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EDUCATION

- **Princeton University**, 1977-81; Ph.D., 1981,
Thesis: *Principal curvature and harmonic analysis*; advisor: E.M. Stein.
- **University of Chicago**, 1973-77; B.A., S.M., 1977.

POSITIONS

- **University of Rochester: Professor**, 1997 - ; **Chairman**, 2011 - 14;
Associate Prof., 1986-97; Assistant Prof., 1983 - 86.
- **Mathematical Sciences Research Institute, Berkeley**: Member, Fall 1987 & Fall 2010.
- **University of Washington**: Visiting Associate Professor, 1990 - 1991.
- **M.I.T.**: NSF Postdoctoral Research Fellow, 1981 - 1983.

RESEARCH INTERESTS

Harmonic and microlocal analysis, inverse problems, cloaking and transformation optics.

AWARDS & HONORS

- **Simons Foundation Fellowship**, Spring 2016.
- **Fellow of the AMS**, Class of 2015.
- Primary lecturer for **NSF-CBMS Regional Research Conference on *Mathematical Foundations of Transformation Optics***, Howard University, June, 2014. Monograph in preparation.
- **Sloan Research Fellowship**, Sept. 1990 - Sept. 1992
- **NSF Postdoctoral Research Fellowship**, July, 1981 - June, 1983

PROFESSIONAL ACTIVITIES

- At-large member, **Council of the A.M.S.**, Feb. 2013 - Jan. 2016
- Member, **A.M.S. Committee on the Profession**, 2013- ; **Chair**, Feb. 2014- Jan. 2016
- Co-organizer, **Fields Institute Program on Inverse Problems and Imaging**, Jan.-Aug. 2012
- Co-organizer, **A.M.S. Mathematical Research Community in Inverse Problems**, Snowbird, Utah, June, 2009

RESEARCH ARTICLES

1. Superdimensional metamaterial resonators (w/ H. Kettunen, Y. Kurylev, M. Lassas, G. Uhlmann), <http://arxiv.org/abs/1409.3608> (Sept. 2014), submitted.
2. On necklaces inside thin subsets of \mathbb{R}^d (w/ A. Iosevich, M. Pramanik), <http://arxiv.org/abs/1409.2588> (Sept. 2014), submitted.
3. A group-theoretic viewpoint on Erdős-Falconer problems and the Mattila integral (w/ A. Iosevich, B. Liu, E. Palsson), <http://arxiv.org/abs/1306.3598>; *Revista Mat. Iberoamer.*, to appear.
4. Restricted convolution inequalities, multilinear operators and applications, (w/ D. Geba, A. Iosevich, E. Palsson, E. Sawyer), *Math. Res. Lett.*, **20** (2013), 675-694.
5. Multilinear generalized Radon transforms and point configurations, (w/ L. Grafakos, A. Iosevich, E. Palsson), *Forum Math.*, published online Sept. 2013, DOI: 10.1515/forum-2013-0128.
6. On volumes determined by subsets of Euclidian space (w/ A. Iosevich, M. Mourgoglu), *Forum Math.*, **27**, no. 1, (2015), 635-646.
7. A multi-dimensional resolution of singularities with applications to analysis (w/ T. Collins, M. Pramanik), *Amer. Jour. of Math.*, **135** (2013), 1179-1252.
8. Cloaked electromagnetic, acoustic and quantum amplifiers via transformation optics (w/ Y. Kurylev, M. Lassas, U. Leonhardt, G. Uhlmann), *Proc. Nat. Acad. Sci.*, **109** (2012), 10169-10174.
9. Three point configurations determined by subsets of the Euclidian plane, a bilinear operator and applications to discrete geometry (w/ A. Iosevich), *Analysis and PDE*, **5-2** (2012), 397-409.
10. An FIO calculus for marine seismic imaging, II: Sobolev estimates (w/ R. Felea, M. Pramanik), *Math. Annalen*, **352** (2012), 293-337.
11. Cloaking a sensor via transformation optics, (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *Physical Review E*, **83** (2011), 016603.
12. Approximate quantum and acoustic cloaking (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *Jour. of Spectral Theory*, **1** (2011), 27-80.
13. Fourier integral operators with open umbrellas and seismic inversion for cusp caustics (w/ R. Felea), *Math. Res. Lett.*, **17** (2010), 867-886.

