


Krzysztof Barański

Curriculum Vitae

University of Warsaw
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Degrees

- 1992 **MSc in Mathematics**, University of Warsaw
Thesis: *Hausdorff dimension of Julia sets of meromorphic functions*
Advisor: Feliks Przytycki
- 1998 **PhD in Mathematics**, University of Warsaw
Thesis: *Iteration of rational maps: exotic Fatou components and their bifurcations*
Advisor: Feliks Przytycki
- 2009 **Habilitation in Mathematics**, University of Warsaw
Thesis: *Geometry of invariant sets in dynamical systems*
- 2021 **Professor in Mathematics**, Council of Scientific Excellence/President of Poland

Positions

- 1992–1999 Institute of Mathematics, University of Warsaw – Teaching Assistant
- 1999–2010 Institute of Mathematics, University of Warsaw – Assistant Professor
- 2003–2004 Institute of Mathematics of the Polish Academy of Sciences – Assistant Professor
- 2010–2021 Institute of Mathematics, University of Warsaw – Associate Professor
- 2022– Institute of Mathematics, University of Warsaw – Full Professor

Research interests

Dynamical systems, in particular iteration of holomorphic maps and geometry of fractal sets

Publications

- Krzysztof Barański
Hausdorff dimension and measures on Julia sets of some meromorphic maps
Fund. Math. 147 (1995), no. 3, 239–260.
- Krzysztof Barański
Connectedness of the basin of attraction for rational maps
Proc. Amer. Math. Soc. 126 (1998), no. 6, 1857–1866.
- Krzysztof Barański
From Newton's method to exotic basins, Part I: The parameter space
Fund. Math. 158 (1998), no. 3, 249–288.
- Krzysztof Barański, Alexander Volberg, Anna Zdunik
Brennan's conjecture and the Mandelbrot set
Internat. Math. Res. Notices 12 (1998), no. 12, 589–600.

- Krzysztof Barański
From Newton's method to exotic basins, Part II: Bifurcation of the Mandelbrot-like sets
Fund. Math. 168 (2001), no. 1, 1–55.
- Krzysztof Barański
On realizability of branched coverings of the sphere
Topology Appl. 116 (2001), no. 3, 279–291.
- Krzysztof Barański, Núria Fagella
Univalent Baker domains
Nonlinearity 14 (2001), no. 3, 411–429.
- Krzysztof Barański
On the complexification of the Weierstrass non-differentiable function
Ann. Acad. Sci. Fenn. Math. 27 (2002), no. 2, 325–339.
- Krzysztof Barański
Multifractal analysis on the flexed Sierpiński gasket
Ergodic Theory Dynam. Systems 25 (2005), no. 3, 731–757.
- Krzysztof Barański
On some lacunary power series
Michigan Math. J. 54 (2006), no. 1, 65–79.
- Krzysztof Barański
Hausdorff dimension of the limit sets of some planar geometric constructions
Adv. Math. 210 (2007), no. 1, 215–245.
- Krzysztof Barański
Trees and hairs for some hyperbolic entire maps of finite order
Math Z. 257 (2007), no. 1, 33–59.
- Krzysztof Barański, Bogusława Karpińska
Coding trees and boundaries of attracting basins for some entire maps
Nonlinearity 20 (2007), no. 2, 391–415.
- Krzysztof Barański
Hausdorff dimension of hairs and ends for entire maps of finite order
Math. Proc. Camb. Phil. Soc. 145 (2008), no. 3, 719–737.
- Krzysztof Barański
Hausdorff dimension of self-affine limit sets with an invariant direction
Discrete Continuous Dynam. Systems 21 (2008), no. 4, 1015–1023.
- Krzysztof Barański, Bogusława Karpińska, Anna Zdunik
Hyperbolic dimension of Julia sets of meromorphic maps with logarithmic tracts
Internat. Math. Res. Notices 2009 (2009), no. 4, 615–624.
- Krzysztof Barański, Bogusława Karpińska, Anna Zdunik
Dimension properties of the boundaries of exponential basins
Bull. Lond. Math. Soc. 42 (2010), no. 2, 210–220.
- Krzysztof Barański, Michał Misiurewicz
Omega-limit sets for the Stein-Ulam Spiral map
Topology Proc. 36 (2010), 145–172.
- Krzysztof Barański
On the dimension of graphs of Weierstrass-type functions with rapidly growing frequencies
Nonlinearity 25 (2012), no. 1, 193–209.

