

# CURRICULUM VITAE

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## ACADEMIC DEGREES:

- ◇ **PhD** degree in Mathematics, University of Missouri at Columbia, USA, May 2005. Thesis advisor Professor Marius Mitrea. Thesis title “The Poisson Problem in Lipschitz Domains”.
- ◇ Full Higher Education in the specialty Applied Mathematics (equivalent to **MS**), Kharkiv National University, Ukraine, June 2001.
- ◇ Full Higher Education in the specialty Finance (equivalent to **MBA**), Kharkiv Institute of Social Progress, Ukraine, September 2001.

## ACADEMIC POSITIONS:

- ◇ August 2008 – present  
Assistant Professor, Purdue University, West Lafayette, IN, USA
- ◇ July 2007 – December 2007  
Visiting Assistant Professor, Brown University, Providence, RI, USA
- ◇ January 2006 – August 2008  
Zassenhaus Visiting Assistant Professor, The Ohio State University, Columbus, OH, USA
- ◇ July 2005 – December 2005  
Visiting Assistant Professor, Australian National University, Canberra, ACT, Australia

## RESEARCH INTERESTS:

- ◇ *Partial differential equations*: elliptic differential equations and systems in non-smooth media, boundary value problems, regularity, potential theory, spectral theory, wave propagation and localization of the eigenmodes in rough domains.
- ◇ *Analysis*: harmonic analysis, singular integral operators, maximal functions, function spaces, wavelet and atomic decompositions, interpolation, functional calculus of differential operators, operator theory.
- ◇ *Geometric measure theory*: geometry of rough domains, non-linear capacity, rectifiability, connections with Analysis.

## GRANTS, AWARDS AND HONORS:

- ◇ NSF Faculty Early Career Development (CAREER) Award, 2011–2016.
- ◇ Alfred P. Sloan Research Fellowship, 2010–2012.
- ◇ US National Science Foundation Grant DMS 0758500, 2008–2011.  
Title of project: *Elliptic boundary value problems, harmonic analysis and spectral theory*.
- ◇ The Association for Women in Mathematics, Travel Grant, Summer 2007.
- ◇ Degree with Honors, Kharkiv National University, Ukraine, June 2001.
- ◇ Honors Fellowship, Kharkiv National University, Ukraine, September 1997–June 1999.

## PUBLICATIONS

### Refereed publications:

- ◇ *The connections between Dirichlet, Regularity and Neumann problems for second order elliptic operators with complex bounded measurable coefficients*, **Advances in Mathematics** 225 (2010), 1786–1819.
- ◇ *Boundedness of the gradient of a solution and Wiener test of order one for the biharmonic equation* (with Vladimir Maz'ya), **Inventiones Mathematicae**, 175 (2009), no. 2, 287–334.

- ◇ *Strong localization induced by one clamped point in thin plate vibrations* (with Marcel Filoche), **Physical Review Letters**, Volume: 103, Issue: 25, Article Number: 254301, (2009).
- ◇ *Finite square function implies integer dimension* (with Alexander Volberg), **Comptes Rendus - Mathématique** 347 (2009), pp. 1271–1276.
- ◇ *Hardy and BMO spaces associated to divergence form elliptic operators* (with Steve Hofmann), **Mathematische Annalen**, 344 (2009), no. 1, 37–116.
- ◇ *Boundedness of the square function and rectifiability* (with Alexander Volberg), **Comptes Rendus - Mathématique** 347 (2009), pp. 1051–1056.
- ◇ *Pointwise estimates for the polyharmonic Green function in general domains* (with Vladimir Maz'ya), Cialdea, Alberto (ed.) et al., **Analysis, partial differential equations and applications**. The Vladimir Maz'ya anniversary volume. Selected papers of the international workshop, Rome, Italy, June 30–July 3, 2008. Basel: Birkhäuser. Operator Theory: Advances and Applications 193, 143–158 (2009).
- ◇ *Boundedness of the Hessian of a biharmonic function in a convex domain* (with Vladimir Maz'ya), **Comm. Partial Differential Equations** 33 (2008), no. 7–9, 1439–1454.
- ◇ *Interpolation of Hardy-Sobolev-Besov-Triebel-Lizorkin spaces and applications to problems in partial differential equations* (with Nigel Kalton and Marius Mitrea), **Interpolation Theory and Applications, Contemporary Mathematics**, 445 (2007), 121–177.
- ◇ *The Poisson problem for the Lamé system on low-dimensional Lipschitz domains* (with Marius Mitrea), **Integral methods in science and engineering**, 137–160, Birkhauser Boston, Boston, MA, 2006.
- ◇ *Layer potentials and boundary value problems for Laplacian in Lipschitz domains with data in quasi-Banach Besov spaces* (with Marius Mitrea), **Annali di Matematica Pura ed Applicata** (4) 185 (2006), no. 2, 155–187.
- ◇ *Sharp estimates for Green potentials on non-smooth domains* (with Marius Mitrea), **Mathematical Research Letters**, 11 (2004), 481–492.
- ◇ *Square-function estimates for singular integrals and applications to partial differential equations* (with Marius Mitrea), **Differential Integral Equations**, 17 (2004), no. 7–8, 873–892.

