

Curriculum Vitae

Mikhail Lyubich

August 31, 2016

Date of birth: February 25, 1959.

Education

MS 1980, Kharkov State University. Thesis: “Entropy of rational maps”.

PhD 1984, Tashkent State University. Thesis: “Dynamics of rational maps”.

Fields of interest: Dynamical Systems, especially Analytic Low-Dimensional Dynamics, complex and real.

Positions: Institute for Math. Sciences and Math. Dept. at Stony Brook (Feb 1990 – Assistant Professor, Sept 1990 – Associate Professor, Sept 1994 – Professor)

Sept 1995 – 2004: Deputy Director of the IMS

July 2002: Professor and Canada Research Chair at the University of Toronto

Sept 2004 – 2007: Co-Director of the IMS

Sept 2013 – 2016: Chair of Stony Brook Math Dept

Sept 2007 – current: Director of the IMS

Memberships

- Member of the St Petersburg and American Math Societies
- Fellow of the American Math Society (Inaugural Class)
- Member of the Brazilian and EU Academies of Sciences.

Awards

Prize of Leningrad Math. Society 1987

Alfred P. Sloan Research Fellowship 1991-1994

NSF grants 1991-2019

NSERC grant 2003-2008

Guggenheim Fellowship, 2002 - 2004

Jeffery-Williams prize of the Canadian Math. Society 2010

Selected invited lectures

- Plenary address at the ICM-14, Seoul (2014)
- Invited address at ICM-94, Zürich (1994)
- Plenary address at the V Latin American Congress of Mathematicians, Barranquilla (2016)
- Invited address at the International Congress in Mathematical Physics,

London (July 2000)

- Invited address at the First Latin American Congress of Mathematicians, IMPA (July 2000)
- Plenary address at the annual AMS meeting in Washington, DC (Jan 2000)
- Plenary address at the joint meeting of FSM and CMS, Toulouse (July 2004)
- Plenary address at the annual CMS meeting in Ottawa (Dec 2013)
- Jeffery-Williams Prize lecture at the Meeting of the Canadian Math Society, June 2010
- Series of Balzan-Palis Symposia at IMPA (Rio de Janeiro) and IHP (Paris), 2012–2015
- Invited speaker at birthday conferences for Bodil Branner (Holbaek 2003), Adrien Douady (Paris 1995 and 2006), John Hubbard (Paris 2005 and Bremen 2015), Yulij Ilyashenko (Moscow 2014), Nick Makarov (Saas Fee 2016), Welington de Melo (Salvador 2006), John Mather (Princeton 2002), John Milnor (Stony Brook 1991 and Cancun 2016), Jacob Palis (Edinburgh 2000 and Buzios 2011), Dennis Sullivan (New York 2002), and Alberto Verjovsky (Cuernavaca 2003 and 2013)
- Magna Conference: A Century of Science: Paving a Better Future, celebrating 100 years of the Brazilian Academy of Sciences, Rio de Janeiro (May 2016)

Lecture series

- European Math. Society Lecture Series “Real and Complex Dynamics”, St. Petersburg - Barcelona - Copenhagen (May - June 1999)
- Annual Spring Lecture Series “Complex Dynamics”, University of Arkansas (April 1999).
- Lecture series on the Real and Complex Dynamics in Kyoto - Hiroshima - Tokyo (June 2000).
- Mini-course on “Laminations and Holomorphic Dynamics” at the International Conference “New Directions in Dynamical Systems”, Kyoto 2002.
- Workshop on Dynamical Systems, Trieste (August 2001). Mini-course on the Regular and Stochastic Dynamics in the real quadratic family.
- Winter School “Recent Trends in Non-linear Dynamics”, Cullera, Spain (Jan 2008). Mini-course “Introduction to Holomorphic Dynamics”.
- Winter school in Complex Analysis and Geometry (Jan 2010). Mini-course “Lee-Yang zeros and 2D rational dynamics ”.
- Workshop “Discrete groups in complex geometry”, Trieste (July 2010). Mini-course “On the problem of local connectivity of the Mandelbrot set”
- Conference “Geometric and Algebraic Structures in Mathematics” to celebrate Dennis Sullivan 70th birthday, Stony Brook (May 2011). Mini-course on Renormalization.
- Workshop “MLC, Status and Quo Vadis?”, Holbaek (Denmark), Sept 2012. Mini-course “A priori bounds” (joint with J. Kahn).
- Advanced School and Workshop in Real and Complex Dynamics, Trieste, May 2013. Mini-course on Complex 1D Dynamics.

