

# Svitlana Mayboroda

School of Mathematics  
University of Minnesota  
127 Vincent Hall  
206 Church St. SE.  
Minneapolis, MN 55455

Phone: 1-612-624-4001

email: [svitlana@math.umn.edu](mailto:svitlana@math.umn.edu)

URL: <http://www.math.umn.edu/~svitlana>

Born: June 2, 1981 – Kharkiv, Ukraine

## Academic Degrees:

- 2005     **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”.
- 2001     Full Higher Education in the specialty Applied Mathematics (equivalent to **MS**), Kharkiv National University, Ukraine, June 2001.
- 2001     Full Higher Education in the specialty Finance (equivalent to **MBA**), KISP, Ukraine, September 2001.

## Academic Positions:

- 2015–     Full Professor, University of Minnesota, USA
- 2011–2015     Associate Professor, University of Minnesota, USA
- 2008–2011     Assistant Professor (promoted to Associate Professor from August 2011), Purdue University, USA
- 2007     Visiting Assistant Professor, Brown University, USA
- 2006–2008     Zassenhaus Visiting Assistant Professor, The Ohio State University, USA
- 2005     Visiting Assistant Professor, Australian National University, Australia

## Research Interests:

### PARTIAL DIFFERENTIAL EQUATIONS:

second and higher order 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, free boundary problems, harmonic/elliptic measure.

### 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, Analysis and PDEs on uniformly rectifiable sets, harmonic measure, regularity of free boundaries.

#### PHYSICS:

influence of rough geometry and/or material on properties of a physical system, localization of waves in acoustics, plate vibration, Anderson localization, quantum physics, systems of cold atoms.

#### ENGINEERING:

analysis and design of GaN light emitting devices, the impact of disorder in nitride alloy materials on localization of carriers in quantum wells, radiative efficiency, Auger recombination, quantum droop, on performance of LEDs and lasers.

### Current membership in professional organizations:

American Mathematical Society  
Association for Women in Mathematics

### Grants, awards, and honors:

2015	Fellow of the American Mathematical Society
2015	NSF, The Eighteenth Rivière-Fabes Symposium, co-PI, 2015
2015	Fondation Jacques Hadamard Fellowship, 2015
2014	AWM-Sadosky Prize in Analysis, 2014
2014	Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) Award, 2014–2019, \$800,000.00, <i>“INSPIRE Track 1:” Localization: analysis, control, and design of waves in inhomogeneous media.</i>
2014	NSF, The Seventeenth Rivière-Fabes Symposium, co-PI, 2014.
2013	Ecole Polytechnique, 2013, chercheur invité, 2 months
2011	NSF Faculty Early Career Development (CAREER) Award, 2011–2016, \$410,000.00, <i>CAREER: Analysis of Partial Differential Equations in non-smooth media</i> ,
2013	CNRS, Projets Exploratoires Pluridisciplinaires (PEPS 2013), Physique Théorique et ses Interfaces, <i>“Théorie géométrico-analytique de la localisation”</i> , collaborator, 2013.
2013	NSF DMS 1304998, The Sixteenth Rivière-Fabes Symposium, co-PI, 2013.
2012	CNRS, 2012, chercheur invité, 3 mois
2012	CNRS, Projets Exploratoires Pluridisciplinaires (PEPS 2012), Physique Théorique et ses Interfaces, <i>“Théorie géométrique de la localisation”</i> , collaborator, 2012.
2012	NSF MRSEC (Materials Research Science and Engineering Center) Seed, MRSEC III Award DMR 0819885, 2011–2014. The project was chosen for NSF MRSEC Seed highlights in 2012.
2010	Alfred P. Sloan Research Fellowship, 2010–2015, \$50,000.00.
2010	Farman Project, ENS Cachan, France, collaborator, January–December 2010.
2008	NSF Grant DMS 0758500 (individual disciplinary grant, Analysis program), 2008–2011, <i>Elliptic Boundary Value Problems, Harmonic Analysis and Spectral Theory</i> ,
2007	The Association for Women in Mathematics, Travel Grant, Summer 2007.
2001	Degree with Honors, Kharkiv National University, Ukraine, June 2001.
1997	Honors Fellowship, Kharkiv National University, Ukraine, September 1997– June 1999.

### Currently active funding:

2014–2019	Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) Award, PI, 2014–2019, \$800,000.00, <i>“INSPIRE Track 1:” Localization: analysis, control, and design of waves in</i>
-----------	---

- inhomogeneous media.*
- 2011–2016 NSF Faculty Early Career Development (CAREER) Award, PI, 2011–2016, \$410,000.00, *CAREER: Analysis of Partial Differential Equations in non-smooth media*,
- 2010–2015 Alfred P. Sloan Research Fellowship, 2010–2015, \$50,000.00.
- 2015 NSF, The Eighteenth Rivière-Fabes Symposium, co-PI, 2015.

