Maciej Zworski

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Research Interests

Partial Differential Equations, Microlocal Analysis, Scattering Theory.

Education

Massachusetts Institute of Technology *September 1985–June 1989*
Ph.D. in Mathematics
Thesis Advisor : Professor R.B. Melrose
Thesis title : High Frequency Scattering by a Convex Obstacle.

Massachusetts Institute of Technology *September 1983–June 1985*
S.B. in Mathematics.

Imperial College, London, U.K. *October 1982–June 1983*
B.Sc. programme in the Department of Mathematics.

Experience

Professor of Mathematics, University of California, Berkeley	*1998–date*
Vice-Chair for Faculty Affairs, Mathematics, UC Berkeley	*2006–2009*
Professor of Mathematics, University of Toronto	*1995–2000*
Professor of Mathematics, The Johns Hopkins University	*1994–1996*
Associate Professor of Mathematics, The Johns Hopkins University	*1992–1993*
Benjamin Peirce Lecturer, Harvard University	*1989–1992*

Professional Activities

Member, Scientific Advisory Panel of The Fields Institute, Toronto	*2024–date*
Founding Editor-in-Chief, Pure and Applied Analysis (Math Sci Publishers)	*2018–date*
Editor, Analysis & PDE (Math Sci Publishers)	*2016-date*
Chair, Conseil scientifique, Fondation mathématique Jacques Hadamard	*2011–2016*
Member, Board of Directors, Mathematical Science Publishers	*2011-2014*
Member, Scientific Advisory Panel of The Fields Institute, Toronto	*2009–2013*

Founding Editor-in-Chief, Analysis & PDE (Math Sci Publishers)	*2007–2016*
Editor, Applied Mathematics Research eXpress	*2006–2017*
Associate Editor, Inverse problems and imaging	*2006–date*
Associate Editor, American Journal of Mathematics	*2006–date*
Associate Editor, Canadian Journal of Mathematics	*2001–2006*
Editor, Methods and Applications of Analysis	*2001–date*
Editor, American Journal of Mathematics	*2000–2005*
Editor, International Mathematics Research Notices	*1998–2006*
Associate Editor, Duke Mathematical Journal	*1992–2000*

Fellowships and Honours

Wacław Sierpiński Medal of the Polish Mathematical Society	*2019*
Honorary Doctorate, Université de Paris-Sud	*2018*
Simons Fellow	*2017/18*
Miller Research Professor, University of California, Berkeley	*Fall 2015*
Faculty Mentor Award of the Graduate Assembly, UC Berkeley	*2014*
Chaire d'Excellence, *Université de Paris-Nord*	*2011*
Fellow of American Academy of Arts and Sciences	*2010–date*
Fellow of Royal Society of Canada	*1999–date*
Coxeter-James Prize of the Canadian Mathematical Society	*1999*
Fellow of Trinity College, University of Toronto	*1996–2000*
Alfred P. Sloan Research Fellow	*1991–1993*
Sloan Doctoral Dissertation Fellow	*1988–1989*
Jon A. Bucsela Prize in Mathematics, MIT	*1985*

Selected Lectures

Plenary talk at International Congress of Mathematical Physics, *Strasbourg*	*2024*
The Avron Douglis Memorial Lecture, University of Maryland	*2023*
Bernoulli Lecture, École polytechnique fédérale de Lausanne	*2021*
Plenary talk at Dynamics, Equations and Applications, *Cracow*	*2019*
Alexandra Bellow Distinguished Lecture Series, Northwestern University	*2017*
Distinguished Lecture Series, Heilbronn Institute, Bristol	*2017*
QMath 13 plenary speaker	*2016*
Public Lecture at the HKUST Jockey Club Institute for Advanced Study	*2014, 2016*
Rivière–Fabes Lectures, University of Minnesota	*2014*
Kempf Lectures, The Johns Hopkins University	*2013*
BMC/BAMC superplenary speaker	*2010*

Zygmund–Calderón Lectures, University of Chicago	*2008*
Andreas Floer Memorial Lecture, UC Berkeley	*2007*
Qmath 10 plenary speaker	*2007*
The van Winter Memorial Lecture, University of Kentucky	*2004*
ICM speaker in the PDE section	*2002*