- Krzysztof Barański, Xavier Jarque, Lasse Rempe
Brushing the hairs of transcendental entire functions
Topology Appl. 159 (2012), no. 8, 2102–2114.
- Krzysztof Barański, Bogusława Karpińska, Anna Zdunik
Bowen's formula for meromorphic functions
Ergodic Theory Dynam. Systems 32 (2012), no. 4, 1165–1189.
- Krzysztof Barański, Balázs Bárány, Julia Romanowska
On the dimension of the graph of the classical Weierstrass function
Adv. Math. 265 (2014), 32–59.
- Krzysztof Barański, Núria Fagella, Xavier Jarque, Bogusława Karpińska
On the connectivity of the Julia sets of meromorphic functions
Invent. Math. 198 (2014), no. 3, 591–636.
- Krzysztof Barański
Dimension of the graphs of the Weierstrass-type functions
Fractal Geometry and Stochastics V, 77–91, Progr. Probab. 70,
Birkhäuser/Springer, Cham, 2015.
- Krzysztof Barański, Núria Fagella, Xavier Jarque, Bogusława Karpińska
Absorbing sets and Baker domains for holomorphic maps
J. London Math. Soc. 92 (2015), no. 1, 144–162.
- Krzysztof Barański, Michał Wardal
On the Hausdorff dimension of the Sierpiński Julia sets
Discrete Contin. Dyn. Syst. 35 (2015), no. 8, 3293–3313.
- Krzysztof Barański, Núria Fagella, Xavier Jarque, Bogusława Karpińska
Accesses to infinity from Fatou components
Trans. Amer. Math. Soc. 369 (2017), no. 3, 1835–1867.
- Krzysztof Barański, Bogusława Karpińska, Anna Zdunik
Conformal measures for meromorphic maps
Ann. Acad. Sci. Fenn. Math. 43 (2018), no. 1, 247–266.
- Krzysztof Barański, Núria Fagella, Xavier Jarque, Bogusława Karpińska
Connectivity of Julia sets of Newton maps: a unified approach
Rev. Mat. Iberoam. 34 (2018), no. 3, 1211–1228.
- Krzysztof Barański, Núria Fagella, Xavier Jarque, Bogusława Karpińska
Escaping points in the boundaries of Baker domains
J. Anal. Math. 137 (2019), no. 2, 679–706.
- Krzysztof Barański, Núria Fagella, Xavier Jarque, Bogusława Karpińska
Fatou components and singularities of meromorphic functions
Proc. Roy. Soc. Edinburgh Sect. A 150 (2020), no. 2, 633–654.
- Krzysztof Barański, Yonatan Gutman, Adam Śpiewak
A probabilistic Takens theorem
Nonlinearity 33 (2020), no. 9, 4940–4966.
- Krzysztof Barański, Adam Śpiewak
Singular stationary measures for random piecewise affine interval homeomorphisms
J. Dynam. Differential Equations 33 (2021), no. 1, 345–393.
- Krzysztof Barański, Yonatan Gutman, Adam Śpiewak
On the Shroer–Sauer–Ott–Yorke predictability conjecture for time-delay embeddings
Comm. Math. Phys. 391 (2022), no. 2, 609–641.

- Krzysztof Barański, Bogusława Karpińska
On the dimension of points which escape to infinity at given rate under exponential iteration
Ergodic Theory Dynam. Systems 42 (2022), no. 5, 1591–1623.
- Krzysztof Barański, Adam Śpiewak
On the dimension of stationary measures for random piecewise affine interval homeomorphisms
Ergodic Theory Dynam. Systems 44 (2024), no. 6, 1473–1488.
- Krzysztof Barański, Yonatan Gutman, Adam Śpiewak
Prediction of dynamical systems from time-delayed measurements with self-intersections
J. Math. Pures Appl. 186 (2024), 103–149.
- Krzysztof Barański, Yonatan Gutman, Adam Śpiewak
Regularity of almost-surely injective projections in Euclidean spaces
Ann. Sc. Norm. Super. Pisa Cl. Sci., to appear.