## Publications

### SUBMITTED:

- 2015 *Rectifiability of harmonic measure* (with Jonas Azzam, Steve Hofmann, José María Martell, Mihalis Mourgoglou, Xavier Tolsa, and Alexander Volberg), submitted.
- 2015 *Harmonic measure is rectifiable if it is absolutely continuous with respect to the co-dimension one Hausdorff measure* (with Jonas Azzam, Steve Hofmann, José María Martell, Mihalis Mourgoglou, Xavier Tolsa, and Alexander Volberg), submitted.
- 2015 *Absolute continuity between the surface measure and harmonic measure implies rectifiability*, (with Steve Hofmann, José María Martell, Xavier Tolsa and Alexander Volberg), preprint  
<http://arxiv.org/abs/1507.04409>
- 2015 *The effective confining potential of quantum states in disordered media* (with Doug Arnold, Guy David, Marcel Filoche, and David Jerison), submitted.
- 2015 *Polyharmonic capacity and Wiener test of higher order* (with Vladimir Maz'ya), submitted
- 2015 *A free boundary problem for the localization of eigenfunction* (with Guy David, Marcel Filoche, David Jerison), a monograph, submitted
- 2015 *Higher-order elliptic equations in non-smooth domains: history and recent results* (with Ariel Barton), submitted

### PUBLISHED AND IN PRESS:

- 2015 *Uniform Rectifiability, Carleson measure estimates, and approximation of harmonic functions*, (with Steve Hofmann and Jose Maria Martell), *Duke Math. J.*, accepted.
- 2015 *Maximal function characterizations of Hardy spaces associated to homogeneous higher order elliptic operators* (with Dachun Yang and Jun Cao), *Forum Mathematicum*, accepted.
- 2015 *Local Hardy spaces associated with inhomogeneous higher order elliptic operators* (with Dachun Yang and Jun Cao), *Analysis and Applications*, accepted
- 2015 *Dual hidden landscapes in Anderson localization on discrete lattices* (with Marcel Filoche, Marcelo Lyra), *Europhys. Lett. EPL*, accepted.
- 2015  *$L^p$  and endpoint solvability results for divergence form elliptic equations with complex  $L^\infty$  coefficients* (with Steve Hofmann and Mihalis Mourgoglou), *Advances in Mathematics*, 270 (2015), 480–564.
- 2015 *Layer potentials and boundary-value problems for second order elliptic operators with data in Besov spaces* (with Ariel Barton), *Memoirs of the AMS*, accepted.
- 2015 *The Regularity problem for second order elliptic operators with real non-symmetric coefficients* (with Steve Hofmann, Carlos Kenig, and Jill Pipher), *Mathematische Annalen*, 361 (2015), no. 3-4, 863–907.
- 2015 *Square function/non-tangential maximal function estimates and the Dirichlet problem for non-symmetric elliptic operators* (with Steve Hofmann, Carlos Kenig, and Jill Pipher), *Journal of the American Mathematical Society*, *J. Amer. Math. Soc.* 28 (2015), no. 2, 483–529.  
<http://www.ams.org/journals/jams/0000-000-00/S0894-0347-2014-00805-5/S0894-0347-2014-00805-5.pdf>
- 2014 *Regularity of solutions to the polyharmonic equation in general domains* (with Vladimir Maz'ya), *Inventiones Mathematicae*, 196 (2014), no. 1, 1–68.  
<http://dx.doi.org/10.1007/s00222-013-0464-1>.