Visiting Positions

Visiting Researcher, University College London	*February-April 2023*
Visiting Professor, Università di Bologna	*April-May 2018*
Visiting Researcher, Université de Paris-Sud, Orsay	*October-December 2017*
Visiting Professor, Institut Henri Poincaré	*June 2015*
Visiting Professor, Université de Paris-Sud, Orsay	*May 2009*
Visiting Directeur de Recherche*, CNRS, École Polytechnique*	*September-December 2004*
Visiting Professor, Université de Paris-Nord	*October 2003*
Visiting Professor, Université de Paris-Sud, Orsay	*September 2003*
Programme Organizer, MSRI	*January-May 2003*
Visiting Professor, Université de Paris-Sud, Orsay	*June 2002*
Programme Organizer, Erwin Schrödinger Institute, Vienna	*May–July 2001*
Visiting Professor, Université de Bordeaux I	*June 2000*
Visiting Professor, Université de Paris-Nord	*June 1999*
Visiting Directeur de Recherche*, CNRS, École Polytechnique*	*April–June, 1997*
Visiting Professor, Université de Nantes	*June 1996*
Visiting Professor, Institut Fourier, Grenoble	*June 1995*
Visiting Professor, Université de Paris-Nord	*June 1994*
Institute des Hautes Études Scientifiques	*September 1992–May 1993*
Visiting Professor, Université de Paris-Sud, Orsay	*May–June 1990*

Publications

[1] "On the Representation of P_0–lattices Being P–algebras."(with J. Klukowski), *Demonstratio Mathematica*, **18**(1) (1985), 103–114.
[2] "Distribution of poles for scattering on the real line" *J. of Funct. Anal.* **73**(3) (1987), 277–296.
[3] "Decomposition of normal currents." *Proc. Amer. Math. Soc.* **102** (4)(1988), 831-839.
[4] "Sharp polynomial bounds on the number of scattering poles of radial potentials." *J. of Funct. Anal.* **82**(2) (1989), 370–403.
[5] "Sharp polynomial bounds on the number of scattering poles." *Duke Math. J.* **59**(2) (1989), 311-323.
[6] "High frequency scattering by a convex obstacle." *Duke Math. J.* **61**(2) (1990), 545-634.

[7] "Shift of the shadow boundary in high frequency scattering." *Comm. Math. Phys.* **136** (1991), 141-156
[8] "Complex scaling and the distribution of scattering poles."(with J. Sjöstrand), *Jour. Amer. Math. Soc.* **4**(4) (1991), 729-769.
[9] "Distribution of scattering poles near the real axis."(with J. Sjöstrand), *Comm.PDE* **17** (1992), 1021-1035.
[10] "The remainder estimate in spectral accumulation for degenerating hyperbolic surfaces."(with L. Ji), *J. of Func. Anal.* **114** (1993), 412-420.
[11] "Lower bounds on the number of scattering poles."(with J. Sjöstrand), *Comm.PDE* **18** (1993), 847-858.
[12] "Estimates on the number of scattering poles near the real axis for strictly convex obstacles."(with J. Sjöstrand), *Ann. Inst. Fourier* **43**(3)(1993), 769-790.
[13] "Semilinear diffraction of conormal waves (joint work with Melrose and Sá Barreto)." Séminaire E.D.P. 1992-1993, École Polytechnique, II-1-II-21.
[14] "Finite volume surfaces with resonances far from the unitarity axis." (with R. Froese), *Int. Math. Research Notices* **10**(1993), 275-277.
[15] "Lower bounds on the number of scattering poles II." (with J. Sjöstrand), *J. Func. Anal.* **123**(2)(1994), 336-367.
[16] "Scattering matrix for asymptotically flat manifolds" Journées "Equations aux derivées partielles" 1994, Saint-Jean-de-Monts, XVII-1-XVII-14.
[17] "The complex scaling method for scattering by strictly convex obstacles." (with J. Sjöstrand), *Ark. för Math.* **33**(1)(1995), 135-172.
[18] "Upper bounds on the number of resonances on noncompact Riemann surfaces." (with L. Guillopé), *J. Func. Anal.* **129**(1995), 364-389.
[19] "Semilinear diffraction of conormal waves." (with R.B. Melrose and A. Sá Barreto), *Astérisque* **240**(1996).
[20] "An example of new singularities in semilinear interaction of a cusp and a plane." *Comm.PDE.* **19**(5&6)(1994), 901-909.
[21] "Polynomial bounds on the number of resonances for some complete spaces of constant negative curvature near infinity." (with L. Guillopé), *Asymp. Anal.* **11**(1995) 1-22.
[22] "Counting scattering poles." *Proceedings of the Taniguchi International Workshop* Spectral and Scattering Theory, M. Ikawa ed., Marcel Dekker, New York, Basel, Hong Kong, 1994.
[23] "Spectral asymptotics for manifolds with cylindrical ends." (with T. Christiansen), *Ann. Inst. Fourier* **45**(1)(1995), 251-263.
[24] "Existence of resonances in three dimensions." (with A. Sá Barreto), *Comm. Math. Phys.* **173**(2)(1995), 401-415.
[25] "Ergodicity of eigenfunctions for ergodic billiards." (with S. Zelditch), *Comm. Math. Phys.* **175**(3)(1996), 673-682.
[26] "Scattering metrics and geodesic flow at infinity." (with R.B. Melrose), *Invent. Math.* **124**(1996), 389-436.
[27] Appendix to "Density of resonances for strictly convex analytic obstacles." by J. Sjöstrand, *Can. J. Math.* **48**(2)(1996), 437-446.

