JOSEPH D. LAKEY
BIOGRAPHICAL DATA

EDUCATION

S.B.	Mathematics	The University of Chicago, 1986
Ph.D.	Mathematics	University of Maryland, 1991

FELLOWSHIPS and AWARDS

2018	Distinguished Reviewer for Zentralblatt Math
2013–	Fellow, American Mathematical Society

PROFESSIONAL EXPERIENCE

6/2018–	Academic Associate Dean, Arts & Sciences, New Mexico State University
8/2010–5/2018	Department Head, Mathematical Sciences, New Mexico State University
8/2009–7/2010	Visiting Professor, Department of Mathematics, Washington University in St. Louis
8/2006–	Professor, Mathematical Sciences, New Mexico State University
8/2000–8/2006	Associate Professor, Mathematical Sciences, New Mexico State University
2000–2005	Research Associate, Physical Science Labs–NMSU
9/2002–5/2003	Adjunct Associate Professor, The University of Texas at Austin
5-6/2000	Visiting Scholar, Macquarie University, Sydney
1995–2000	Assistant Professor, Mathematical Sciences, New Mexico State University
1994–1995	Visiting Assistant Professor, Department of Mathematics, Texas A&M University
1991–1994	R. H. Bing Instructor in Mathematics, The University of Texas at Austin
1992–1994	Research Associate, Applied Research Labs-UT
1986–1990	Teaching Assistant, University of Maryland

RESEARCH SUPPORT

2017	NSF DMS-1642586 CBMS Conference on Sparse Approximation, PI
2007–2009	NSF DMS-0713888 New Mexico Analysis Seminars 2007-2009, co-PI
2006–2007	DARPA, Analog-Digital Adaptive Microsystem (co-investigator, C. Brislawn (LANL) PI)
2006–2007	NIH, Functional Role Frontopolar Cortex EEG (co-investigator, J. Kroger PI)
2005–2007	LANL-NMSU-MOU, Signal Detection Adapted Filter Banks, PI
2004–2005	AFRL, Statistical Processing EEG (co-PI, J. Kroger PI)
2005	NSF DMS-0440945 CBMS Conference, Nonlinear Dispersive Waves, PI
2002–2005	ARO DAAD-19-02-1-0211, Coordination Models, PI
2001–2003	NSF DMS-0086986: New Mexico Analysis Seminars, co-PI
1997–1999	Sandia SURP Grant Ax-6430
1993–1995	NSF Contract DMS-9307655, co–PI

NMSU DOCTORAL DISSERTATIONS DIRECTED

Phan Nguyen, "Biorthogonal Multiwavelets Adapted to Boundary Value Problems " (2012)

Scott Izu, "Eigenvalue estimates and sampling for time-frequency localization operators " (2009)

Christopher Weaver, "Calibration of a Social Systems Model... " (2005)

Sofian Obeidat, "Wavelet Techniques for the Navier-Stokes Equations" (2002)

Ying Wang, "Perturbations of Gabor Frames " (2001)

RECENT PROFESSIONAL AND PUBLIC SERVICE

CONFERENCES AND WORKSHOPS ORGANIZED
Special Session, Harmonic Analysis, Frames and Sampling,... AMS #1172 2021
SAMPTA-19 (Technical Program Committee)
CBMS Conference on Sparse Signal Recovery, Las Cruces, 2017
Special Session, Harmonic Analysis and it Applications ..., AMS, Albuquerque, 2014
Special Session, Computational Methods in Harmonic Analysis ..., AMS, Albuquerque, 2007
CBMS Conference on Nonlinear Dispersive and Wave Equations, Las Cruces, 2005
Special Session, Analog to Digital via multiresolution ..., Wavelets XI, SPIE, San Diego, 2005
Special Session, Multiscale methods and sampling ..., AMS, Albuquerque, 2004
Annual New Mexico Analysis Seminar I-XII, 1998-2009

Recent Referee Work:
American Mathematical Monthly; Analysis and Mathematical Physics; Analysis Mathematica; Applied and
Computational Harmonic Analysis; Applied Stochastic Models in Business and Industry; Bulletin of the
Australian Mathematical Society; Computer Methods and Programs in Medicine; Constructive Approxima-
tion; IEEE Signal Processing Letters; IEEE Transactions on Signal Processing; IET Radar; Information and
Inference: A journal of the IMA; Journal of Fourier Analysis and Applications; Journal of Mathematical
Analysis and its Applications; Journal of Mathematical Physics; MDPI Mathematics; MDPI Symmetry;
Proyecciones (Antofagasta, On line); Results in Mathematics; Sampling Theory, Signal Processing and Data
Analysis, SIAM Journal on Imaging Sciences, Rocky Mountain Journal of Mathematics;