- 2014 *Uniform Rectifiability and Harmonic Measure III: Riesz transform bounds imply uniform rectifiability of boundaries of 1-sided NTA domains* (with Steve Hofmann and Jose Maria Martell), *International Mathematics Research Notices*, 2014, no. 10, 2702–2729. <http://dx.doi.org/10.1093/imrn/rnt002>.
- 2014 *Boundary-value problems for higher-order elliptic equations in non-smooth domains* (with Ariel Barton), *Concrete operators, spectral theory, operators in harmonic analysis and approximation*, 53–93, *Oper. Theory Adv. Appl.*, 236, Birkhäuser Springer, Basel, 2014.
- 2013 *The Dirichlet problem for higher order equations in composition form* (with Ariel Barton), *Journal of Functional Analysis*, Volume 265, Issue 1, (2013), 49–107, <http://dx.doi.org/10.1016/j.jfa.2013.03.013>.
- 2013 *The landscape of Anderson localization in a disordered medium* (with Marcel Filoche), *Contemporary Mathematics*, 601 (2013), 113–121, <http://dx.doi.org/10.1090/conm/601/11916>.
- 2012 *Universal mechanism for Anderson and weak localization* (with Marcel Filoche), *Proceedings of the National Academy of Sciences*, 2012 109 (37) 14761–14766; published ahead of print August 27, 2012, doi:10.1073/pnas.1120432109
- 2012 *Localization of eigenfunctions of a one-dimensional elliptic operator* (with Marcel Filoche and Brandon Patterson), “Recent Advances in Harmonic Analysis and Partial Differential Equations”, *Contemporary Mathematics*, 581 (2012), 99–116, <http://dx.doi.org/10.1090/conm/581>
- 2011 *Second order elliptic operators with complex bounded measurable coefficients in  $L^p$ , Sobolev and Hardy spaces* (with Alan McIntosh and Steve Hofmann), *Les Annales Scientifiques de l’Ecole Normale Supérieure*, Volume 44, fascicule 5 (2011), 723–800.
- 2010 *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.
- 2009 *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.
- 2009 *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).
- 2009 *Finite square function implies integer dimension* (with Alexander Volberg), *Comptes Rendus - Mathématique* 347 (2009), pp. 1271–1276.
- 2009 *Hardy and BMO spaces associated to divergence form elliptic operators* (with Steve Hofmann), *Mathematische Annalen*, 344 (2009), no. 1, 37–116.
- 2009 *Boundedness of the square function and rectifiability* (with Alexander Volberg), *Comptes Rendus - Mathématique* 347 (2009), pp. 1051–1056.
- 2009 *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).
- 2008 *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.
- 2007 *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.
- 2007 *The solution of the Chang-Krantz-Stein conjecture* (with Marius Mitrea), to appear in *Proceedings of the Workshop in Harmonic Analysis, Tokyo, Japan*.
- 2006 *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.
- 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.
- 2004 *Sharp estimates for Green potentials on non-smooth domains* (with Marius Mitrea), *Mathematical Research Letters*, 11 (2004), 481–492.
- 2004 *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.
- 2001 *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.

TO BE SUBMITTED WITHIN 2-3 MONTHS:

- 2015 *Rectifiability of harmonic measure*, (with Jonas Azzam, Steve Hofmann, José María Martell, Mihalis Mourougolou, Xavier Tolsa and Alexander Volberg), in preparation.
- 2015 *The origin of strong localization of quantum states in disordered media*, (with Doug Arnold, Guy David, Marcel Filoche, and David Jerison), in preparation.
- 2015 *Carleson measure estimates and approximation of solutions in uniformly rectifiable domains* (with Steve Hofmann and Jose Maria Martell), in preparation.
- 2015 *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.

## Students and postdoctoral researchers

GRADUATE:

- 2009–2014 Koushik Ramachandran, Purdue University, graduated in May 2014.  
Koushik was working on asymptotics of harmonic functions in rough paraboloid-shaped domains (supervised by Svitlana Mayboroda jointly with Alexandre Eremenko). He has published the results of his dissertation and has moved on to a postdoctoral position at the Indian Statistical Institute (ISI) at Bangalore, India.
- 2013–... Jonathan Hill, University of Minnesota, is working on the properties of the Green function for elliptic operators with bounded measurable coefficients. He has showed that in the case of an elliptic operator with  $t$ -independent coefficients the Green potential exhibits appropriate mapping properties in weak- $L^p$  spaces (and this is sharp) and is moving towards considering more general operators and systems. In particular, he is working with Blair Davey on well-posedness of boundary problems for generalized Schrödinger operator. Jonathan and Blair have already proved the basic estimates of fundamental solutions, Green function, and Neumann Green function.
- 2015–... Nadia Ott, University of Minnesota, is a graduate student at the University of Minnesota. She is starting to work on the localization of eigenfunctions in disordered media (specifically, the decay properties of eigenfunctions and questions related to the density of states) under the supervision of Svitlana Mayboroda.

POSTDOCTORAL:

- 2015–... Joseph Feneuil, University of Minnesota, to start in September 2015.  
Joseph Feneuil has just graduated from the University of Grenoble, under the supervision of Emmanuel Russ. He is joining the University of Minnesota as a Dunham Jackson postdoctoral researcher in the Fall of 2015 to work under the supervision of Svitlana Mayboroda on harmonic analysis of elliptic boundary problems.
- 2014–2015 Stephen Lewis, University of Minnesota, September 2014 – January 2015.  
Stephen Lewis has obtained his PhD from the University of Washington in 2014, under the supervision of Tatiana Toro, and has started working under the supervision of Svitlana Mayboroda and

Douglas Arnold on localization of waves. He has left University of Minnesota in 2015 to work in industry.