14. Approximate quantum cloaking and almost trapped states (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *Phys. Rev. Lett.*, **101** (2008), 220404.
15. Isotropic transformation optics: approximate and quantum cloaking (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *New Jour. Phys.*, **10**, 115024.
16. Electromagnetic wormholes via handlebody constructions, (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *Comm. Math. Phys.*, **281** (2008), 369-385.
17. An FIO calculus for marine seismic imaging: folds and cross-caps (w/ R. Felea), *Comm. in P.D.E.*, **33** (2008), 45-77.
18. Comment on “Scattering theory derivation of a 3D acoustic cloaking shell”, (w/ Y. Kurylev, M. Lassas, and G. Uhlmann), <http://arxiv.org/abs/0801.3279> (Jan. 2008), unpublished.
19. Electromagnetic wormholes and virtual magnetic monopoles from metamaterials, (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *Phys. Rev. Lett.*, **99** (2007), 183901. Featured as an Editors’ Suggestion. (**179 citations on scholar.google**).
20. Improvement of cylindrical cloaking with the SHS lining, (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *Optics Express* **15** (2007), 12717-12734.
21. Full-wave invisibility of active devices at all frequencies (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *Comm.. Math. Phys.*, **275** (2007), 749-789. (**217 citations on scholar.google**)
22. Ultrasound attenuation and thermo/photo/opto-acoustic tomography: theoretical foundation (w/ S. Patch), *Proc. SPIE* **6437**, *Photons Plus Ultrasound: Imaging and Sensing 2007*, 643726 (February 13, 2007); doi:10.1117/12.701161.
23. Oscillatory integral operators with homogeneous polynomial phases in several variables (w/ M. Pramanik, W. Tang), *Jour. Func. Analysis*, **244** (2007), 444-487.
24. Average decay for Fourier transforms of measures supported on curves (w/ L. Brandolini, G. Gigante, A. Iosevich, A. Seeger, G. Travaglini), *Jour. Geom. Analysis*, **17** (2007),15-40.
25. $L^p - L^{p'}$ estimates for overdetermined Radon transforms (w/ L. Brandolini and G. Travaglini), *Trans. A.M.S.*, **359** (2007), 2559-2575.
26. On nonuniqueness for Calderon’s inverse problem EIT (w/ M. Lassas, G. Uhlmann), *Math. Res.Lett.*, **10** (2003), 685-693. (**324 citations on scholar.google**)
27. Anisotropic conductivities that cannot be detected by EIT (w/ M. Lassas, G. Uhlmann), *Physiological Meas.*, **24** (2003), 413-419. (**279 citations on scholar.google**)
28. The Calderón problem for conormal potentials, I: Global uniqueness and reconstruction (w/ M. Lassas, G. Uhlmann), *Comm. Pure Applied Math.*, **55** (2003), 328-352.
29. Oscillatory and Fourier integral operators with degenerate canonical relations (w/ A. Seeger), in *Proc. of the 6th Int. Conf. on Harmonic Analysis and PDE (El Escorial 2000)*, P. Cifuentes, et al, eds., Barcelona, 2002.
30. Oscillatory integral operators with low-order degeneracies (w/ A. Seeger), *Duke Math. Jour.*, **112** (2002), 397 - 420.
31. Local uniqueness for the Dirichlet-to-Neumann map via the two-plane transform (w/ G. Uhlmann), *Duke Math. Jour.*, **108** (2001), 599-617.

