., ser. 3, No 5 (2001), 125-135
9. MASS Program at Penn State (with A. Katok and S. Katok). Math. Intelligencer, 24 (2002), No 4, 50-56
10. A tale of a geometric inequality. MASS Selecta, AMS, 2003, 257-262

Curriculum development

Transformational geometry, lecture notes, UARK, 1993
Differential topology, lecture notes, UARK, 1999
Mathematical methods of mechanics, lecture notes, UARK, 2000
Introduction to symplectic topology, lecture notes, Penn State, 2002
Intuitive topology, MASS course, Penn State, 2002

Editor

Books:
Mathematical Olympiads by Correspondence, Nauka, Moscow, 1987
Differential and symplectic topology of knots and curves, AMS Transl., ser.2, v. 190, 1999
Differential topology, infinite-dimensional Lie algebras and their applications (with A. Astashkevich), AMS Transl., ser.2, v. 194, 1999
Kvant Selecta: Algebra and Analysis I, AMS Math. World, v. 14, 1999
Kvant Selecta: Algebra and Analysis II, AMS Math. World, v. 15, 1999
Kvant Selecta: Discrete mathematics I, AMS Math. World, v. 17, 2002
MASS Selecta: teaching and learning advanced undergraduate mathematics (with S. Katok, A. Sossisnky), AMS, 2003

Journals:
Kvant, 1989–1990
American Mathematical Monthly, 2001–

Conference Organizing

Symplectic Topology, Fayetteville, AR, 1992
Dehn Surgery (with Ch. Goodman-Strauss), Fayetteville, AR, 1997
Combinatorial Methods in Algebra (with M. Johnson and V. Retakh), Fayetteville, AR, 1998
Complex Dynamics (with L. Lanzani and V. Retakh), Fayetteville, AR, 1999

Doctoral students

F. Dogru, Ph.D. 2003
D. Genin

Conference, Colloquium and Seminar Talks (since 1991)

1. Annual AMS/MAA Meeting (Geometry), San Francisco, January 1991
2. Midwest Topology Conference, Lawrence, May 1991
3. Centre de Physique Theorique, Luminy, June 1991
4. University of Texas at Austin, October 1991
5. UC at Davis, December 1991
6. Annual AMS/MAA Meeting (Symplectic topology), Baltimore, January 1992

7. Rencontres Franco-Russe de geometrie, CIRM, Luminy, May 1992
8. Ecole Normale Superieur de Lyon, June 1992
9. Université Louis Pasteur, Strasbourg, October 1992
10. Conference on polygonal billiards, ENS de Lyon, October 1992
11. Université de Rennes, November 1992
12. IHES, Bures-sur-Yvette, November 1992
13. ETH-Zentrum, Zurich, December 1992
14. Penn State University, March 1993
15. UC at Davis, May 1993
16. Stanford University, May 1993
17. Smith College, July 1993
18. Wichita St. University, September 1993
19. UC at Riverside, March 1994
20. SUNY at Stony Brook, March 1994
21. Yale University, March 1994
22. Symposium on classical and quantum billiards, Ascona, July 1994
23. Université Louis Pasteur, Strasbourg, April 1995
24. Ecole Normale Superieur, Paris, April 1995
25. Centre de Physique Theorique, Luminy, April 1995
26. Stanford University, May 1995
27. University of Southern California, LA, May 1995
28. UC at Santa Cruz, May 1995
29. Geometry conference, Oberwolfach, October 1995
30. MPIM (Oberseminar), Bonn, November 1995
31. Koeln University, February 1996
32. Tel Aviv University, January 1997
33. Combinatorics and knot theory workshop, MSRI, January 1997
34. AMS Meeting (Chaotic dynamics), Memphis, March 1997
35. UC at Santa Cruz, June 1997
36. Université de Rennes, January 1998
37. University of Wisconsin, Madison, February 1998
38. AMS Meeting (Geometry and topology of 3-Manifolds), Davis, April 1998
39. Université Catholique de Louvain, June 1998
40. University of Toronto, November 1998
41. Columbia University, December 1998
42. University of Alabama, Birmingham, February 1999
43. Dynamics conference, Oberwolfach, July 1999
44. University of Arizona, Tucson, September 1999
45. Tulane University, October 1999
46. Penn State University, November 1999
47. New Mexico St. University, Las Cruces, December 1999
48. AMS Meeting (Finsler and Minkowski geometry), Lowell, April 2000
49. Tel Aviv University, May 2000
50. Centre de Physique Theorique, Luminy, June 2000
51. Ecole Normale Superieur, Paris, June 2000
52. Georgia topology conference, Athens, July 2000
53. Geometry conference, Oberwolfach, October 2000; minicourse of 2 lectures
54. AMS Meeting (Dynamics), San Francisco, October 2000
55. Indiana University, Bloomington, February 2001
56. University of Pennsylvania, Philadelphia, March 2001
57. Séminaire Sud-Rhodanien de Géométrie, Atelier billiards, Montpellier, June 2001; minicourse of 5 lectures
58. Ruhr University, Bochum, July 2001
59. Dynamical systems conference, Penn State, October 2001

60. Tel Aviv University, December 2001
61. Haifa Technology Institute (Technion), December 2001
62. Georgia Institute of Technology, Atlanta, April 2002
63. Institut de Mathématiques de Luminy, May 2002
64. Université de Province, Marseille, May 2002
65. Université Claude Bernard, Lyon, May 2002
66. International workshop on piecewise isometries, Luminy, June 2002
67. University of South Carolina, Columbia, March 2003
68. AMS Meeting (Differential geometry), Bloomington, April 2003
69. AMS Meeting (Applications of Teichmuller theory), Bloomington, April 2003
70. AMS Meeting (Algebraic and topological combinatorics), New York, April 2003
71. University of Florida, Gainsville, April 2003
72. Conference on hyperbolic dynamics, Zurich, June 2003
73. Conference on topology and robotics, Zurich, June 2003

Service and outreach activities

MASS Director, Department of Mathematics, Penn State, 2000–
Honors Director, Department of Mathematics, Penn State, 2000–
Member of committees: Student Awards, Undergraduate, VIGRE; Department of Mathematics, Penn State, 2000–
Member of committees: Undergraduate, Hiring, Steering, Library, Spring Lecture Series, Graduate, VIGRE; Department of Mathematics, UARK, 1990–2000
Honors advisor, Department of Mathematics, UARK, 1996–2000
Referee for various research journals
Referee and panelist for DMS NSF
Reviewer for Mathematical Reviews
Canada/USA Binational Mathematical Summer Program, Invited lecturer, Colby College, August 2001; Colorado College, July 2002
Mathematical Club for high school students (with J. Duncan), UARK, 1990–93
Mathematical Club at Park Forest Elementary School, State College, 2002
Mathematical Club at Radio Park Elementary School, State College, 2003
American Mathematics Competitions, Advisory Panel, member, 2002–