Book Reviews:
American Mathematical Society

RECENT INVITED AND CONTRIBUTED LECTURES

Frames in Time–Frequency and Time–Scale Analysis, SEAMS School 2022, (lecture series) Philippines, Dec. 5–13, 2022

An analogue of Slepian vectors on Boolean Hypercubes, BIRS Multitaper Spectrum Analysis, (online) June 25, 2022

Spatio-spectral limiting on products of triangles, ICCHA, (online) Sept. 16, 2021

Spatio–Spectral Limiting on Boolean Cubes, UNM Analysis Seminar, (online) April 30, 2021

Spatio-spectral limiting on Boolean cubes, JFAA, College Park, MD Sept 21, 2019

Numerical computation of eigenspaces of spatio-spectral limiting on hypercubes, SampTA-19, Bordeaux, July 10, 2019

Spatio–spectral limiting on hypercubes, Math Colloquium, UTEP, November 2, 2018

ICCHA VII, Nashville, "An analogue of Slepian vectors for Boolean hypercubes, (May 17, 2018)

AMS Spring Western Meeting, "Slepian vectors on Boolean cubes," Portland, OR. (April 14, 2018).

SAMPTA-17, Riesz bounds for prolate shifts, 12th International Conference, Tallinn, Estonia, (July 2017)

NMAS 2016, "Frames for Duration and Bandwidth Limiting," Albuquerque, (Feb. 21, 2016)

SIAM Minisymposium, "Recent Advances in Duration and Bandwidth Limiting," JMM, Seattle, Jan. 8 2016

Northwest A&F U. Math Seminar, "Time-Frequency Analysis of EEG data," CN. (July 3, 2015).

Northwest U. Math Seminar, "Time-Frequency Analysis of EEG data," Xi'an, CN. (June 30, 2015).

BUCEA Math Seminar, "Some Mathematical Tools for Analysis of EEG data," Beijing, CN. (June 25, 2015).

CARMA Seminar, "Some Mathematical Tools for Analysis of EEG data," Newcastle, AUS. (June 11, 2015).

SAMPTA-15, "Wavelet Frames Generated by Bandpass Prolate Functions," Washington, DC. (May 25, 2015)

AMS Spring Eastern Meeting, "Prolate shift frames and bandpass prolates," Washington, DC. (March 8, 2015).

PUBLICATIONS

Books

J.A. Hogan and J. Lakey, "Time–Frequency and Time–Scale Methods," Birkhäuser, Boston, 2005.

J.A. Hogan and J. Lakey, "Duration and Bandwidth Limiting," Birkhäuser, Boston, 2012.

Articles

Journal Articles

1. N. Dizon, J.A. Hogan, and J.D. Lakey, (2022). Optimization in the construction of cardinal and symmetric wavelets on the line. Int. J. Wavelets Multiresolut. Inf. Process. 20 (2022), Paper No. 2150048, 25 pp.

2. H. Baghal Ghaffari, J.A. Hogan, and J.D. Lakey, (2022). Properties of Clifford-Legendre Polynomials. Adv. Appl. Clifford Algebras 32, 12 (2022).

3. J.A. Hogan, and J.D. Lakey, (2021). Spatio-spectral limiting on discrete tori: adjacency invariant spaces. Sampl. Theory Signal Process. Data Anal. 19, 14 (2021).

4. J.A. Hogan, and J.D. Lakey, (2021). Spatio-Spectral Limiting on Boolean Cubes. J. Fourier Anal. Appl 27, 40 (2021).

5. J.A. Hogan, and J.D. Lakey, (2017). An Analogue of Slepian Vectors on Boolean Hypercubes, Journal of Fourier Analysis and Applications (2019) 25:2004–2020.

6. J.A. Hogan, and J.D. Lakey, (2017). On the Numerical Evaluation of Bandpass Prolates II, Journal of Fourier Analysis and Applications (2017) 23:125–140.

7. J.A. Hogan and J.D. Lakey, (2016). Frame expansions of bandlimited signals using prolate spheroidal wave functions, Sampling Theory in Signal and Image Processing, 15:139–154.

8. J.A. Hogan, J.K. Kroger and J.D. Lakey, (2014). Time and bandpass limiting and an application to EEG. Sampling Theory in Signal and Image Processing, (2014) 13:295–313.

9. J.A. Hogan and J.D. Lakey, (2013). Frame properties of shifts of prolate spheroidal wave functions. Applied and Computational Harmonic Analysis, (2014) 31:21–32.