[28] "Generic simplicity of resonances." (with F. Klopp), *Helv. Phys. Acta* **68**(1995), 531-538.
[29] "Harmonic functions of polynomial growth on some complete manifolds." (with T. Christiansen), *Geom. and Func. Anal.* **6**(4)(1996), 619-627.
[30] "Existence of resonances in potential scattering." (with A. Sá Barreto), *Comm. Pure and Applied Math.* **49**(12)(1996), 1271-1280.
[31] "Scattering asymptotics for Riemann surfaces." (with L. Guillopé), *Annals of Math.* **145**(1997), 597-660.
[32] "Distribution of resonances for spherical black holes." (with A. Sá Barreto), *Math. Res. Lett.* **4**(1)(1997), 103-121.
[33] "Poisson formulæ for resonances" Séminaire E.D.P. 1996-1997, École Polytechnique, XIII-1-XIII-12.
[34] "Distribution of resonances for convex co-compact hyperbolic surfaces" Journées "Equations aux derivées partielles" 1997, Saint-Jean-de-Monts, XVIII-1-XVIII-9.
[35] "Dimension of the limit set and the density of resonances for convex co-compact hyperbolic surfaces", *Invent. Math.* **136** (1999), 353-409.
[36] "From quasimodes to resonances" (with S.-H. Tang), *Math. Res. Lett.* **5** (1998), 261-272.
[37] "Wave trace for Riemann surfaces" (with L. Guillopé), *Geom. and Func. Anal.* 6 (1999), 1156-1168.
[38] "Asymptotic distribution of resonances for convex obstacles" (with J. Sjöstrand), *Acta Math.*, 183(2) (1999), 191-253.
[39] "Poisson formula for resonances in even dimensions", *Asian J. Math.* **2**(3), (1998), 615-624.
[40] "Spacing between phase shifts in a simple scattering problem", (with S. Zelditch), *Comm. Math. Phys.* **204** (1999), 709-729.
[41] "Breit-Wigner approximation and the distribution of resonances near the real axis", (with V. Petkov), *Comm. Math. Phys.* **204** (1999), 329-351.
[42] "Resonances in Physics and Geometry", *Notices Amer. Math. Soc.* **46**(3)(1999), 319-328.
[43] "Singular part of the scattering matrix determines the obstacle", *Osaka J. Math.* 38(2001), 13–20.
[44] "Distribution of resonances for asymptotically Euclidean manifolds", (with J. Wunsch), *J. Diff. Geom.* 55(2000), 43-82.
[45] "Resonant rigidity of S^2" (with A. Hassell), *J. Funct. Analysis.*, 169 (1999), 604-609.
[46] "The FBI transform on compact $\mathcal{C}^\infty$ manifolds", (with J. Wunsch), *Trans. Amer. Math. Soc.* 353 (2001), 1151-1167.
[47] "Semi-classical estimates in asymptotically euclidean scattering" (with A. Vasy), *Comm. Math. Phys.* 212(2000), 205-217.
[48] "Resonance wave expansions: two hyperbolic examples" (with T. Christiansen), *Comm. Math. Phys.* 212(2000), 323–336.
[49] "Resonance wave expansions of scattered waves" (with S.H. Tang), *Comm. Pure Appl. Math.* 53(2000), 1305–1334.