- ◇ *On one approach to the solution of problems of numerical analysis of the electrostatic field*, Collection of the scientific works of KISP, V. 6 (2001), 223–227.

**In press:**

- ◇ *The solution of the Chang-Krantz-Stein conjecture* (with Marius Mitrea), to appear in *Proceedings of the Workshop in Harmonic Analysis*, Tokyo, Japan.

**Submitted:**

- ◇ *Riesz transforms and functional calculus in Sobolev spaces for divergence form elliptic operators* (with Alan McIntosh and Steve Hofmann), submitted to *Les Annales Scientifiques de l’Ecole Normale Supérieure*, accepted modulo minor revisions.
- ◇ *Correction to “Hardy and BMO spaces associated to divergence form elliptic operators”* (with Steve Hofmann), submitted.

**Manuscripts in preparation:**

- ◇ *Green potential estimates and the Poisson problem on Lipschitz domains* (with Marius Mitrea), in preparation.
- ◇ *Spectral properties of the operator pencils and regularity of the solution for the biharmonic equation on a non-smooth domain* (with Vladimir Maz’ya), in preparation.
- ◇ *The hidden landscape of localization* (with Marcel Filoche), in preparation.
- ◇ *The perturbation in BMO for second order elliptic boundary problems* (with Steve Hofmann, Carlos Kenig, and Jill Pipher), in preparation.
- ◇ *Regularity of solutions, capacity, and Wiener test for the polyharmonic equation* (with Vladimir Maz’ya), in preparation.
- ◇ *Perturbation of the boundary problems for second-order elliptic operators* (with Steve Hofmann), in preparation.
- ◇ *Localization of vibrations in non-homogeneous strings* (with Marcel Filoche and Brandon Patterson), in preparation.

## INVITED TALKS:

### 2010

- ◇ The Georgia Institute of Technology, Atlanta, GA, December 2010, *Square function, Riesz transform and rectifiability.*
- ◇ 2010 Fall Western Section Meeting, Los Angeles, CA, October 2010, *Square function, Riesz transform and rectifiability.*
- ◇ University of Helsinki, June 2010, *Elliptic PDEs, analysis and potential theory in non-smooth domains.*
- ◇ Université Paris-Sud, May 2010, *Analysis and potential theory for higher order PDEs in the domains of rough geometry.*
- ◇ Université Bordeaux 1, May 2010, *Analysis and potential theory for higher order elliptic equations.*
- ◇ Wabash Seminar, March 2010, *Weighted integral estimates, analysis and potential theory for higher order boundary problems.*
- ◇ University of Kentucky, March 2010, *Analysis and potential theory for higher order elliptic equations.*
- ◇ 2010 Spring Southeastern Sectional Meeting, Special Session on Complex Analysis and Potential Theory, Lexington, KY, March 2010, *Boundedness of the square function and rectifiability.*
- ◇ 2010 Spring Southeastern Sectional Meeting, Special Session on Function Theory, Harmonic Analysis, and Partial Differential Equations, Lexington, KY, March 2010, *The connections between Dirichlet, Regularity and Neumann problems for second order elliptic operators with complex bounded measurable coefficients.*
- ◇ Purdue University, March 2010, *Hadamard's Conjecture, Green Function Estimates and Potential Theory for Higher Order PDEs.*
- ◇ University of South Carolina, March 2010, *Analysis and potential theory for higher order elliptic equations.*
- ◇ Calderón-Zygmund Analysis Seminar, University of Chicago, February 2010, *Fine regularity properties of the solutions to the higher order elliptic equations.*

- ◇ Colloquium at Georgetown University, January 2010, *Harmonic analysis and elliptic equations in non-smooth domains*.

