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EDUCATION

- **Princeton University**, 1977-81; Ph.D., 1981, advisor: E.M. Stein.
- **University of Chicago**, 1973-77; B.A., S.M., Mathematics, 1977.

POSITIONS

- **University of Rochester: Professor**, 1997 - ; Chairman, 2011 - 14;
Assoc. Prof., 1986-97; Asst. Prof., 1983 - 86.
- **M.S.R.I., Berkeley**: Member, Fall 1987 & 2010; **Organizer**, Spring 2017 Program.
- **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**, 2015–2016.
- **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

- Co-organizer, **MSRI Program on Harmonic Analysis**, Jan.- May 2017
- Associate editor, *Inverse Problems and Imaging*, 2016 - .
- 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, **Math. Resch. Community in Inverse Problems**, Snowbird, Utah, June, 2009

RECENT LECTURES AND COLLOQUIA

- ICERM Workshop, “Mathematical and Computational Aspects of Radar Imaging”, Oct., 2017
- International Conference on Theoretical and Computational Acoustics, Vienna, Aug. 2017
- Colloquium, University of New Mexico, April, 2017
- Simons MATH + X Symposium on Seismology and Inverse Problems, Rice University, Jan., 2017
- LMS-EPSC Symposium on Maxwell’s Equations (2 talks), Durham, UK, July, 2016
- Inverse Problems Seminar, University College London, May, 2016
- Integrated Applied Mathematics Colloquium, University of New Hampshire, May, 2016
- Seminar, University of Helsinki, March, 2016
- Inverse Problems Seminar, University of Washington, March, 2016
- Colloquium, University of Limerick, Ireland, February, 2016
- IAS Workshop on Inverse Problems, Imaging and PDEs, Hong Kong Univ.Sci.Tech., Sept. 2015
- 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
- Colloquium, University of Wisconsin, February, 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).

RESEARCH ARTICLES

1. Bilinear generalized Radon transforms in the plane (w/ A Iosevich, B. Krause, A. Liu), <https://arxiv.org/abs/1704.00861> (April, 2017).
2. Propagation and recovery of singularities in the inverse conductivity problem (w/ M. Lassas, M. Santacesaria, S. Siltanen, G. Uhlmann), <https://arxiv.org/abs/1610.01721> (October, 2016).
3. An elementary approach to simplexes in thin subsets of Euclidean space (w/ A. Iosevich, B. Liu and E. Palsson), <https://arxiv.org/abs/1608.04777> (August, 2016).
4. Superdimensional metamaterial resonators (w/ H. Kettunen, Y. Kurylev, M. Lassas, G. Uhlmann), <http://arxiv.org/abs/1409.3608>.
5. On necklaces inside thin subsets of \mathbb{R}^d (w/ A. Iosevich, M. Pramanik), <http://arxiv.org/abs/1409.2588>; *Math. Research Letters*, to appear.
6. A group-theoretic viewpoint on Erdős-Falconer problems and the Mattila integral (w/ A. Iosevich, B. Liu, E. Palsson), *Revista Mat. Iberoamer.*, **31** (2015), no. 3, 799–810.
7. Restricted convolution inequalities, multilinear operators and applications, (w/ D. Geba, A. Iosevich, E. Palsson, E. Sawyer), *Math. Res. Lett.*, **20** (2013), 675-694.
8. Multilinear generalized Radon transforms and point configurations, (w/ L. Grafakos, A. Iosevich, E. Palsson), *Forum Math.*, **27**, no. 4, (2015), 2323-2360.
9. On volumes determined by subsets of Euclidian space (w/ A. Iosevich, M. Mourgoglu), *Forum Math.*, **27**, no. 1, (2015), 635-646.
10. A multi-dimensional resolution of singularities with applications to analysis (w/ T. Collins, M. Pramanik), *Amer. Jour. of Math.*, **135** (2013), 1179-1252.
11. 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.
12. 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.
13. An FIO calculus for marine seismic imaging, II: Sobolev estimates (w/ R. Felea, M. Pramanik), *Math. Annalen*, **352** (2012), 293-337.
14. Cloaking a sensor via transformation optics, (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *Physical Review E*, **83** (2011), 016603.
15. Approximate quantum and acoustic cloaking (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *Jour. of Spectral Theory*, **1** (2011), 27-80.
16. Fourier integral operators with open umbrellas and seismic inversion for cusp caustics (w/ R. Felea), *Math. Res. Lett.*, **17** (2010), 867-886.
17. Approximate quantum cloaking and almost trapped states (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *Phys. Rev. Lett.*, **101** (2008), 220404.