10. J.D. Lakey, and P. Nguyen, Divergence-free Multiwavelets on the Half Plane. Axioms, (2013) 22:100–121.

11. J.A. Hogan and J.D. Lakey, (2013). Letter to the Editor: Numerical estimation of bandpass prolates. Journal of Fourier Analysis and its Applications, (2013) 19:439446.

12. J.A. Hogan and J.D. Lakey, On the Numerical Computation of Certain Eigenfunctions of Time and Multiband Limiting. Numerical Functional Analysis and Optimization (2012), 33:1095-1111.

13. J.A. Hogan, S. Izu and J.D. Lakey, Sampling approximations for time- and bandlimiting, Sampling Theory in Signal and Image Processing (2010) 26:91–117.

14. S. Izu and J.D. Lakey, Time-frequency localization and sampling of multiband signals, Acta Appl. Math. (2009) 107:399–435.

15. J.A. Hogan and J.D. Lakey, Non-translation invariance and the synchronization problem in wavelet sampling, Acta Appl. Math. (2009) 107:373–398.

16. J.A. Hogan and J. Lakey, On uncertainty bounds and growth estimates for fractional Fourier transforms; Applicable Analysis **85** (2006), 891–899.

17. J.A. Hogan and J. Lakey, Hardy's theorem and rotations, Proc. Amer. Math. Soc. **134** (2006), 1459–1466.

18. J.A. Hogan and J. Lakey, Sampling and Oversampling in shift-invariant and multiresolution spaces I: validation of sampling schemes, Int. J. Wavelets and Multires. Inf. Proc., **3** (2005), 257–282.

19. J.E. Gilbert, J.A. Hogan and J. Lakey, BMO, boundedness of affine operators, and frames, Applied and Computational Harmonic Analysis, **18** (2005), 3–24.

20. S. Efromovich, J. Lakey, M.C. Pereyra and N. Tymes, Data-driven and optimal denoising of a signal and recovery of its derivative using multiwavelets; IEEE Trans. Sig. Proc. **52**, (2004), 628–635.

21. J. Lakey and Y. Wang, On perturbations of irregular Gabor frames; Jour. Comp. Appl. Math. **155** (2003), 111-129.

22. J.E. Gilbert, Y.S. Han, J.A. Hogan, J. Lakey, D. Weiland and G. Weiss, Smooth molecular decompositions of functions and singular integral operators; Memoirs of the AMS No. 742 (2002), 1–74.

23. J. Lakey, Constructive decomposition of functions of finite central mean oscillation; Proc. Amer. Math. Soc. **127** (1999), 2375–2384.

24. J.E. Gilbert, J.A. Hogan and J. Lakey, Characterization of Hardy spaces by singular integrals and 'divergence-free' wavelets; Pacific J. Math. **193** (2000), 79–105.

25. J. Alvarez, M. Guzman-Partida and J. Lakey, Spaces of λ-bounded central mean oscillation, Morrey spaces, and λ-central Carleson measures; Collect. Math. **51** (2000) 1–47.

26. J.E. Gilbert, J.A. Hogan and J. Lakey, Atomic decomposition of divergence-free Hardy spaces; Math. Moravica, Special Vol, Proc. 5th IWAA (1997) 33–52.

27. J.A. Hogan and J. Lakey, Extensions of the Heisenberg group by dilations and frames; Applied and Computational Harmonic Analysis, **2** (1995), 174–199.

28. J. Lakey, Trace inequalities, maximal inequalities, and weighted Fourier transform estimates; Journal of Fourier Analysis and Applications, **1** (1994), 201–232.

29. J. Lakey, Weighted Fourier transform inequalities via mixed norm Hausdorff–Young inequalities; Canad. J. Math., **46** (1994), 586–601.

30. J.J. Benedetto and J. Lakey, The definition of the Fourier transform for weighted norm inequalities; J. Funct. Anal., **120** (1994), 403–439.