Training of students and postdocs

I have advised 12 PhD students, among them are M. Yampolsky, C. Cabrera, and D. Cheraghi.

Over the past twenty five years, I have been actively involved in working with postdocs and junior visitors of the IMS at Stony Brook and the University of Toronto (two-three people every year). The list of these people includes A. Avila, P. Berger, S. Brooks, A. de Carvalho, A. Cheritat, T. Firsova, J. Kahn, L. Lomonaco, M. Martens, Y. Minsky, H. Peters, L. Rempe, R. Roeder, N. Selinger, and E. Vargas.

Organizing scientific events and editing Proceedings

I have co-organized or co-organized 3 Scientific Programs:

- Holomorphic Dynamics and Hyperbolic Geometry, MSRI (Spring 1995),
- Program at the Fields Institute in Toronto “Renormalization in Dynamics and Math. Physics” (fall 2005).
- Program at the Fields Institute in Toronto “Holomorphic Dynamics, Hyperbolic Geometry, and Laminations” (spring 2006). Proceeding: Fields Institute Communications, v. 51. (with G. Forni, C. Pugh and M. Shub). and v. 53, dedicated to John Milnor’s 75th birthday (with M. Yampolsky)

I have also organized or co-organized about 10 Conferences, including:

- “Laminations and foliations in dynamics, geometry and topology”, Stony Brook (May 1998); Proceedings: Contemporary Mathematics, v. 269 (with Y. Minsky and J. Milnor).
- “Graphs and patterns in mathematics and theoretical physics” in honor of Dennis Sullivan’s 60th birthday, Stony Brook (June 2001). AMS Proceedings of Symposia in Pure Math, v. 73 (with L. Takhtajan).
- “Advances in Low Dimensional Dynamics”, Stony Brook (June 2009);
- “Frontiers in Complex Dynamics”, in celebration of John Milnor’s 80th birthday, Banff (Feb 2011). Proceedings: Princeton Univ. Press, v. 51 (with A. Bonifant and S. Sutherland).
- “Geometric and Algebraic Structures in Mathematics”, dedicated to Dennis Sullivan’s 70th birthday, Stony Brook (June 2011). Proceedings: Pure and Applied Math. Quarterly, v. 9, # 2 (with L. Ji, C. McMullen and S.-T. Yau).
- “IMS-XXV”, to celebrate 25th anniversary of the IMS, Stony Brook (May 2015).

I have also co-organized a number of special sessions at the AMS, FSM and CMS meetings,

Serving on and for Editorial Boards

Over the years, I was serving on the boards of the “Electronic J. of Conformal Geometry and Dynamics”, “Mathematical Physics, Analysis and Geometry”, “Ergodic Theory and Dynamical Systems”, “Discrete and Continuous Dynamics”, and “Communications for Math. Physics”.

I have been also regularly serving as a referee for the Annals Math., Inventiones Math., JAMS, GAFA, and many other journals.