Conference talks

- 1994 *Hausdorff dimension and measures on Julia sets of some meromorphic maps*,
'Chaotic Dynamical Systems', Woudschoten, the Netherlands.
- 1998 *Iteration of cubic rational maps – exotic Fatou components*,
Banach Center Symposium 'Complex Dynamics and Hyperbolic Geometry',
Warsaw, Poland.
- 1998 *Iteration of cubic rational maps*,
'Questions de mesures et dimension en dynamique holomorphe', Luminy, France.
- 2000 *Univalent Baker domains*,
'International Conference on Dynamical Systems', Porto, Portugal.
- 2000 *Iteration of cubic rational maps: bifurcations of Mandelbrot-like sets*,
'PhD Euroconference on Complex Analysis and Holomorphic Dynamics',
Platja d'Aro, Spain.
- 2002 *On the complexification of the Weierstrass non-differentiable function*,
'New Directions in Dynamical Systems', Kyoto, Japan.
- 2002 *Rational-like maps*,
'Workshop on Real and Complex One-dimensional Holomorphic Dynamics',
Warwick, UK.
- 2003 *Hausdorff dimension of the limit sets of some geometric constructions*,
'Geometric Aspects of Dynamical Systems', Warwick, UK.
- 2005 *Coding trees for entire maps*,
'Conformal Dynamics, Hyperbolic Geometry, and Continued Fractions',
Luminy, France.
- 2006 *Geometry and ergodic properties of fractal limit sets for some planar dynamical systems*,
'Mathematical Takeoffs from Barcelona', Bellaterra, Spain.
- 2007 *Hausdorff dimension of the limit sets of some planar geometric constructions*,
'Convex and Fractal Geometry', Będlewo, Poland.
- 2007 *Julia sets of some hyperbolic entire maps of finite order*,
'Conformal Structures and Dynamics. The current state-of-art and perspectives', Warwick,
UK.

- 2007 *Dynamics of hyperbolic entire maps of finite order with one Fatou component*,
'First Joint International Meeting between the American Mathematical Society (AMS)
and the Polish Mathematical Society (PTM)', Warsaw, Poland.
- 2008 *Topology and geometry of Julia sets of entire maps with bounded set of singularities*,
'Dynamical Systems and Topology', Tossa de Mar, Spain.
- 2009 *Dimension of the boundaries of exponential basins*,
'Dynamical Systems II', Denton, USA.
- 2009 *Hyperbolic dimension of Julia sets of meromorphic maps with logarithmic tracts*,
'CODY Third Year Conference', Będlewo, Poland.
- 2009 *Escaping set in the boundaries of exponential basins*,
'The escaping set in transcendental dynamics', Oberwolfach, Germany.
- 2010 *Thermodynamic formalism for some meromorphic maps*,
'CODY Fourth Year Conference: Conformal Methods in Analysis and Dynamics', Seillac,
France.
- 2010 *Hausdorff dimension of the Sierpiński Julia sets*,
'The 8th AIMS Conference on Dynamical Systems, Differential Equations and Applica-
tions', Dresden, Germany.
- 2010 *Bowen's formula for non-hyperbolic meromorphic maps*,
'CODY Autumn in Warsaw – Transcendental Dynamics', Warsaw, Poland.
- 2010 *Omega-limit sets for the Stein–Ulam Spiral map*,
'CODY Autumn in Warsaw – Low-dimensional Dynamics', Warsaw, Poland.
- 2011 *On the graphs of non-differentiable functions of the Weierstrass type*,
'Fractals and Related Fields II', Porquerolles Island, France.
- 2012 *Bowen's formula for meromorphic functions*,
Mini-Workshop 'Thermodynamic Formalism, Geometry and Stochastics',
Oberwolfach, Germany.
- 2013 *Absorbing domains for meromorphic maps*,
'The Role of Complex Analysis in Complex Dynamics', Edinburgh, UK.
- 2013 *Thermodynamic formalism for transcendental entire maps*,
Summer school 'Topics in Complex Dynamics', Barcelona, Spain.
- 2013 *Dimension properties of the boundaries of exponential basins*,
Workshop on Holomorphic Dynamics 'Maps with essential singularities',
Holbæk, Denmark.
- 2014 *On the dimension of the graph of the classical Weierstrass function*,
'Fractal Geometry and Stochastics V', Tabarz, Germany.
- 2015 *Absorbing domains for holomorphic maps II*,
'2015 Joint Meeting of the American Mathematical Society, European Mathematical
Society and Sociedade Portuguesa de Matemática', Porto, Portugal.
- 2015 *Topological and geometric aspects of the dynamics of entire and meromorphic functions*,
'6. Forum of Polish Mathematicians', Warsaw, Poland.
- 2015 *Ergodic aspects of transcendental dynamics*,
'Ergodic Theory and Holomorphic Dynamics', Vienna, Austria.