[50] "Scattering matrices and scattering geodesics of locally symmetric spaces" (with L. Ji), *Ann. Sci. Ec. Norm. Sup.* 34(2001), 441-469.
[51] "A remark on a paper by E.B. Davies", *Proc. A.M.S.* 29(2001), 2955-2957.
[52] "Resonance expansions in semi-classical propagation" (with N. Burq), *Comm. Math. Phys.* 232 (2001), 1-12.
[53] "Resonance expansions of scattered waves" Séminaire E.D.P. 1999-2000, École Polytechnique, XXII-1-XXII-8.
[54] Erratum "Breit-Wigner approximation and the distribution of resonances near the real axis", (with V. Petkov), *Comm. Math. Phys.* **214** (2000), 733-735.
[55] "A remark on isopolar potentials", *SIAM J. Math. Anal.* 82(6)(2001), 1823-1826.
[56] "Semi-classical estimates on the scattering determinant" (with V. Petkov), *Ann. H. Poincaré*, 2(2001), 675-711.
[57] "Numerical linear algebra and solvability of partial differential equations", *Comm. Math. Phys.* **229** (2002), 293-307.
[58] "Quantum resonances in chaotic scattering," (with Kevin Lin), *Chem. Phys. Lett.* 355(2002), 201-205.
[59] "Quantum monodromy and semiclassical trace formulae," (with Johannes Sjöstrand), *J. Math. Pure Appl.* 81 (2002), 1-33.
[60] "Correction and supplements to: Scattering matrices and scattering geodesics of locally symmetric spaces [Ann. Sci. École Norm. Sup. (4) 34 (2001), no. 3, 441–469" *Ann. Sci. École Norm. Sup.*(4) 35 (2002), no. 6, 897–901.
[61] "Scattering matrix in conformal geometry," (with C. Robin Graham), Séminaire E.D.P. 2000-2001, École Polytechnique, XXII-1-XXII-8.
[62] "Scattering matrix in conformal geometry," (with C. Robin Graham), *Invent. Math.* 152(2003), 89-118.
[63] "Birkhoff normal forms in semi-classical inverse problems" (with Alexei Iantchenko and Johannes Sjöstrand), *Math. Res. Lett.* 9(2002), 337-362.
[64] "Pseudospectra in automorphic scattering" (with Tanya Christiansen), *Forum Math.* 16(2004), 681-694
[65] "Fractal Weyl laws for chaotic open systems" (with Wentao Lu and Srinivas Sridhar), *Phys. Rev. Lett.* **91**(2003), 154101.
[66] "Resonance expansions of propagators in the presence of potential barriers" (with Shu Nakamura and Plamen Stefanov), *J. Funct. Anal.*, **205**(2003), 180-205.
[67] "Quantum resonances and partial differential equations" Proc. I.C.M. 2002, vol III, 243-252.
[68] "The Selberg zeta function for convex co-compact Schottky groups" (with L. Guillopé and K. Lin), *Comm. Math. Phys.* 245 (2004), 149 - 176.
[69] "Pseudospectra of semiclassical (pseudo)differential operators" (with N. Dencker and J. Sjöstrand), *Comm. Pure. Appl. Math.* **57**(2004), 384-415.
[70] "Geometric control in the presence of a black box" (with N. Burq), *Journal of A.M.S.*, 17 (2004), 443-471.
[71] "Bouncing ball modes and quantum chaos" (with N. Burq), *SIAM Review*, 47(5), 2005, 43-49.