Selected publications (out of 95 papers)

Dynamics in the quadratic and quasi-quadratic families

- Almost every real quadratic map is either regular or stochastic. Annals of Math., v. 156 (2002), 1–78.
- Feigenbaum-Couillet-Tresser Universality and Milnor’s Hairiness Conjecture. Annals of Math., v. 149 (1999), 319–420.
- Dynamics of quadratic polynomials, I-II. Acta Math., v. 178 (1997), 185–297.
- Dynamics of quadratic polynomials, III. Parapuzzle and SBR measures. Asterisque, v. 261 (2000), 173–200. Colloque en l’honneur d’Adrien Douady (Orsay 1995).
- (with J. Milnor) The Fibonacci unimodal map. JAMS, v. 6 (1993), 425–457.
- Combinatorics, geometry and attractors of quasi-quadratic maps. Annals of Math., v. 140 (1994), 347–404.
- (with M. Yampolsky) Complex bounds for real maps. Ann. Inst. Fourier., v. 47 (1997), 1219–1255.
- (with A. Avila & W. de Melo) Regular or stochastic dynamics in real analytic families of unimodal maps. Inventiones Math., v. 154 (2003), 451 – 550.

Entropy and Stability

- Entropy properties of rational endomorphisms of the Riemann sphere. Erg. Th. & Dyn. Syst., v. 3 (1983), 351–385.
- Some typical properties of the dynamics of rational maps, Russian Math. Surveys, v. 38 (1983), 154–155. Detailed account: An analysis of stability of the dynamics of rational functions. Teoriya Funk., Funk. Anal. & Prilozh., # 42 (1984), 72 - 91 (Russian). English translation: Selecta Mathematica Sovietica, v. 9 (1990), 69 - 90.

Transcendental Dynamics

- (with A. Eremenko) Iterations of entire functions. Dokl. Akad. Nauk SSSR, v. 279 (1984), 25–27.
- (with A. Eremenko) Dynamical properties of some classes of entire functions. Ann. Inst. Fourier, v. 42 (1992), # 4, 989–1020.
- (with A. Eremenko) Examples of entire functions with pathological dynamics. J. London Math. Soc., v. 36 (1987), 458–468.
- Measurable dynamics of the exponential. Syberian J. of Math., v. 28 (1987), 111–127.

- (with Anna Benini) Repelling periodic orbits and landing rays for post-singular bounded exponential maps. *Ann. Inst Fourier*, v. 64 (2014), 1493–1520.

Smooth 1D Dynamics

- Non-existence of wandering intervals and structure of topological attractors of one-dimensional dynamical systems, I. The case of negative Schwarzian derivative. *Erg. Th. & Dyn. Syst.*, v. 9 (1989), 737–750.
- (with A. Blokh) Attractors of transformations of the interval. *Function. Analysis and Appl.*, v. 21 (1987), 70–71. Detailed account: Attractors of maps of the interval. *Banach Center Publ.*, v. 23 (1989), 427–442.
- (with A. Blokh) Measure of solenoidal attractors of unimodal transformations of the interval. *Math. Notes*, v. 48 (1990), 15–20.
- (with A. Blokh) Measurable dynamics of S -unimodal maps of the interval. *Ann. Sci. Ec. Norm Sup.*, v. 24 (1991), 545–573.

Towards MLC

- (with J. Kahn) Quasi-Additivity Law in conformal geometry. *Annals of Math.*, v. 169 (2009), 561–593.
- (with J. Kahn) A priori bounds for some infinitely renormalizable quadratics, II. Decorations. *Ann. Sci. Ecole Norm. Sup.*, v. 41 (2008), 57–84.

Higher degree unicritical dynamics

- (with J. Kahn) Local connectivity of Julia sets for unicritical polynomials. *Annals of Math.*, v. 170 (2009).
- (with A. Avila, J. Kahn and W. Shen) Combinatorial rigidity for unicritical polynomials. *Annals of Math.*, v. 170 (2009).
- (with A. Avila and W. Shen) Parapuzzle of the Multibrot set and typical dynamics of unimodal maps. *J. European Math Soc.*, v. 13 (2011), 27–56.
- (with A. Avila) The full renormalization horseshoe for unimodal maps of higher degree: exponential contraction along hybrid classes. *Publications IHES*, n 114 (2012), p. 171–223.