31. J. Lakey, Weighted restriction for curves; Canad. Math. Bull., **36** (1993), 87–95.

Conference Papers

32. H. Baghal Ghaffari, J.A. Hogan, and J.D. Lakey, (2019). A Clifford Construction of Multidimensional Prolate Spheroidal Wave Functions. Proc. 12th Int. Conf. on Sampling Theory Appl.. Leonia, NJ: EDAS Conference Services.

    https://sampta2019.sciencesconf.org/272784/document

33. J.A. Hogan, and J.D. Lakey, (2019). Numerical computation of eigenspaces of spatio-spectral limiting on hypercubes. Proc. 12th Int. Conf. on Sampling Theory Appl.. Leonia, NJ: EDAS Conference Services.

    https://sampta2019.sciencesconf.org/272689/document

34. N. Dizon, J.A. Hogan, and J.D. Lakey, (2019). Optimization in the construction of nearly cardinal and nearly symmetric wavelets. Proc. 12th Int. Conf. on Sampling Theory Appl.. Leonia, NJ: EDAS Conference Services.

    https://sampta2019.sciencesconf.org/272690/document

35. J.A. Hogan and J.D. Lakey, (2017). Sampling in Paley-Wiener spaces, uncertainty, and the prolate spheroidal wave functions. In Proceedings of the Centre for Mathematics and its Applications, Australian National University., X. Duong, C. Meaney, L. Ward (Ed.), 47:50–66.

36. J.A. Hogan and J.D. Lakey, (2017). Riesz bounds for prolate shifts, 2017 International Conference on Sampling Theory and Applications (SampTA), 271–274.

37. J.A. Hogan and J.D. Lakey, (2017). Bandpass pseudo prolate shift frames and Riesz bases, 2017 International Conference on Sampling Theory and Applications (SampTA), 369–372.

38. J.A. Hogan, and J.D. Lakey, (2015) Wavelet frames generated by bandpass prolate functions, Sampling Theory and Applications (SampTA), 2015 Int. Conf. on, IEEE 120–123 DOI 10.1109/SAMPTA.2015.7148863

39. J.A. Hogan, and J.D. Lakey, (2015) Prolate Shift frames and their duals, Sampling Theory and Applications (SampTA), 2015 Int. Conf. on. 115-119 DOI 10.1109/SAMPTA.2015.7148862

40. J.A. Hogan and J.D. Lakey, Sampling aspects of approximately time-limited multiband and bandpass signals. In Werner Henkel Et al. (Ed.), Proceedings of the 10th International Conference on Sampling

Theory and Applications (2013, pp. 532-535).

41. J.A. Hogan and J. Lakey, Non-translation invariance in principal shift-invariant spaces, *in* "Advances in Analysis: Proceedings of the 4th ISAAC Congress," H.G.W. Begehr et al., eds., World Scientific, Singapore, 2005, 471–486 (refereed conference proceedings).

42. J.E. Gilbert and J. Lakey, On a characterization of the local Hardy space by Gabor frames, *in* "Wavelets, Frames, and Operator Theory," AMS Contemporary Mathematics, C. Heil, P. Jorgensen, and D. Larson eds., 2004, 153–162 (refereed conference proceedings).

43. T. L. Berkopec, J. Lakey, M. C. Pereyra and N. Tymes, Multiwavelets and EP denoising, *in* "Wavelet Applications in Signal and Image Processing IX," M. Unser, A. Aldroubi, A. Laine eds., Proc SPIE 4478, (2001), 230-241 (refereed conference proceedings).

44. J.A. Hogan and J. Lakey, Zak transforms, sampling and aliasing in multiresolution spaces; *in* Proc. Conf. on Applied Math., Edmond, OK, February 2001, University of Central Oklahoma, 79–93.

45. J.A. Hogan and J. Lakey, Sampling and aliasing without translation invariance; *in* Proc. Fourth Int. Conf. on Sampling Theory and Applications (SampTA'01), Orlando FL, USA, May 2001, 61–66 (refereed conference proceedings).

46. J.A. Hogan and J. Lakey, Sampling for shift invariant and wavelet subspaces *in* "Wavelet Applications in Signal and Image Processing VIII," M. Unser, A. Aldroubi, A. Laine eds., Proc SPIE 4119, (2000), 36–47 (refereed conference proceedings).

47. J. Lakey, S. Obeidat and M.C. Pereyra, Multiwavelet characterization of function spaces adapted to the Navier-Stokes equations, *in* "Wavelet Applications in Signal and Image Processing VIII," M. Unser, A. Aldroubi, A. Laine eds., Proc SPIE 4119, (2000) 372–383 (invited paper).

48. J. Lakey and M.C. Pereyra, Multiwavelets on the interval and divergence-free wavelets; *in* "Wavelet Applications in Signal and Image Processing VII," M. Unser, A. Aldroubi, A. Laine eds., Proc SPIE 3813, (1999) 162–173 (refereed conference proceedings).

49. J.A. Hogan and J. Lakey, Sharp embeddings for modulation spaces and the Poisson summation formula; *in* Proc. Sampling Theory and Its Applications, Loen Norway, 1999, 52–57 (refereed conference proceedings).