[72] "Elementary linear algebra for advanced spectral problems" (with J. Sjöstrand), *Annales de l'Institut Fourier*, 57(2007), 2095–2141.
[73] "Growth of the zeta function for a quadratic map and the dimension of the Julia set" (with John Strain), *Nonlinearity*, 17(5), 2004, 1607–1622.
[74] "Instability for the semi-classical non-linear Schrödinger operator" (with Nicolas Burq), *Comm. Math. Phys.*, 260(2005), 45-58.
[75] "Control theory and high energy eigenfunctions", (with Nicolas Burq), Journées "Équations aux Dérivées Partielles", Exp. No. XIII, 10 pp., École Polytech., Palaiseau, 2004.
[76] "Fractal Weyl laws for quantum resonances." Séminaire: Équations aux Dérivées Partielles. 2004–2005, Exp. No. IV, 29 pp., École Polytech., Palaiseau, 2005.
[77] "Quantum decay rates in chaotic scattering", (with S. Nonnenmacher), Séminaire: Équations aux Dérivées Partielles. 2005–2006, Exp. No. XXII, 6 pp., École Polytech., Palaiseau, 2006.
[78] "Fractal upper bounds on the density of semiclassical resonances" (with Johannes Sjöstrand), *Duke Math. J.* 137 (2007), 381–459.
[79] "Distribution of resonances for open quantum maps", (with Stephane Nonnenmacher), *Comm. Math. Phys.* 269(2007), 311-365.
[80] "Fractal Weyl laws in discrete models of chaotic scattering" (with Stéphane Nonnenmacher), *Journal of Physics A*, 38 (2005), 10683-1070
[81] "On dissipation induced destabilization and brake sqeal: a structured pseudospectral perspective" (with Oliver O'Reilly, Patrick Kessler, and Annelise Raphael), *Journal of Sound and Vibration*, 308(2007), 1-11.
[82] "Fast soliton scattering by delta impurities" (with Justin Holmer and Jeremy Marzuola), *Comm. Math. Phys.* 274(2007), 187-216.
[83] "Soliton splitting by external delta potentials" (with Justin Holmer and Jeremy Marzuola), *J. of Nonlinear Science,* 17(2007), 349-367.
[84] "Semiclassical L^p estimates" (with Herbert Koch and Daniel Tataru), *Annales Henri Poincaré* 8(2007), 885-916.
[85] "Slow soliton interaction with external delta potentials" (with Justin Holmer), *J. of Modern Dynamics*, 1(2007), 689–718.
[86] "Symmetry of bound and antibound states in the semiclassical limit" (with David Bindel), *Lett. Math. Phys.* 81(2007), 107-117.
[87] "Theory and computation of resonances in 1d scattering" (with David Bindel), online presentation, including MATLAB codes, http://www.cims.nyu.edu/~dbindel/resonant1d/
[88] "Soliton interaction with slowly varying potentials" (with Justin Holmer), *Int. Math. Res. Notices*, 2008 (2008), Art. ID runn026, 36 pp.
[89] "Breathing patterns in nonlinear relaxation" (with Justin Holmer), *Nonlinearity*, 22(2009), 1259–1301.
[90] "A mathematical formulation of the Mahaux-Weidenmüller formula for the scattering matrix" (with Tanya J. Christiansen), *J. Phys. A: Math. Theor.*, 42(2009) 415202.
[91] "Quantum decay rates in chaotic scattering" (with Stéphane Nonnenmacher), *Acta Math.*, 203(2)(2009), 149–233.
[92] "Semiclassical resolvent estimates in chaotic scattering" (with Stéphane Nonnenmacher), Applied Mathematics Research eXpress 2009; doi: 10.1093/amrx/abp003.