- 2015 *Dimension of the graphs of the Weierstrass-type functions*,
'Fractal Geometry and Dynamics', Będlewo, Poland.
- 2016 *Dimension of the graphs of the Weierstrass-type functions*,
'Wandering Seminar – A mini-conference on Ergodic Theory and Dynamical Systems',
Warsaw, Poland.
- 2016 *Connectivity of Julia sets of Newton maps: A unified approach*,
contributed talk at the 7th European Congress of Mathematics, Berlin, Germany.
- 2016 *Thermodynamic formalism for meromorphic maps*,
'Analysis and Dynamics', Oaxaca, Mexico.
- 2017 *Thermodynamic formalism for meromorphic maps*,
'Thermodynamic formalism – Applications to geometry and number theory',
Bremen, Germany.
- 2017 *Elements of thermodynamic formalism for transcendental meromorphic maps*,
'Just a Little Calculation in Dynamics', Będlewo, Poland.
- 2018 *Accesses to infinity from Fatou components*,
'On geometric complexity of Julia sets', Będlewo, Poland.
- 2018 *Pressure and conformal measures for transcendental meromorphic maps*,
'Resonances of complex dynamics', Edinburgh, UK.
- 2019 *Dynamics of meromorphic maps on invariant Fatou components*,
'Topics in Complex Dynamics 2019', Barcelona, Spain.
- 2019 *Thermodynamic formalism for transcendental maps*,
'Dynamics, measures and dimensions', Będlewo, Poland.
- 2019 *Slow escaping points for transcendental maps*,
'Dynamics, Equations and Applications', Kraków, Poland.
- 2019 *Singular stationary measures for random interval homeomorphisms*,
'Topological and probabilistic methods in low dimensional dynamics',
Shanghai, China.
- 2019 *Probabilistic Takens delay embedding theorem*,
'Low-dimensional and Complex Dynamics', Lausanne, Switzerland.
- 2020 *On the dimension of points which escape to infinity at given rate under exponential iteration*,
'On geometric complexity of Julia sets – II',
Banach Center, Warsaw, Poland – online.
- 2021 *Typical behaviour of boundary points of Fatou components of transcendental maps*,
'Topics in Complex Dynamics 2021: Transcendental dynamics and beyond',
Centre de Recerca Matemàtica, Bellaterra, Spain – online.
- 2022 *Singular stationary measures for random interval homeomorphisms*,
'Fractals and Related Field IV', Porquerolles, France.
- 2023 *Prediction of dynamical systems*,
'The Spanish-Polish Mathematical Meeting', Łódź, Poland.
- 2024 *From cubic Newton maps to cubic polynomials – tour of Mandelbrot-like sets*,
'Parameter spaces in complex dynamics and related topics', Pisa, Italy.

Research visits

- 1998–1999 Centre de Recerca Matemàtica (CRM), Bellaterra, Spain
2003/04 Institute of Mathematics of the Polish Academy of Sciences, Warsaw, Poland
2011, 2013, Universitat de Barcelona, Barcelona, Spain
2014, 2015,
2016
2016 Centro Internazionale per la Ricerca Matematica (CIRM), Trento, Italy
2018 Centre de Recerca Matemàtica (CRM), Bellaterra, Spain
2019 Centro di Ricerca Matematica Ennio De Giorgi, Pisa, Italy
2021 Christian-Albrechts-Universität zu Kiel, Kiel, Germany
2021, 2022, Universitat de Barcelona, Barcelona, Spain
2023
2024 Centre de Recerca Matemàtica (CRM), Bellaterra, Spain

Research projects

- 1991–1993 *Iterations and Fractals*,
State Committee for Scientific Research, Poland, grant no. 210469101 (Investigator).
- 1994–1996 *Iterations and Fractals II*,
State Committee for Scientific Research, Poland, grant no. 2 P301 013 07
(Investigator).
- 1997–1999 *Iterations of Holomorphic Functions*,
State Committee for Scientific Research, Poland, grant no. 2 P03A 025 12
(Investigator).
- 1998–2002 *Probabilistic Methods in Non-Hyperbolic Dynamics (PRODYN)*,
European Science Foundation grant (Investigator).
- 1999–2002 *Iterations of Holomorphic Functions in Dimension 1 – Bifurcations, Non-holomorphic Disorders, Measures and Geometry*,
Foundation for Polish Science beneficiary (Scholarship Fellow).
- 1999–2002 *Iterations of Holomorphic Functions II*,
State Committee for Scientific Research, Poland, grant no. 2 P03A 009 17
(Investigator).
- 2003–2006 *Conformal Dynamical Systems and Geometry of Fractal Sets*,
State Committee for Scientific Research, Poland, grant no. 2 P03A 034 25
(Investigator).
- 2005–2009 *Deterministic and Stochastic Dynamics, Fractals, Turbulence (SPADE2)*,
European Commission (FP6-MOBILITY) grant no. 14508 (Investigator).
- 2007–2010 *Geometric and Ergodic Properties of Dynamical Systems*,
National Science Centre, Poland, grant no. N N201 0234 33 (Key Investigator).
- 2007–2010 *Conformal Structures and Dynamics (CODY)*,
European Commission (FP6-MOBILITY) grant no. 35651 (Key Investigator).
- 2011–2014 *Geometric and Ergodic Properties of Dynamical Systems II*,
National Science Centre, Poland, grant no. N N201 607940 (Key Investigator).