50. J.E. Gilbert, J.A. Hogan and J. Lakey, Fourier and wavelet characterizations of massless Hardy spaces; *in* "Dirac Operators in Analysis," J. Ryan and D. Struppa eds., 25–40, Longman, 1998 (refereed conference proceedings).

51. J. Lakey, P. Massopust and C. Pereyra, Divergence-free multiwavelets; *in* "Approximation Theory IX," Vol. 2, C.K. Chui and L.L. Schumaker eds., Vanderbilt Univ. Press, Nashville, 1998, 161–168 (refereed conference proceedings).

52. J. Lakey, Metaplectic frames and sampling theory; *in* "1997 International Workshop on Sampling Theory and its Applications," P.J. Ferreira ed., Universidade de Aveiro, 1997 (refereed conference proceedings).

53. J.E. Gilbert, J.A. Hogan and J. Lakey, Wavelet subspaces for sampling and extrapolation; *in* "1997 International Workshop on Sampling Theory and its Applications," P.J. Ferreira ed., Universidade de Aveiro, 1997 (refereed conference proceedings).

54. J. Lakey and W. Trappe, Analysis of chirp signals by time-frequency localization frames; *in* "Wavelet Applications in Signal and Image Processing IV," M. Unser, A. Aldroubi, A. Laine eds., Proc SPIE 2825, (1996) 551–560 (refereed conference proceedings).

55. J.E. Gilbert, J.A. Hogan and J. Lakey, Frame decompositions of form-valued Hardy spaces; *in* "Clifford Algebras in Analysis and Related Topics," 239–256, CRC Press, 1996 (refereed conference proceedings).

56. J. Lakey and W. Trappe, Signal analysis by composite wavelet transforms; Approximation Theory VIII, vol. 2, C.K. Chui and L.L. Schumaker, eds., 243–250, World Scientific, 1995 (refereed conference proceedings).

57. J.E. Gilbert and J. Lakey, Wavelets of composite type; Proc. IEEE–ICASSP' 94, Adelaide pp. IV-117–120 (refereed conference proceedings).

Invited Book Chapters

58. J.A. Hogan and J.D. Lakey, (2021). SpatioSpectral Limiting on Redundant Cubes: A Case Study, in "Excursions in Harmonic Analysis, Volume 6." M. Hirn et al., eds. 97–115. Birkhäuser, 2021.

59. J.A. Hogan and J.D. Lakey, (2020). Prolate Shift Frames and Sampling of Bandlimited Functions in "Sampling: Theory and Applications: A Centennial Celebration of Claude Shannon" S.D. Casey et al., eds. 141–167. Birkhäuser, 2020.

60. J.A. Hogan and J.D. Lakey, (2017). Frame properties of shifts of prolate and bandpass prolate functions, in "Frames and Other Bases in Abstract and Function Spaces," Novel Methods in Harmonic Analysis, Volume 1. I. Pesenson et. al., eds. 215–235. Birkhäuser, 2017.

61. Lakey, J. D. (2013). An overview of time and multiband limiting. *In*: "Excursions in Harmonic Analysis, Volume 1" T.D Andrews et al., eds. 85-106. Boston: Birkhauser., 2013

62. J.A. Hogan and J.D. Lakey, Sampling and time-frequency localization of bandlimited and multiband signals, *in* "Representations, Wavelets and Frames," P.E.T. Jorgensen, K.D. Merrill and J.A. Packer eds., 275–291. Birkhauser, Boston, 2008

63. J.A. Hogan and J. Lakey, Periodic nonuniform sampling in shift-invariant spaces, *in* "Harmonic Analysis and Applications: In Honor of John J. Benedetto," C. Heil ed., 253–288. Birkhäuser, Boston, 2006

64. J. Lakey and M.C. Pereyra, On the nonexistence of certain divergence-free multi-wavelets, *in* "Wavelets and Signal Processing," L. Debnath ed. 41–54. Birkhäuser, Boston, 2003

65. J.A. Hogan and J. Lakey, Embeddings and uncertainty principles for generalized modulation spaces; *in* "Modern Sampling Theory: Mathematics and Applications," J. Benedetto and P. Ferreira, eds. 75–108, Birkhauser, 2001

66. J. Lakey and M.C. Pereyra, Divergence-free multiwavelets on rectangular domains; *in* "Wavelet Analysis and Multiresolution Methods," 203–240, Marcel Dekker, 2000

Preprints and Miscellaneous Publications

67. Herman et multi alii, OpenStax Calculus, `https://openstax.org/details/calculus-volume-1`, (Contributing author)