2013–2015 Blair Davey, University of Minnesota, 2013–2015 Blair has obtained her PhD degree from the University of Chicago with Carlos Kenig. She has started working with Vladimir Sverak on unique continuation for elliptic and parabolic equations and with Svitlana Mayboroda on boundary value problems for Schrödinger-type elliptic operators. In this direction, Blair (together with S. Mayboroda’s graduate student, Jonathan Hill) has established pointwise bounds and regularity for fundamental solutions of general elliptic PDEs of Schrödinger type with bounded measurable coefficients, obtained the corresponding results for the Green function, and is currently working on the properties of the corresponding layer potentials. Blair has secured a tenure-track position at the CUNY, starting in the Fall of 2015.

2010–2013 Ariel Barton, Purdue University and University of Minnesota, 2010–2013. Ariel has obtained her PhD degree from the University of Chicago under the supervision of Carlos Kenig, and was working on the higher order elliptic problems on Lipschitz domains and second order problems with rough coefficients (mentored by Svitlana Mayboroda). During her postdoctoral studies, Ariel has finished 5 research papers, 3 of them jointly with Svitlana Mayboroda, 1 expository (see the list of publications above), and 1 monograph, jointly with Svitlana Mayboroda, accepted to *Memoirs of the AMS*. Ariel then held a position at the University of Missouri. She continued working on the higher order elliptic operators, specifically, well-posedness problems for divergence form elliptic PDEs with bounded measurable coefficients, under the supervision of Steve Hofmann and Svitlana Mayboroda. During this time, she has finished 1 paper on boundedness of layer potentials for higher order PDEs (joint with S. Mayboroda and S. Hofmann), an expository paper on recent developments in higher order elliptic theory (joint with S. Mayboroda) and the work on the fundamental solutions in this context (by herself). She has accepted a tenure-track position at the University of Arkansas, Fayetteville.

#### UNDERGRADUATE RESEARCH:

2015–... Zhongwei Yang, University of Minnesota, 2015 is starting the UROP (Undergraduate Research Opportunities Program) project under the supervision of Svitlana Mayboroda. He will be working on the properties of the landscape function for the Neumann problem, in concert with the localization of Neumann eigenfunctions.

2013 Ye Wang, University of Minnesota, 2013 has successfully completed a UROP (Undergraduate Research Opportunities Program) project on Localization of vibrations and conformal mappings. He has started as a graduate student at the NYU from the Fall of 2013.

2012 Yaowen Gu, University of Minnesota, 2012 has successfully completed a Senior Project on the Harmonic measure and Brownian motion.

2010–2011 Brandon Patterson, Purdue University, 2010–2011, has been working on localization of vibrations in non-homogeneous strings (supervised by Svitlana Mayboroda). The project resulted in a research paper (see *Refereed Publications* above). Brandon has presented our joint work at the CSESC conference (<http://csesc.purdue-siam.org/>) and won the Best Undergraduate Presentation Award. He is currently a graduate student at the University of Michigan, Ann Arbor.

2011 Landon Lehman, Purdue University, 2011 has been working on the study of dependence of Anderson localization on the characteristics of disorder (supervised by Svitlana Mayboroda and Ariel Barton). The resulting Report can be found on S. Mayboroda’s website, at [Landon](#) is now a graduate student at the University of Notre Dame.

#### Service and other synergistic activities:

2012, 2013, 2014 **Served on an NSF panel (2012, 2013, 2014)**

#### CONFERENCES AND WORKSHOPS ORGANIZED:

- 2017 MSRI program on Harmonic Analysis (with Michael Christ, Allan Greenleaf, Steven Hofmann, Michael Lacey, Betsy Stovall, Brian Street), January 17–May 26, 2017
- 2016 The Nineteenth Rivière-Fabes Symposium (lead organizer), University of Minnesota, April 15–17, 2015
- 2015 AIM SQuaRE program (with A. Barton, S. Hofmann, C. Kenig, and J. Pipher), American Institute of Mathematics, Palo Alto, CA, August 31–Sept 4, 2015.
- 2015 Institut Henri Poincaré, Research in Paris (with S. Hofmann, J.-M. Martell, X. Tolsa, A. Volberg), 15 June –15 July, 2015
- 2012–2016 Workshop for Women in Analysis and PDE, yearly in the Spring/Summer of 2012–2016  
*2012 edition:* May 30–June 2, 2012, at the Institute for Mathematics and its Applications, Minneapolis, MN, 47 participants,  
<http://www.ima.umn.edu/2011-2012/SW5.30-6.2.12/>  
*2015 edition:* May 22–25, 2015, at the Institute for Mathematics and its Applications, Minneapolis, MN  
<http://www.ima.umn.edu/2014-2015/SW5.28-31.15/>
- 2015 Banff Research Station, Research in Teams, Localization of eigenfunctions of elliptic operators (with D. Arnold, G. David, M. Filoche, D. Jerison), April 2015
- 2015 The Eighteenth Rivière-Fabes Symposium & Spring 2015 Midwest PDE Conference, University of Minnesota, April 17–19, 2015
- 2014 The Seventeenth Rivière-Fabes Symposium, University of Minnesota, April 25–27, 2014
- 2014 AIM SQuaRE program (with A. Barton, S. Hofmann, and J. Pipher), American Institute of Mathematics, Palo Alto, CA, April 21–25, 2014.
- 2013 The Sixteenth Rivière-Fabes Symposium, University of Minnesota, April 19–21, 2013
- 2012 AIM SQuaRE program (with S. Hofmann, C. Kenig and J. Pipher), American Institute of Mathematics, Palo Alto, CA, August 27–31, 2012.
- 2011 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.
- 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.
- 2010 Special Session on Harmonic Analysis at the 2010 Fall Eastern Sectional Meeting #1062 (with D. Bilyk), October 2–3, 2010, Syracuse University, Syracuse, NY.
- 2010 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.