18. Isotropic transformation optics: approximate and quantum cloaking (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *New Jour. Phys.*, **10**, 115024.
19. Electromagnetic wormholes via handlebody constructions, (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *Comm. Math. Phys.*, **281** (2008), 369-385.
20. An FIO calculus for marine seismic imaging: folds and cross-caps (w/ R. Felea), *Comm. in P.D.E.*, **33** (2008), 45-77.
21. 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.
22. 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. (210 citations on scholar.google).
23. Improvement of cylindrical cloaking with the SHS lining, (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *Optics Express* **15** (2007), 12717-12734.
24. Full-wave invisibility of active devices at all frequencies (w/ Y. Kurylev, M. Lassas, G. Uhlmann), *Comm.. Math. Phys.*, **275** (2007), 749-789. (247 citations on scholar.google)
25. 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.
26. Oscillatory integral operators with homogeneous polynomial phases in several variables (w/ M. Pramanik, W. Tang), *Jour. Func. Analysis*, **244** (2007), 444-487.
27. 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.
28. $L^p - L^{p'}$ estimates for overdetermined Radon transforms (w/ L. Brandolini and G. Travaglini), *Trans. A.M.S.*, **359** (2007), 2559-2575.
29. On nonuniqueness for Calderón’s inverse problem (w/ M. Lassas, G. Uhlmann), *Math. Res.Lett.*, **10** (2003), 685-693. (373 citations on scholar.google)
30. Anisotropic conductivities that cannot be detected by EIT (w/ M. Lassas, G. Uhlmann), *Physiological Meas.*, **24** (2003), 413-419. (323 citations on scholar.google)
31. The Calderón problem for conormal potentials, I: Global uniqueness and reconstruction (w/ M. Lassas, G. Uhlmann), *Comm. Pure Applied Math.*, **55** (2003), 328-352.
32. 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.
33. Oscillatory integral operators with low-order degeneracies (w/ A. Seeger), *Duke Math. Jour.*, **112** (2002), 397 - 420.
34. Local uniqueness for the Dirichlet-to-Neumann map via the two-plane transform (w/ G. Uhlmann), *Duke Math. Jour.*, **108** (2001), 599-617.
35. Characteristic space-time estimates for the wave equation (w/ G. Uhlmann), *Math. Zeit.*, **236** (2001), 113-131.

36. 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.
37. On oscillatory integral operators with folding canonical relations (w/ A. Seeger), *Studia Math.*, **132** (1999), 125-239.
38. On X-ray transforms for rigid line complexes and integrals over curves in \mathbb{R}^4 , (w/ A. Seeger, S. Wainger), *Proc. Amer. Math. Soc.*, **127** (1999), 3533-45.
39. Fourier integral operators with cusp singularities (w/ A. Seeger), *Amer. Jour. Math.*, **120** (1998), 1077-1119.
40. 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.
41. Fourier integral operators with fold singularities (w/ A. Seeger), *Jour. Reine u. Angew. Math.*, **455** (1994), 35-56.
42. Recovering singularities of a potential from singularities of scattering data (w/ G. Uhlmann), *Comm. Math. Phys.*, **157** (1993), 549-572.
43. Microlocal analysis of the 2-plane transform (w/ G. Uhlmann), *Contemp. Math.* **140** (1992), 65-71.
44. 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.
45. Microlocal techniques in integral geometry (w/ G. Uhlmann), in *Contemp. Math.* **113** (1990), 121-136.
46. 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.
47. Estimates for singular Radon transform and pseudodifferential operators with singular symbols (w/ G. Uhlmann), *Jour. Func. Anal.*, **89** (1990), 202-232.
48. Nonlocal inversion formulas for the X-ray transform (w/ G. Uhlmann), *Duke Math. Jour.*, **58** (1989), 205-240.
49. Singular integrals with conical singularities, unpublished manuscript, 1985.
50. The first eigenvalue of a CR manifold, *Comm. in P.D.E.*, **10** (1985), 191-217.
51. Pointwise convergence of singular convolution operators, *Duke Math. Jour.*, **50** (1983), 1171-1199.
52. Principal curvature and harmonic analysis, *Indiana Univ. Math. Jour.*, **30** (1981), 519-538.

IN PREPARATION

1. Multiplier ideals and jumping numbers for real analytic functions in \mathbb{R}^2 (w/ M. Pramanik).
2. Bilinear operators and Fréchet differentiability in seismic inversion (w/ M. Cheney, R. Felea, R. Gaburro and C. Nolan).

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.
2. Cloaking Devices, Electromagnetic Wormholes and Transformation Optics (w/ Y. Kurylev, M. Lassas, and G. Uhlmann), *SIAM Review*, **51** (2009), 3-33.
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.

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. Numerical and microlocal analysis of inverse problems with internal data, Denitza Straub, May, 2016; published in *Jour. Pseudo-Diff. Oper. Appl.*, doi:10.1007/s11868-016-0176-6 (2016).

EXTERNAL SUPPORT

- **Amer. Inst. Math. SQuaRE (Structured Quartet Research Ensemble)**, travel funding for three week-long meetings w/co-PIs M. Cheney, R. Felea, R. Gaburro, C. Nolan, 2016-2018.
- **Simons Foundation Fellowship:** 7/2015 - 6/2016.
- **PI: NSF-DMS-1362271**, 7/2014-6/2017; \$219,000.
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-8821711, 7/1989 - 6/1991;
DMS-8601534, 7/1986 - 6/1988.
- **Co-PI:** DMS-1346808 for CBMS-NSF Regional Research Conf. at Howard Univ., 2/2014 -1/2015.
- **Sloan Research Fellowship:** 9/1990 - 9/1992.