[93] "Probabilistic Weyl laws for quantized tori" (with Tanya J. Christiansen), *Comm. Math. Phys.* 299(2)(2010), 305—334.
[94] "Effective dynamics of double solitons for perturbed mKdV" (with Justin Holmer and Galina Perelman), *Comm. Math. Phys.* 305(3)(2011), 363–425.
[95] "Resolvent estimates for normally hyperbolic trapped sets" (with J. Wunsch), *Ann. Inst. Henri Poincaré (A)*, 12(7)(2011), 1349–1385.
[96] "From open quantum systems to open quantum maps" (with Stéphane Nonnenmacher and J. Sjöstrand), *Comm. Math. Phys.* 304(1)(2011), 1–48.
[97] "Control for Schrödinger operators on tori" (with N. Burq), *Math. Res. Lett.* 19(2)(2012), 309–324.
[98] "Weighted eigenfunction estimates with applications to compressed sensing" (with N. Burq, S. Dyatlov and R. Ward), *SIAM J. Math. Analysis.* 44(5)(2012), 3481–3501.
[99] "Semiclassical Analysis", *Graduate Studies in Mathematics* **138***, American Mathematical Society,* 2012.
[100] "Quantum ergodicity for restrictions to hypersurfaces" (with S. Dyatlov), *Nonlinearity,* 26(2013), 35–52.
[101] "A quantitative version of Catlin-D'Angelo-Quillen theorem" (with A. Drouot) *Analysis and Mathematical Physics,* 3(2013), 1–19.
[102] "Sharp polynomial bounds on the number of Pollicott-Ruelle resonances" (with K. Datchev and S. Dyatlov), *Ergodic Theory and Dynamical Systems,* 34(2014), 1168–1183.
[103] "Weyl asymptotics: from closed to open systems" (with A. Potzuweit, T. Weich, S. Barkhofen, U. Kuhl and H.-J. Stöckmann), *Physical Review E,* 86, 066205(2012).
[104] "Pointwise bounds on quasimodes of semiclassical Schrodinger operators in dimension two" (with Hart F. Smith), *Math. Res. Lett.* 20(2013), 401–408.
[105] "Experimental observation of spectral gap in microwave n-disk systems" (with S. Barkhofen, T. Weich, A. Potzuweit, U. Kuhl and H.-J. Stöckmann), *Phys. Rev. Lett.* 110, 164102(2013).
[106] "Control for Schrödinger operators on 2-tori: rough potentials" (with J. Bourgain and N. Burq), *J. Eur. Math. Soc.* 15, 1597–1628(2013).
[107] "Fractal Weyl law for open quantum chaotic maps" (with Stéphane Nonnenmacher and Johannes Sjöstrand), *Annals of Math.* 179(1)(2014), 179–251.
[108] "Decay of correlations for normally hyperbolic trapping", (with Stéphane Nonnenmacher), *Invent. Math.* 200(2)(2015), 345–438.
[109] "Trapping of waves and null geodesics for rotating black holes", (with Semyon Dyatlov), *Physical Review D* 88, 084037(2013)[8 pages].
[110] "Dynamical zeta functions for Anosov flows via microlocal analysis", (with Semyon Dyatlov), *Ann. Sci. École Norm. Sup.* 49(2016), 543–577.
[111] "Resonances and lower resolvent bounds", (with Kiril Datchev and Semyon Dyatlov), *Journal of Spectral Theory,* 5(2015), 599–615.
[112] "Stochastic stability of Pollicott-Ruelle resonances" (with Semyon Dyatlov,) *Nonlinearity*, 28(2015), 3511–3534.
[113] "Heat traces and existence of scattering resonances for bounded potentials" (with Hart F. Smith), *Ann. Inst. Fourier*, 66(2016), 455–475.