#### REFEREEING:

a non-complete list, with (randomly) selected papers identified by years:

Inventiones Mathematicae; Duke Math Journal (2013); Advances in Mathematics (2012, 2011); Journal of Functional Analysis (3 papers); Advances in Differential Equations (2013); Mathematical Research Letters (2011); Transactions of the American Mathematical Society (5 papers, 2014, 2012, 2011, and before); Proceedings of London Mathematical Society (2 papers, 2012 and before); Publicacions Matemàtiques (2012); Communications on Pure and Applied Analysis (2014); Potential Analysis (2012); Journal of Mathematical Analysis and Applications (3 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; Advances in Acoustics and Vibration

#### SERVICE TO THE UNIVERSITY AND THE DEPARTMENT:

- 2015–2016 College of Science & Engineering Consultative Committee, Faculty Search Committee; Rivière-Fabes Symposium organizing committee; Visitor Program Committee
- 2014–2015 Dunham Jackson Postdoc Search Committee; Rivière-Fabes Symposium organizing committee; Ordway Visitor Committee
- 2013–2014 Faculty Search Committee; Rivière-Fabes Symposium organizing committee; Visitor Program Committee
- 2012–2013 Graduate Studies Committee; Rivière-Fabes Symposium organizing committee; Ordway Visitor Committee

#### SUPPORTING THE GROUPS UNDERREPRESENTED IN MATHEMATICS:

- 2012–2016 organizer of the Workshop for Women in Analysis and PDE (see above)  
faculty supervisor of the University group for Undergraduate Women in Mathematics, University of Minnesota
- 2012–... faculty supervisor of the AWM Chapter at the University of Minnesota
- 2011 in the Association for Women in Mathematics Mentor Network (mentored Dina Buric)

#### INTERDISCIPLINARY WORK:

physics (with M. Filoche, Ecole Polytechnique, D. Arnold, University of Minnesota, G. David, Université Paris Sud – Orsay, D. Jersion, MIT, V. Josse, Institut d’Optique, and others)

engineering (with J. Speck, University of California – Santa Barbara and C. Weisbuch, Ecole Polytechnique & University of California – Santa Barbara, P. Sebbah, Institut Langevin, and others)

This work has been supported by the NSF INSPIRE grant and the NSF MRSEC UMN grant. It resulted in 4 publications, in Physical Review Letters, Proceedings of the National Academy of Sciences, and Contemporary Mathematics (see Publications section), 1 is submitted, and 2 more are to be submitted within 2-3 months. It addresses wave localization in acoustics, plate vibration, quantum physics, and its role in LED engineering.

## Teaching Experience

- 2015 *Elementary Partial Differential Equations*, undergraduate, Fall 2015, University of Minnesota.
- 2014 *Real Analysis*, graduate, Fall 2014, University of Minnesota.
- 2014 *Theory of Partial Differential Equations – II*, graduate, Spring 2014, University of Minnesota.
- 2013 *Linear Algebra and Differential Equations*, undergraduate, Spring 2013, University of Minnesota.
- 2011 *Elementary Partial Differential Equations*, undergraduate, Fall 2011, University of Minnesota.
- 2011 *Introduction to Distributions*, graduate, reading course, Summer 2011, Purdue University.
- 2011 *Partial Differential Equations*, graduate, Spring 2011, Purdue University.
- 2010 *Localization of vibrations*, graduate, reading course, Spring and Fall 2010, Purdue University.
- 2009 *Ordinary Differential Equations*, undergraduate, Fall 2009, Fall 2010, Purdue University (2 sections each).
- 2008 *Differential Equations and Partial Differential Equations for Engineering and the Sciences*, undergraduate, Fall 2008, Purdue University.
- 2008 *Accelerated Calculus with Analytic Geometry II*, undergraduate, Winter 2008, the Ohio State University.
- 2007 *Multivariable Calculus*, undergraduate, Fall 2007, Brown University.
- 2006–2008 *Introduction to Real Analysis* (various levels, undergraduate/graduate), Fall 2006, Winter 2007, Spring 2007, Spring 2008, the Ohio State University.



