Alex H. Barnett

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Born: 7th Dec, 1972
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RESEARCH AREAS

- Computational partial differential equations: wave scattering (Helmholtz and time-domain), viscous fluids (Stokes), periodic or singular geometries, optics, heat equation, high-frequency eigenvalues.
- Numerical analysis and software libraries: fast algorithms, high-order/spectral methods, boundary integral equations, quadrature, signal/image processing, nonuniform Fourier methods.
- Computational biology (spike sorting, cryo-electron microscopy), inverse imaging problems (phase retrieval), computational quantum physics, statistical methods (sampling, spatial regression).
- Mathematical physics: quantum chaos. Mathematics of music, acoustics.

EDUCATION

Harvard University. Ph. D. in Physics: *Dissipation in Deforming Chaotic Billiards*   October 2000
Thesis advisor: Eric J. Heller

Cambridge University, England. B. A. *(First class)* in Theoretical Physics   June 1994
Undergraduate thesis advisor: David J. C. MacKay

POSITIONS

Group Leader, Numerical Analysis. Center for Computational Mathematics, Flatiron Institute, Simons Foundation, New York, NY   2018–present

Group Leader, Numerical Algorithms. Center for Computational Biology, Flatiron Institute, Simons Foundation, New York, NY   2017–2018

Professor.   2017
Department of Mathematics, Dartmouth College, NH

Senior Research Scientist.   November 2014–August 2015; January–March 2016; January–May 2017
Flatiron Institute (formerly Simons Center for Data Analysis), Simons Foundation, New York, NY

Associate Professor.   2011–2017
Department of Mathematics, Dartmouth College, NH
Also adjunct at Department of Physics and Astronomy, Dartmouth College, NH

Assistant Professor.   2005–2011
Department of Mathematics, Dartmouth College, NH

Courant Instructor / Assistant Professor.   2002–2005
Courant Institute of Mathematical Sciences, New York University, NY

Postdoctoral Research Fellow.   February–August 2002
Photon Migration Imaging Laboratory, Dept. of Radiology, Harvard Medical School, Charlestown, MA

Consultant.   November–December 2000
TrueWind Solutions LLC, Lowell, MA

Teaching Fellow / Head Teaching Fellow.   1995–2001
Department of Physics, Harvard University, Cambridge, MA

FELLOWSHIPS AND AWARDS

- *Best Paper Award, PDSEC21 (workshop of IPDPS)*, for "cuFINUFFT: a load-balanced GPU library for general-purpose nonuniform FFTs," Y.-H. Shih, et al. 2021
- *C. Troy Shaver 1969 Fellow*, Dartmouth College 2017
- *Office of Naval Research, N00014-17S-B001*, award amount $10,000 2017
  Funding support for *Modern Advances in Computational and Applied Mathematics*, Yale
- *National Science Foundation, Grant DMS-1347163*, PI, award amount $34,973 2014
  Funding support for *CBMS Conference on Fast Direct Solvers for Elliptic PDEs*
- *Neukom Institute CompX Faculty Grant*, co-PI, award amount $25,000 2013
  "Efficient numerical solution of electromagnetic scattering from periodic arrays of cylindrically symmetric objects"
- *National Science Foundation, Grant DMS-1216656*, PI, award amount $180,000 2012–2015
  "Next-generation integral equation methods for wave scattering and propagation in periodic structures"
- *Elizabeth R. and Robert A. Jeffe 1972 Fellowship*, Dartmouth College 2011
- *Karen E. Wetterhahn Memorial Award for Distinguished Creative or Scholarly Achievement*, Dartmouth College 2011
- *Burke Initiation Award*, Dartmouth College 2011
- *National Science Foundation, Grant DMS-1005360*, co-PI, award amount $42,355 2010
  Funding support for *International Conference on Spectral Geometry*
- *The Class of 1962 Faculty Fellowship*, Dartmouth College 2010
- *National Science Foundation, Grant DMS-0811005*, PI, award amount $310,517 2008–2011
  "Efficient spectrally accurate global basis methods for high frequency wave scattering, eigenmodes, and photonics"
- *National Science Foundation, Grant DMS-0507614*, PI, award amount $102,520 2005–2008
  "High frequency cavity eigenmodes: rapid computation methods, applications and asymptotics"
- *Harvard University Certificate of Distinction in Teaching* Fall 1997, Spring 2001 and Fall 2001
- *Harold T White Prizes*, teaching introductory physics, Harvard Physics Department 1996 and 1997
- *Kennedy Scholarship*, Kennedy Memorial Trust, London 1994
- *Hockin Prize, Duchess of Somerset Scholarships*, St John's College, Cambridge 1993 and 1994
- XXI International Physics Olympiad, *First Prize* of 155 entrants, Groningen, The Netherlands 1990