## 2009

- ◇ Fall Southeastern Meeting of the AMS, Boca Raton, FL, October 2009, *Square function, Riesz transform and rectifiability*.
- ◇ Conference on "Microlocal Analysis and Spectral Theory on Singular Spaces" Pennsylvania State University, State College, PA, October 2009, *Properties of the biharmonic functions: Hadamard's conjecture, regularity of the Green function and Wiener criterion*.
- ◇ Georgia Institute of Technology, April 2009, *Hadamard's conjecture, Green's function estimates and potential theory for higher order partial differential equations*
- ◇ Michigan State University, April 2009, *Hadamard's conjecture, Green's function estimates and potential theory for higher order partial differential equations*
- ◇ Brown University, February 2009, *Hadamard's conjecture, Green's function estimates and potential theory for higher order partial differential equations*.
- ◇ Colloquium at Washington University, St. Louis, MO, February 2009, *Harmonic analysis and elliptic equations in non-smooth domains*.
- ◇ University of Missouri, Columbia, MO, February 2009, *Hadamard's conjecture, Green's function estimates and potential theory for higher order partial differential equations*.
- ◇ The conference "Potential Theory and Analysis of Growth Processes", Laboratoire MAPMO, Université d'Orléans, France, January 2009, *Higher order elliptic problems in non-smooth domains*.
- ◇ Laboratoire Jacques-Louis Lions, Université Pierre et Marie Curie (Paris VI), January 2009, *Properties of solutions to the polyharmonic equation in arbitrary domains*.

## 2008

- ◇ Institute for Advanced Study, Princeton, NJ, October 2008, *Higher order elliptic boundary value problems*.

- ◇ Purdue University, October 2008, *Higher order capacity and regularity properties of polyharmonic functions in non-smooth domains.*
- ◇ The conference on the occasion of the 70th birthday of Vladimir Maz'ya "Analysis, PDEs and Applications", Rome, Italy, July 2008, *Regularity properties of solutions to higher order elliptic equations in non-smooth domains.*
- ◇ The conference "Recent Advances in Geometric Function Theory", Syracuse University, May 2008, *Regularity properties of polyharmonic functions in non-smooth domains.*
- ◇ The Second Workshop on Harmonic Analysis and Partial Differential Equations, Merida, Yucatan, Mexico, February 2008, *Higher order elliptic boundary value problems in non-smooth domains.*
- ◇ University of Oregon, January 2008, *Elliptic partial differential equations in non-smooth domains.*
- ◇ Lehigh University, January 2008, *Elliptic partial differential equations in non-smooth domains.*
- ◇ Michigan State University, January 2008, *Elliptic partial differential equations in non-smooth domains.*
- ◇ Syracuse University, January 2008, *Elliptic partial differential equations in non-smooth domains.*
- ◇ Purdue University, January 2008, *Elliptic partial differential equations in non-smooth domains.*

## 2007

- ◇ University of Minnesota, December 2007, *Elliptic partial differential equations in non-smooth domains.*
- ◇ University of Kentucky, December 2007, *Elliptic partial differential equations in non-smooth domains.*
- ◇ SIAM Conference on Analysis of PDE, Mesa, AZ, December 2007, *Regularity of the solutions to higher order elliptic equations on non-smooth domains.*
- ◇ Colloquium at Brown University, November 2007, *Elliptic partial differential equations in non-smooth domains.*

- ◇ Michigan State University, October 2007, *Regularity of solutions to the higher order elliptic equations.*
- ◇ 2007 Fall Western Section Meeting, University of New Mexico, Albuquerque, NM, October 2007, *Properties of solutions to the biharmonic equation on non-smooth domains.*
- ◇ 2007 Fall Central Section Meeting, DePaul University, Chicago, IL, October 2007, *Green function estimates and Wiener's test for the biharmonic equation.*
- ◇ Brown University, September 2007, *The solution of the Chang-Krantz-Stein conjecture.*
- ◇ Brown University, September 2007, *Higher order elliptic boundary value problems in non-smooth domains.*
- ◇ Instituto de Matemáticas, Cuernavaca, Mexico, Colloquium talk, May 2007, *Regularity of a biharmonic function on a non-smooth domain.*
- ◇ The VII Joint AMS-SMM Meeting, Zacatecas, Mexico, May 2007, *Boundedness and continuity of the gradient of a biharmonic function.*
- ◇ The Ohio State University, May 2007, *Regularity of a biharmonic function on a non-smooth domain.*