- 2004, 2006 *Analytic Geometry and Calculus I*, undergraduate, Fall 2004, University of Missouri-Columbia, Winter 2006, The Ohio State University.
- 2003 *Calculus II*, undergraduate, Fall 2003, University of Missouri-Columbia
- 2003–2005 *Elements of Calculus*, undergraduate, Winter 2003, Winter 2004, Winter 2005, University of Missouri-Columbia
- 2002 *College Algebra for Calculus Bound Students*, undergraduate, Fall 2002, University of Missouri-Columbia

## Invited Talks

- 2015 Brandeis-Harvard-MIT-Northeastern Joint Mathematics Colloquium, October 2015
- 2015 Institut Henri Poincaré, Problèmes Spectraux en Physique Mathématique, June 2015
- 2015 Complex Analysis & Dynamical Systems VII, Naharia, Israel, May 2015
- 2015 Colloquium, Stanford University, April 2015
- 2015 Columbia University, April 2015
- 2015 Banff International Research Station, Workshop “Laplacians and Heat Kernels: Theory and Applications”, March 2015
- 2015 Workshop on Harmonic Analysis, Partial Differential Equations and Geometric Measure Theory, ICMAT, Campus de Cantoblanco, Madrid, January 12–16, 2015.
- 2014 Colloquium, Duke University, December 2014
- 2014 Institute for Computational and Experimental Research in Mathematics, Providence, RI, October 2014
- 2014 Colloquium, UC Berkeley, September 2014
- 2014 Invited address at the AMS meeting at the University of Wisconsin, Eau Claire, September 2014
- 2014 “Harmonic Analysis and Partial Differential Equations - Recent Developments and Future directions”, a conference in honor of Carlos Kenig, The University of Chicago, September 2014.
- 2014 Conference “Perspectives of Modern Complex Analysis”, the Banach Center conference place in Bedlewo, Poland, June 2014
- 2014 Conference “Recent advances in non-local and non-linear analysis: theory and applications”, Zurich, Switzerland, June 2014
- 2014 Trimester Program on Harmonic Analysis and Partial Differential Equations, “Introductory Workshop: Topics in Harmonic Analysis and PDEs”, the Hausdorff Research Institute, Bonn, Germany, June-July 2014
- 2014 73rd Midwest PDE Seminar, Northwestern University, May 10-11, 2014
- 2014 University of California – Santa Barbara, Colloquium, April 2014
- 2014 University of California – Santa Barbara, Applied Mathematics and PDE Seminar, April 2014
- 2014 Purdue University, Special Seminar, April 2014
- 2014 13th New Mexico Analysis Seminar, An afternoon in Honor of Cora Sadosky, Albuquerque, NM, April 2014
- 2014 Western Spring Sectional Meeting, Special Session on Harmonic Analysis and Operator Theory, Albuquerque, NM, April 2014
- 2014 University of Chicago, Calderón-Zygmund Analysis Seminar, January 2014
- 2014 2014 Joint Mathematics Meetings, Baltimore, AMS Special Session “Fractal Geometry: Mathematics of Fractals and Related Topics”, January 2014
- 2013 Mathematics and Mechanics in the Physical Sciences: A Tribute to James Serrin, November 2013.
- 2013 University of California – Santa Barbara, Materials Department Seminar, August 2013
- 2013 University of Minnesota, PDE Seminar, September 2013
- 2013 Fluid Mechanics and Singular Integrals, Seville, Spain, June 2013
- 2013 Research Term on Real Harmonic Analysis and Applications to PDE Madrid, June 2013