[114] "A local trace formula for Anosov flows" (with Long Jin and an appendix by Frédéric Naud), *Ann. Inst. Henri Poincaré (A)*, 18(2017), 1–35.
[115] "Scattering resonances as viscosity limits" "Algebraic and Analytic Microlocal Analysis", M. Hitrik, D. Tamarkin, B. Tsygan, and S. Zelditch, eds. Springer, 2018.
[116] "Resonances for asymptotically hyperbolic manifolds: Vasy's method revisited," *Journal of Spectral Theory*, 6(2016), 1087–1114.
[117] "A Fermi golden rule for quantum graphs", (with Minjae Lee) *Journal of Mathematical Physics*, 57(2016), 092101, 17 pp.
[118] "Ruelle zeta function at zero for surfaces", (with Semyon Dyatlov), *Invent. Math.* 210(2017), 211–229.
[119] "Mathematical study of scattering resonances," *Bull. Math. Sci* 7(2017), 1–85.
[120] "Remarks on Vasy's operator with analytic coefficients", (with Gilles Lebeau) *Proc. Amer. Math. Soc.* 147(2019), 145–152.
[121] "Resonances for obstacles in hyperbolic space", (with Peter Hintz), *Comm. Math. Phys.* 359(2018), 699–731.
[122] "Wave decay for star-shaped obstacles in $\mathbb{R}^3$: papers of Morawetz and Ralston revisited", (with Peter Hintz), *Math. Proc. R. Ir. Acad.* 117A(2017), 47–62.
[123] "A semiclassical approach to the Kramers–Smoluchowski equation", (with Laurent Michel), *SIAM J. Math. Anal.* 50(2018), 5362–5379.
[124] "Fractal uncertainty for transfer operators", (with Semyon Dyatlov), *Int. Math. Res. Notices*, 2020, no. 3, 781–812.
[125] "Rough controls for Schrödinger operators on 2-tori", (with Nicolas Burq), *Annales Henri Lebesgue*, 2(2019), 331–347.
[126] "Magnetic oscillations in a model of graphene", (with Simon Becker), *Comm. Math. Phys.* 367(2019), 941–989.
[127] "Microlocal analysis of forced waves", (with Semyon Dyatlov), *Pure and Applied Analysis*, 1(2019), 359–394.
[128] "Mathematical Theory of Scattering Resonances", (with Semyon Dyatlov), *Graduate Studies in Mathematics* **200**, *American Mathematical Society*, 2019.
[129] "An introduction to microlocal complex deformations", (with Jeff Galkowski), arXiv:1912.09845, expository companion to [130].
[130] "Viscosity limits for 0th order pseudodifferential operators", (with Jeff Galkowski), *Communication in Pure and Applied Mathematics*, 75(2022), 1798-1869.
[131] "Analytic hypoellipticity of Keldysh operators", (with Jeff Galkowski), *Proc. London Math. Soc.* (3)(2021), 1–19.
[132] "Outgoing solutions via Gevrey-2 properties", (with Jeff Galkowski), *Annals of PDE*, 7(2021).
[133] "Mathematics of magic angles in a model of twisted bilayer graphene", (with Simon Becker, Mark Embree and Jens Wittsten), *Probability and Mathematical Physics*, 3(2022), 69–103.
[134] "Spectral characterization of magic angles in twisted bilayer graphene", (with with Simon Becker, Mark Embree and Jens Wittsten), *Phys. Rev. B* 103, 165113, 2021.
[135] "Honeycomb structures in magnetic fields," (with Simon Becker, Rui Han and Svetlana Jitomirskaya), *Journal of Physics A*, 2021, vol.54, no.34, 345203.

[136] "Mathematics of internal waves in a 2D aquarium", (with Semyon Dyatlov and Jian Wang), to appear in *Analysis & PDE*.
[137] "Fine structure of flat bands in a chiral model of magic angles", (with Simon Becker and Tristan Humbert), submitted, arXiv:2208.01628.
[138] "Integrability in the chiral model of magic angles", (with Simon Becker and Tristan Humbert), *Comm. Math. Phys.* 403(2023), 1153–1169.
[139] "The scattering phase: seen at last", (with Jeffrey Galkowski, Pierre Marchand and Jian Wang), *SIAM Journal on Applied Mathematics*, 84(2024), 246–261.
[140] "From the chiral model of TBG to the Bistritzer-MacDonald model" (with Simon Becker) *J. Math. Phys.* 65 (2024), no. 6, Paper No. 062103, 13 pp.
[141] "Dirac points for twisted bilayer graphene with in-plane magnetic field", *J. Spectr. Theory* 14 (2024), no. 2, 479–511.
[142] "Degenerate flat bands in twisted bilayer graphene", (with Simon Becker and Tristan Humbert), preprint, arXiv:306.02909.
[143] "An abstract formulation of the flat band condition", (with Jeffrey Galkowski), arXiv:2307.04896, to appear in AMS Contemporary Mathematics volume in honor of Steve Zelditch.
[144] "Mathematical results on the chiral model of twisted bilayer graphene", (with an appendix by Mengxuan Yang and Zhongkai Tao), arXiv:2310.20642, to appear in *Journal of Spectral Theory*.
[145] "Classically forbidden regions in the chiral model of twisted bilayer graphene." (with Michael Hitrik and an appendix joint with Zhongkai Tao), submitted, arXiv:2310.19140.
[146] "Optimal enhanced dissipation for contact Anosov flows", (with Zhongkai Tao), submitted, arXiv:2311.01000.
[147] "Classical-Quantum correspondence in Lindblad evolution," (with Jeffrey Galkowski), submitted, arXiv:2403.09345.
[148] "Discrete vs. continuous in the semiclassical limit", (with Simon Becker and Jens Wittsten), submitted, arXiv:2406.05934.
[149] "Overdamped QNM for Schwarzschild black holes", (with Michael Hitrik), preprint, arXiv:2406.15924.

Personal Information

Born in 1963 in Wrocław, Poland. Polish and Canadian Citizenships, U.S. Permanent Resident.