32. Characteristic space-time estimates for the wave equation (w/ G. Uhlmann), *Math. Zeit.*, **236** (2001), 113-131.
33. Estimates for generalized Radon transforms in three and four dimensions (w/ A. Seeger, S. Wainger), in *Analysis, Geometry, Number Theory: The Mathematics of Leon Ehrenpreis*, Contemp. Math. **251**, Amer. Math. Soc., Providence, 2000.
34. On oscillatory integral operators with folding canonical relations (w/ A. Seeger), *Studia Math.*, **132** (1999), 125-239.
35. On X-ray transforms for rigid line complexes and integrals over curves in R^4 , (w/ A. Seeger, S. Wainger), *Proc. Amer. Math. Soc.*, **127** (1999), 3533-45.
36. Fourier integral operators with cusp singularities (w/ A. Seeger), *Amer. Jour. Math.*, **120** (1998), 1077-1119.
37. The modified Radon transform of Lax and Phillips in scattering theory (w/ G. Uhlmann), in *75 Years of Radon Transform*, S. Gindikin and P. Michor, eds., Int. Press, 1994.
38. Fourier integral operators with fold singularities (w/ A. Seeger), *Jour. Reine u. Angew. Math.*, **455** (1994), 35-56.
39. Recovering singularities of a potential from singularities of scattering data (w/ G. Uhlmann), *Comm. Math. Phys.*, **157** (1993), 549-572.
40. Microlocal analysis of the 2-plane transform (w/ G. Uhlmann), *Contemp. Math.* **140** (1992), 65-71.
41. Composition of some singular Fourier integral operators and estimates for restricted X-ray transforms, II (w/ G. Uhlmann), *Duke Math. Jour.*, **64** (1991), 415-444.
42. Microlocal techniques in integral geometry (w/ G. Uhlmann), in *Contemp. Math.* **113** (1990), 121-136.
43. Composition of some singular Fourier integral operators and estimates for restricted X-ray transforms (w/ G. Uhlmann), *Annales de l'Institut Fourier* **40** (1990), 443-466.
44. Estimates for singular Radon transform and pseudodifferential operators with singular symbols (w/ G. Uhlmann), *Jour. Func. Anal.*, **89** (1990), 202-232.
45. Nonlocal inversion formulas for the X-ray transform (w/ G. Uhlmann), *Duke Math. Jour.*, **58** (1989), 205-240.
46. Singular integrals with conical singularities, unpublished manuscript, 1985.
47. The first eigenvalue of a CR manifold, *Comm. in P.D.E.*, **10** (1985), 191-217.
48. Pointwise convergence of singular convolution operators, *Duke Math. Jour.*, **50** (1983), 1171-1199.
49. Principal curvature and harmonic analysis, *Indiana Univ. Math. Jour.*, **30** (1981), 519-538.

LECTURE NOTES, SURVEY ARTICLES, BOOK REVIEWS

1. Invisibility and Inverse Problems (w/ Y. Kurylev, M. Lassas, and G. Uhlmann), *Bulletin of the A.M.S.*, **46** (2009), 55-97. (**106 citations on scholar.google**)
2. Cloaking Devices, Electromagnetic Wormholes and Transformation Optics (w/ Y. Kurylev, M. Lassas, and G. Uhlmann), *SIAM Review*, **51** (2009), 3-33. (**140 citations on scholar.google**)
3. Review of “Fourier integrals in classical analysis” by Christopher Sogge, *Bulletin of the A.M.S.*, **30** (1994), 255-258.
4. Extensions of the Calderón-Zygmund theory of singular integrals, in *DIALEXIS*, Publications of the University of Crete, 1987, 11-39.