Complex Hénon family

- (with E. Bedford & J. Smillie) Polynomial diffeomorphisms of \mathbf{C}^2 , IV: The measure of maximal entropy and laminar currents. *Inventiones Math.*, v. 112 (1993), 77–125.
- (with E. Bedford & J. Smillie) Distribution of periodic points of polynomial diffeomorphisms of \mathbf{C}^2 . *Inventiones Math.* (1994).
- (with H. Peters) Classification of invariant Fatou components for dissipative Hénon maps. *GAFA*, v. 24 (2014), 887–915.
- (with Romain Dujardin) Stability and bifurcations for dissipative polynomial automorphisms of \mathbf{C}^2 . *Inventiones Math.*, v. 200 (2015), 439–511

Real Hénon family

- (with A. de Carvalho and M. Martens) Renormalization in the Hénon family, I. Universality but non-rigidity. *J. Stat.Phys.*, Special issue dedicated to Feigenbaum’s 60th birthday, v. 121 (2005), 611–669.

- (with Marco Martens) Renormalization in the Hénon family, II: the heteroclinic web. *Inventiones Math.*, v. 186 (2011), 115–189.
- (with Marco Martens) Probabilistic universality in two-dimensional dynamics. Preprint IMS at Stony Brook, # 2 (2011). Submitted.

Laminations in Holomorphic Dynamics

- (with Y. Minsky) Laminations in holomorphic dynamics. *J. Diff. Geometry.*, v. 47 (1997), 17–94.
- (with Vadim Kaimanovich) Conformal and harmonic measures on laminations associated with rational maps. *Memoirs of the AMS*, v. 173 (2005), # 820.

Dynamics and Stat Physics

- (with Pavel Bleher) The Julia sets and complex singularities in hierarchical Ising models. *Comm. Math. Phys.*, v. 141 (1991), 453–474.
- (with P. Bleher and R. Roeder) Lee-Yang zeros for the Diamond Hierarchical Lattice and 2D rational dynamics, I. Foliation of the physical cylinder. Preprint IMS, # 4 (2010). To appear in *Journal des Mathématiques Pures et Appliquées* (Liouville Journal).
- Lee-Yang zeros for the Diamond Hierarchical Lattice and 2D rational dynamics, II: Global pluripotential interpretation. Preprint IMS, # 2 (2011).

Geometry of Julia sets

- Typical behaviour of trajectories of a rational mapping of the sphere. *Dokl. Akad. Nauk SSSR*, v. 268 (1982), 29–32.
- On the Lebesgue measure of the Julia set of a quadratic polynomial. Preprint IMS at Stony Brook, # 1991/10.
- (with A. Avila) Hausdorff dimension and conformal measures of Feigenbaum Julia sets. *JAMS*, 21 (2008), 305–383.
- Quasisymmetries of Sierpinski carpet Julia sets (with M. Bonk and S. Merenkov). *Advances in Mathematics*, v. 180 (2016).
- (with A. Avila) Lebesgue measure of Feigenbaum Julia sets. arXiv: 1504.02986 [mathDS] (2015). Submitted.

Surveys and books

- Dynamics of rational transforms: topological picture. *Russian Math. Surveys*, v. 41 (1986), 43–117.
- (with A. Eremenko) Dynamics of analytic transformations. *Algebra & Analysis*. v. 1 (1989), 1–70.
- Forty years of unimodal dynamics: on the occasion of Artur Avila winning the Brin prize. *J. of Modern Dynamics.*, v. 6, no 2 (2012).
- Analytic low-dimensional dynamics: from dimension one to two. *Proceedings of the ICM-14*, v. I, 443–474 (2015).
- Conformal Geometry and Dynamics of Quadratic Polynomials, vol I-II. Book in preparation, 500 pp.