## 2006

- ◇ University of Missouri – Columbia, November 2006, *Boundedness of the gradient and the Hessian of a biharmonic function.*
- ◇ Syracuse University, November 2006, *The Dirichlet problem for the bilaplacian.*
- ◇ Brown University, October 2006, *Boundedness of the gradient and the Hessian of a biharmonic function.*
- ◇ Satellite Conference to the ICM-2006 “Harmonic and Geometrical Analysis with Applications to Partial Differential Equations”, Seville, Spain, August 2006, *Estimates for the solution to the biharmonic equation on an arbitrary domain.*
- ◇ The Ohio State University, May 2006, *Boundedness of the gradient and the Hessian of a biharmonic function.*
- ◇ 2006 Spring Central Sectional Meeting, University of Notre Dame, Notre Dame, IN, April 2006, *Hardy and BMO spaces associated to divergence form elliptic operators.*

- ◇ University of Missouri – Columbia, March 2006, *Hardy and BMO spaces associated to divergence form elliptic operators.*

## 2005

- ◇ Flinders University, Adelaide, Australia, November 2005, *Poisson problem on Lipschitz domains and solution of the Chang-Krantz-Stein conjecture.*
- ◇ Macquarie University, Sydney, Australia, October 2005, *Regularity of Green potentials on non-smooth domains and solution of the Chang-Krantz-Stein conjecture.*
- ◇ Australian National University, Canberra, Australia, August 2005, *Boundary value problems for Laplacian in Lipschitz domains and solution of the Chang-Krantz-Stein conjecture.*
- ◇ Ohio State University, February 2005, *The regularity of Green potentials and the solution of the Chang-Krantz-Stein conjecture.*

## 2004

- ◇ The 7th International Conference on Harmonic Analysis and PDEs, El Escorial, Madrid (Spain), June 2004, *Elliptic boundary value problems on non-smooth domains with data in Besov and Triebel-Lizorkin spaces.*
- ◇ The 2nd Symposium on Analysis and PDEs, Purdue University, June 2004, *Sharp estimates for Green potentials on non-smooth domains.*
- ◇ Show Me Analysis Meeting, University of Missouri-Columbia, June 2004, *On the regularity of Green potentials on non-smooth domains.*
- ◇ The 29th Spring Lecture Series in the Mathematical Sciences, Recent Developments in Applied Harmonic Analysis: Multiscale Geometric Analysis, Fayetteville, Arkansas, April 2004, *Envelopes of Besov and Triebel-Lizorkin spaces.*
- ◇ 2004 AMS Spring Southeastern Section Meeting, Tallahassee, Florida, March 2004, *The Poisson problem with optimal Besov and Triebel-Lizorkin estimates on non-smooth domains.*
- ◇ University of Missouri – Columbia, February 2004, *On the regularity of Green potentials on non-smooth domains.*

- ◇ University of Tuebingen, Germany, January 2004, *The Poisson problem for Laplacian in Lipschitz domains.*
- ◇ University of Ulm, Germany, January 2004, *Estimates for Green potential in irregular domains.*

## 2003

- ◇ University of Missouri – Columbia, October 2003, *The Poisson Problem in Lipschitz Domains with Sobolev-Besov Data.*
- ◇ The 6-th TULKA Internet Seminar “Operator matrices and delay semigroups,” Heinrich-Fabri Institut, Blaubeuren, June 2003, *Operators with Wentzell-Robin Boundary Conditions.*
- ◇ The 6-th New Mexico Analysis Seminar, Albuquerque, New Mexico, March 2003, *Layer Potentials and Boundary Value Problems for the Laplace’s Equation in Quasi-Banach Sobolev-Besov Spaces on Lipschitz Domains.*
- ◇ University of Missouri – Columbia, February 2003, *Elliptic Boundary Value Problems in Lipschitz Domains with Data in Quasi-Banach Spaces.*