- 2013 University of Minnesota, Introduction to Research seminar, April 2013.
- 2013 Stanford University, Colloquium, March 2013.
- 2013 Stanford University, Analysis & PDE seminar, March 2013.
- 2013 Career Options for Women in Mathematical Sciences, The Institute for Mathematics and its Applications, March 2013.
- 2013 University of Wisconsin, Colloquium, February 2013.
- 2013 Stanford University, Analysis seminar, February 2013.
- 2012 Charles University, Prague, December 2012, *Hardy spaces and elliptic operators with non-smooth coefficients*
- 2012 Institut de mathematiques de Toulouse, Toulouse, France, November 2012, *Elliptic PDEs in rough media*
- 2012 Université Paris-Sud 11, Orsay, France, November 2012, *Analysis of higher order elliptic operators*
- 2012 International Workshop on Operator Theory and Applications, University of New South Wales, Sydney, Australia, July 2012, *Elliptic PDEs in rough media*
- 2012 School of Mathematical Sciences, Beijing Normal University, Beijing, China, June 2012, *Generalized Hardy, BMO, and Hölder spaces*
- 2012 School of Mathematical Sciences, Beijing Normal University, Beijing, China, June 2012, *Boundary value problems for second order elliptic operators with rough coefficients*
- 2012 School of Mathematical Sciences, Beijing Normal University, Beijing, China, June 2012, *Higher order elliptic boundary problems*
- 2012 School of Mathematical Sciences, Beijing Normal University, Beijing, China, June 2012, *Elliptic PDEs in rough media*
- 2012 The Arkansas Spring Lecture Series, Plenary Talk, Fayetteville, AR, March 2012, *Singular integrals, perturbation problems, boundary regularity, and harmonic measure for elliptic PDEs in rough media*
- 2012 Université Paris-Sud 11, Paris, March 2012, *Well-posedness in  $L^p$  for elliptic boundary value problems*
- 2012 The 28th annual Southeastern Analysis Meeting, Plenary Talk, University of Alabama in Tuscaloosa, Alabama, March 2012, *Elliptic PDEs, analysis, and potential theory in irregular media*
- 2012 The 28th annual Southeastern Analysis Meeting, Plenary talk, University of Alabama in Tuscaloosa, Alabama, March 2012, *Elliptic PDEs, analysis, and potential theory in irregular media*
- 2012 University of Minnesota, Colloquium, March 2012, *Elliptic PDEs, analysis, and potential theory in irregular media*
- 2011 Universitat Autònoma de Barcelona, Barcelona, Spain, December 2011, *Analysis and potential theory for higher order PDEs in the domains of rough geometry.*
- 2011 ICREA Conference on Approximation Theory and Fourier Analysis, Barcelona, Spain, December 2011, *Elliptic PDEs with rough coefficients.*
- 2011 AIM Workshop “Weighted singular integral operators and non-homogenous harmonic analysis”, Palo Alto, CA, USA, October 2011, *Riesz transforms and rectifiability.*
- 2011 International conference “Harmonic Analysis and Approximations, V” dedicated to 75th anniversary of academician Norair Arakelian, Armenia, September 2011, *Harmonic analysis and potential theory for higher order elliptic boundary problems.*
- 2011 “Complex analysis and its applications” International Conference dedicated to the 70th anniversary of A.F.Grishin, Kharkiv, Ukraine, August 2011, *Potential theory, analysis and elliptic boundary problems in rough domains.*
- 2011 International Workshop on Operator Theory and its Applications, Seville, Spain, July 2011, *Elliptic boundary problems with rough coefficients.*
- 2011 Ecole Normale Supérieure de Cachan, Paris, France, June 2011, *The hidden landscape of localization.*
- 2011 Ecole Polytechnique, Paris, France, June 2011, *The hidden landscape of localization.*
- 2011 University of Minnesota, Minneapolis, MN, April 2011, *Analysis of partial differential equations in non-smooth media.*

- 2011 University of South Carolina, Columbia, SC, February 2011, *Analysis of partial differential equations in non-smooth media*.
- 2011 The Georgia Institute of Technology, Atlanta, GA, February 2011, *Analysis of partial differential equations in non-smooth media*.
- 2011 Northeastern University, Boston, MA, January 2011, *Analysis of partial differential equations in non-smooth media*.
- 2010 The Georgia Institute of Technology, Atlanta, GA, December 2010, *Square function, Riesz transform and rectifiability*.
- 2010 2010 Fall Western Section Meeting, Los Angeles, CA, October 2010, *Square function, Riesz transform and rectifiability*.
- 2010 University of Helsinki, June 2010, *Elliptic PDEs, analysis and potential theory in non-smooth domains*.
- 2010 Université Paris-Sud, May 2010, *Analysis and potential theory for higher order PDEs in the domains of rough geometry*.
- 2010 Université Bordeaux 1, May 2010, *Analysis and potential theory for higher order elliptic equations*.
- 2010 Wabash Seminar, March 2010, *Weighted integral estimates, analysis and potential theory for higher order boundary problems*.
- 2010 University of Kentucky, March 2010, *Analysis and potential theory for higher order elliptic equations*.
- 2010 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 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*.
- 2010 Purdue University, March 2010, *Hadamard's Conjecture, Green Function Estimates and Potential Theory for Higher Order PDEs*.
- 2010 University of South Carolina, March 2010, *Analysis and potential theory for higher order elliptic equations*.
- 2010 Calderón-Zygmund Analysis Seminar, University of Chicago, February 2010, *Fine regularity properties of the solutions to the higher order elliptic equations*.
- 2010 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*.
- 2009 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*.
- 2009 Georgia Institute of Technology, April 2009, *Hadamard's conjecture, Green's function estimates and potential theory for higher order partial differential equations*
- 2009 Michigan State University, April 2009, *Hadamard's conjecture, Green's function estimates and potential theory for higher order partial differential equations*
- 2009 Brown University, February 2009, *Hadamard's conjecture, Green's function estimates and potential theory for higher order partial differential equations*.
- 2009 Colloquium at Washington University, St. Louis, MO, February 2009, *Harmonic analysis and elliptic equations in non-smooth domains*.
- 2009 University of Missouri, Columbia, MO, February 2009, *Hadamard's conjecture, Green's function estimates and potential theory for higher order partial differential equations*.
- 2009 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*.
- 2009 Laboratoire Jacques-Louis Lions, Université Pierre et Marie Curie (Paris VI), January 2009, *Proper-*