- 2013–2016 *Topological Properties of Invariant Sets in Transcendental Dynamics*, National Science Centre, Poland, HARMONIA grant for international cooperation no. 2012/06/M/ST1/00168 (Principal Investigator).
- 2015 *Methods of Dynamical Systems and Fractal Geometry in the Study of Complex Networks*, National Science Centre, Poland, PRELUDIUM grant no. 2014/13/N/ST1/02676 (Research Supervisor).
- 2015–2018 *Stochastic Methods in the Theory of Smooth Dynamical Systems*, National Science Centre, Poland, OPUS grant no. 2014/13/B/ST1/04551 (Key Investigator).
- 2019–2023 *Deterministic and Random Phenomena in Dynamical Systems*, National Science Centre, Poland, OPUS grant no. 2018/31/B/ST1/02495 (Principal Investigator).
- 2020–2023 *Probabilistic aspects of the Takens embedding theorem*, National Science Centre, Poland, PRELUDIUM grant no. 2019/33/N/ST1/01882 (Research Supervisor).
- 2024–2028 *Topological, geometric and ergodic problems of complex dynamics*, National Science Centre, Poland, OPUS grant no. 2023/51/B/ST1/00946 (Principal Investigator).

Scientific prizes and awards

- 1992 First prize in the Polish Mathematical Society J. Marcinkiewicz Competition
- 1998 Award from the Rector of the University of Warsaw for distinguished PhD thesis
- 1998/89 Fellowship from the Centre de Recerca Matemàtica, Bellaterra, Spain
- 2003/04 Research position at the Institute of Mathematics of the Polish Academy of Sciences
- 2007 Award from the Rector of the University of Warsaw for scientific research

Teaching

Mathematical Analysis, Differential Equations, Complex Analysis, Dynamical Systems, Ergodic Theory, Holomorphic Dynamics, Fractal Geometry

Organization of conferences and scientific events

- 1995 *Banach Center Symposium "Ergodic Theory and Dynamical Systems"*, Warsaw, Poland.
- 2005 *International Conference on Dynamical Systems in memory of Wiesław Szlenk*, Warsaw, Poland.
- 2008 *International Conference on Dynamical Systems in honour of Michał Misiurewicz on his 60th birthday*, Będlewo, Poland.
- 2009 *Conformal Structures and Dynamics (CODY) Third Year Conference*, Będlewo, Poland.
- 2010 *CODY Autumn in Warsaw*, Warsaw, Poland.
- 2012 *Ergodic Methods in Dynamics*, Będlewo, Poland.
- 2013 *International Conference Beyond Uniform Hyperbolicity*, Będlewo, Poland.
- 2014 *Mini-conference on Ergodic Theory and Dynamical Systems*, Warsaw, Poland.

- 2014 *Perspectives of Modern Complex Analysis*, Będlewo, Poland.
- 2015 *Janina Kotus Birthday Conference*, Warsaw, Poland.
- 2015 *Simons Semester in Banach Center: "Dynamical Systems"*, Warsaw, Poland.
- 2015 *Fractal Geometry and Dynamics*, Będlewo, Poland.
- 2016 *Harmonic Analysis, Complex Analysis, Spectral Theory and all that*, Będlewo, Poland.
- 2019 *Conference on Dynamical Systems Celebrating Michał Misiurewicz's 70th Birthday*, Kraków, Poland.
- 2019 *Jubilee Congress for the 100th anniversary of the Polish Mathematical Society – Dynamical Systems session*, Kraków, Poland.
- 2023 *Mini-semester "Modern holomorphic dynamics and related fields"*, Warsaw, Poland.
- 2023 *Simons Semester in Banach Center: "Topological, smooth and holomorphic dynamics, ergodic theory, fractals"*, Warsaw, Poland.
- 2023 *Complex Dynamics and related fields. From introductory minicourses to advanced topics*, Warsaw, Poland.
- 2023 *Complex dynamics: connections to other fields*, Chęciny, Poland.
- 2023 *Dynamics and Fractals*, Warsaw, Poland.