## CONFERENCES AND WORKSHOPS ORGANIZED:

- ◇ Workshop for Women in Analysis and PDE, yearly in the Spring/Summer of 2012–2016, supported by the NSF CAREER grant (see above) and College of Science of Purdue University.
- ◇ Workshop “Weighted singular integral operators and Non-Homogeneous Harmonic Analysis” (with A. Volberg and M. Reguera), American Institute of Mathematics, Palo Alto, CA, tentatively October 10–14, 2011.
- ◇ Special Session on Harmonic Analysis and Partial Differential Equations at Joint Mathematics Meetings #1067 (with T. Toro), New Orleans, LA, January 6–9, 2011.
- ◇ Special Session on Harmonic Analysis at the 2010 Fall Eastern Sectional Meeting #1062 (with D. Bilyk), October 2-3, 2010, Syracuse University, Syracuse, NY.
- ◇ Research in Teams, Banff International Research Station, “*Boundary problems for the second order elliptic equations with rough coefficients*” (with S. Hofmann, C. Kenig and J. Pipher), April 18–25, 2010.

## STUDENTS AND POSTDOCTORAL RESEARCHERS:

- ◇ *Graduate:* Koushik Ramachandran is working on asymptotics of harmonic functions in rough paraboloid-shaped domains (supervised by Svitlana Mayboroda jointly with Alexandre Eremenko). He is finishing the manuscript of the first paper and has been invited to give a presentation at the Joint Mathematics Meeting in January of 2011.
- ◇ *Postdoctoral:* Ariel Barton has started as a Golomb Visiting Assistant Professor at Purdue University in Fall 2010. She has obtained her PhD degree from the University of Chicago under the supervision of Carlos Kenig, and is working on the higher order elliptic problems on Lipschitz domains (mentored by Svitlana Mayboroda).
- ◇ *Undergraduate research:* Brandon Patterson has been working on localization of vibrations in non-homogeneous strings (supervised by Svitlana Mayboroda), and is currently finishing the manuscript of the resulting paper (see Manuscripts in Preparation above).

## REFEREEING:

- ◇ Inventiones Mathematicae
- ◇ Journal of Functional Analysis (3 papers)
- ◇ Transactions of the American Mathematical Society (2 papers)
- ◇ Proceedings of London Mathematical Society
- ◇ Journal of Mathematical Analysis and Applications (2 papers)
- ◇ Advanced Nonlinear Studies
- ◇ Revista Matemática Iberoamericana
- ◇ Central European Journal of Mathematics
- ◇ Electronic Journal of Differential Equations
- ◇ Quarterly of Applied Mathematics
- ◇ Discrete and Continuous Dynamical Systems - Series S
- ◇ Journal of Inequalities and Applications

## **OTHER SYNERGISTIC ACTIVITIES:**

### **Supporting the groups underrepresented in mathematics:**

- ◇ organizer of the Workshop for Women in Analysis and PDE (see above)
- ◇ mentor in the Association for Women in Mathematics Mentor Network
- ◇ member of the Association for Women in Mathematics
- ◇ mentor of the female postdoctoral scholar, Ariel Barton (see above)
- ◇ active participant of the Women in Science Program

### **Promoting interdisciplinary interactions:**

- ◇ collaboration with physicists (Ecole Polytechnique), applied mathematicians (Ecole Normale Supérieure–Cachan), engineers (Université Bordeaux I): this work has resulted in a publication in Physical Review Letters, and two more manuscripts are currently in preparation.

## **TEACHING EXPERIENCE:**

- ◇ *Differential Equations and Partial Differential Equations for Engineering and the Sciences*, Fall 2008, Purdue University. Student evaluations: 4.8 out of 5 and 4.7 out of 5 (two sections).
- ◇ *Ordinary Differential Equations*, Fall 2009, Fall 2010, Purdue University. Student Evaluations: 4.6 out of 5 and 4.3 out of 5.
- ◇ *Accelerated Calculus with Analytic Geometry II*, Winter 2008, the Ohio State University.
- ◇ *Multivariable Calculus*, Fall 2007, Brown University.
- ◇ *Introduction to Real Analysis* (various levels), Fall 2006, Winter 2007, Spring 2007, Spring 2008, the Ohio State University.
- ◇ *Analytic Geometry and Calculus I*, Fall 2004, University of Missouri-Columbia, Winter 2006, The Ohio State University.
- ◇ *Calculus II*, Fall 2003, University of Missouri-Columbia
- ◇ *Elements of Calculus*, Winter 2003, Winter 2004, Winter 2005, University of Missouri-Columbia
- ◇ *College Algebra for Calculus Bound Students*, Fall 2002, University of Missouri-Columbia