*ties of solutions to the polyharmonic equation in arbitrary domains.*

- 2008 Institute for Advanced Study, Princeton, NJ, October 2008, *Higher order elliptic boundary value problems.*
- 2008 Purdue University, October 2008, *Higher order capacity and regularity properties of polyharmonic functions in non-smooth domains.*
- 2008 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.*
- 2008 The conference "Recent Advances in Geometric Function Theory", Syracuse University, May 2008, *Regularity properties of polyharmonic functions in non-smooth domains.*
- 2008 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.*
- 2008 University of Oregon, January 2008, *Elliptic partial differential equations in non-smooth domains.*
- 2008 Lehigh University, January 2008, *Elliptic partial differential equations in non-smooth domains.*
- 2008 Michigan State University, January 2008, *Elliptic partial differential equations in non-smooth domains.*
- 2008 Syracuse University, January 2008, *Elliptic partial differential equations in non-smooth domains.*
- 2008 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.*
- 2007 University of Kentucky, December 2007, *Elliptic partial differential equations in non-smooth domains.*
- 2007 SIAM Conference on Analysis of PDE, Mesa, AZ, December 2007, *Regularity of the solutions to higher order elliptic equations on non-smooth domains.*
- 2007 Colloquium at Brown University, November 2007, *Elliptic partial differential equations in non-smooth domains.*
- 2007 Michigan State University, October 2007, *Regularity of solutions to the higher order elliptic equations.*
- 2007 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 2007 Fall Central Section Meeting, DePaul University, Chicago, IL, October 2007, *Green function estimates and Wiener's test for the biharmonic equation.*
- 2007 Brown University, September 2007, *The solution of the Chang-Krantz-Stein conjecture.*
- 2007 Brown University, September 2007, *Higher order elliptic boundary value problems in non-smooth domains.*
- 2007 Instituto de Matemáticas, Cuernavaca, Mexico, Colloquium talk, May 2007, *Regularity of a biharmonic function on a non-smooth domain.*
- 2007 The VII Joint AMS-SMM Meeting, Zacatecas, Mexico, May 2007, *Boundedness and continuity of the gradient of a biharmonic function.*
- 2007 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.*
- 2006 Syracuse University, November 2006, *The Dirichlet problem for the bilaplacian.*
- 2006 Brown University, October 2006, *Boundedness of the gradient and the Hessian of a biharmonic function.*
- 2006 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.*

- 2006 The Ohio State University, May 2006, *Boundedness of the gradient and the Hessian of a biharmonic function.*
- 2006 2006 Spring Central Sectional Meeting, University of Notre Dame, Notre Dame, IN, April 2006, *Hardy and BMO spaces associated to divergence form elliptic operators.*
- 2006 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.*
- 2005 Macquarie University, Sydney, Australia, October 2005, *Regularity of Green potentials on non-smooth domains and solution of the Chang-Krantz-Stein conjecture.*
- 2005 Australian National University, Canberra, Australia, August 2005, *Boundary value problems for Laplacian in Lipschitz domains and solution of the Chang-Krantz-Stein conjecture.*
- 2005 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.*
- 2004 The 2nd Symposium on Analysis and PDEs, Purdue University, June 2004, *Sharp estimates for Green potentials on non-smooth domains.*
- 2004 Show Me Analysis Meeting, University of Missouri-Columbia, June 2004, *On the regularity of Green potentials on non-smooth domains.*
- 2004 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 2004 AMS Spring Southeastern Section Meeting, Tallahassee, Florida, March 2004, *The Poisson problem with optimal Besov and Triebel-Lizorkin estimates on non-smooth domains.*
- 2004 University of Missouri – Columbia, February 2004, *On the regularity of Green potentials on non-smooth domains.*
- 2004 University of Tuebingen, Germany, January 2004, *The Poisson problem for Laplacian in Lipschitz domains.*
- 2004 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.*
- 2003 The 6-th TULKA Internet Seminar “Operator matrices and delay semigroups,” Heinrich-Fabri Institut, Blaubeuren, June 2003, *Operators with Wentzell-Robin Boundary Conditions.*
- 2003 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.*
- 2003 University of Missouri – Columbia, February 2003, *Elliptic Boundary Value Problems in Lipschitz Domains with Data in Quasi-Banach Spaces.*

Updated: October 4, 2015