RECENT LECTURES AND COLLOQUIA

- George Boole Mathematical Sciences Conference, Cork, August, 2015
- Computational and Analytical Aspects of Image Reconstruction, ICERM, Providence, July, 2015
- Spectral and Analytic Inverse Problems, Inst. Henri Poincaré, Paris, May, 2015
- Distinguished Lectures on Inverse Problems; Helsinki, August, 2014
- 10th AIMS Conference; Madrid, July, 2014 (two talks)
- Conference in Honor of M. Cowling; Segovia, July, 2014
- CBMS-NSF Regional Conference (primary lecturer); Washington, D.C., June, 2014 (10 talks).
- Fourth Ohio River Analysis Meeting; Lexington, March, 2014
- Colloquium, Temple University; October, 2013
- Progress In Electromagnetics Research Symposium; Stockholm, August, 2013
- Conference in Honor of D.H. Phong; Columbia Univ., May, 2013
- Colloquium, SUNY-Binghamton; May, 2013

PH.D. THESES SUPERVISED

1. Spherical Maximal Operators with Multidimensional Parameter Sets, Young-Hwa Ha, May 1987; published in *Proc. Amer. Math. Soc.* **105** (1989), 401-412.
2. L^p Estimates for the Restricted X-ray transform, Hann-Tzong Wang, June 1987; published in *Trans. Amer. Math. Soc.*, **332** (1992), 793-822.

3. L^2 Estimates for Some Kakeya-type Maximal Operators, Jose Barrionuevo, October 1990; published in *Trans. Amer. Math. Soc.* **335** (1993), 667-682.
4. Microlocal Analysis of Some Isospectral Manifolds, Francisco Marhuenda, October 1990; published in *Trans. Amer. Math. Soc.* **343** (1994), 245-275.
5. The Ambrose Symbol of Fourier Integral Operators, Yong-Jia Ma, May 1993.
6. Oscillatory Integral Operators Related to the Two-Plane Transform, Shieh-Shun Fu; June 1997; published in *Forum Math.*, **11** (1999), 513-541.
7. Composition of Fourier integral operators with fold and blowdown singularities, Raluca Felea, April 2004; published in *Comm. P.D.E.* **30** (2005), 1717-1740, and *Inverse Prob.*, **23** (2007), 1519-1531.
8. Decay rates of oscillatory integral operators, Wan Tang, June 2004; published in *Forum Math.*, **18** (2006), 427-444.
9. L^p Norm estimates of eigenfunctions restricted to submanifolds, Rui Hu, May 2007; published in *Forum Math.* **21** (2009), 1021-1052.
10. Calderón's problem for Lipschitz piecewise smooth conductivities, Sung Eun Kim, May, 2007; published in *Inverse Prob.*, **24** (2008), 055016.
11. Fourier integral operators on Colombeau spaces, Emanuel Palsu-Andriescu, October, 2008.
12. Microlocal analysis of scattering data for nested conormal potentials, Suresh Eswarathasan, May, 2011; published in *Jour. Funct. Anal.* **262** (2012), 2100-2141.
13. Currently advising Denitza Gintcheva; graduation expected in May, 2016.

EXTERNAL SUPPORT

- **PI: NSF-DMS-1362271**, 7/2014-6/2017;
DMS-0853892, 7/2009 - 6/2014;
DMS-0551984, 7/2006 - 6/2009;
DMS-0138167, 7/2002 - 12/2005;
DMS-9877101, 7/1999 - 6/2002;
DMS-9531806, 7/1996 - 6/1999;
DMS-9301064, 7/1993 - 6/1996; DMS-9101298, 7/1991 - 6/1993;
DMS-88217111, 7/1989 - 6/1991; DMS-8601534, 7/1986 - 6/1988.
- **Simons Foundation Fellowship**: 7/2015 - 6/2016.
- **Co-PI**: DMS-1346808 for CBMS-NSF Regional Research Conf. at Howard Univ., 2/2014 -1/2015.
- **Sloan Research Fellowship**: 9/1990 - 9/1992.

RECENTLY REFEREED PAPERS FOR

Amer. Journal of Math. Math. Annalen, Cambridge Math. Proc., Duke Math. Jour., Jour. Fourier Analysis and Appl., Jour. Func. Analysis, Physical Review Letters, Physical Review A, B and E, Optics Express, Applied Physics A, Jour. Applied Phys., New Journal of Physics, Jour. Nonlinear Math. Phys., Nature Scientific Reports.