PUBLICATIONS

Journal publications:

[75] "Accelerating fast Ewald summation with prolates for molecular dynamics simulations," J. Liang, L. Lu, A. H. Barnett, L. Greengard, and S. Jiang, 21 pages (2025). `math.NA:2505.09727`

[74] "Self-reorganization and information transfer in massive schools of fish," H. Hang, C. Huang, A. H. Barnett, and E. Kanso, *under peer review, Nat. Commun.*, 40 pages (2025). `physics.bio-ph:2505.05822`

[73] "A fully adaptive, high-order, fast Poisson solver for complex two-dimensional geometries," D. Fortunato, D. B. Stein, and A. H. Barnett, *submitted, SIAM J. Sci. Comput.*, 25 pages (2025). `math.NA:2501.17967`

[72] "`nifty-ls`: fast and accurate Lomb–Scargle periodograms using a non-uniform FFT," L. H. Garrison, D. Foreman-Mackey, Y.-H. Shih, and A. H. Barnett, *Res. Notes Amer. Astron. Soc.* **8**, 250 (2024). `astro-ph.IM:2409.08090`

[71] "A method of fundamental solutions for large-scale 3D elastance and mobility problems," A. Broms, A. H. Barnett, and A.-K. Tornberg, *in revisions, Adv. Comput. Math.*, 26 pages (2024). `math.NA:2409.04215`

[70] "High-order and adaptive optical conductivity calculations using Wannier interpolation," L. Van Muñoz, J. Kaye, A. H. Barnett, and S. Beck, *in press, Phys. Rev. B*, 12 pages (2024). `condmat:2406.15466`

[69] "Accurate close interactions of Stokes spheres using lubrication-adapted image systems," A. Broms, A. H. Barnett, and A.-K. Tornberg, *J. Comput. Phys.*, **523**, 113636 (24 pages), 2025.

[68] "A superfast direct inversion method for the nonuniform discrete Fourier transform," H. Wilber, E. N. Epperly, and A. H. Barnett, *SIAM J. Sci. Comput.*, **47**(3), 24M1656694, 26 pages (2025).

[67] "Trapped acoustic waves and raindrops: high-order accurate integral equation method for localized excitation of a periodic staircase," F. J. Agocs and A. H. Barnett, *J. Comput. Phys.* **519** 113383 (19 pages), 2024.

[66] "Efficient convergent boundary integral methods for slender bodies," D. Malhotra and A. H. Barnett, *J. Comput. Phys.* **503**, 112855 (28 pages), 2024.

[65] "`riccati`: an adaptive, spectral solver for oscillatory ODEs," F. J. Agocs and A. H. Barnett, *J. Open Source Softw.* **8**(86), 5430 (2023).

[64] "Uniform approximation of common Gaussian process kernels using equispaced Fourier grids," A. H. Barnett, P. R. Greengard, and M. Rachh, *Appl. Comput. Harmonic Anal.* **71**, 101640 (14 pages), 2024.

[63] "An adaptive spectral method for oscillatory second-order linear ODEs with frequency-independent cost," F. J. Agocs and A. H. Barnett, *SIAM J. Numer. Anal.* **62**(1) 295–321 (2024).

[62] "Ensemble reweighting using cryo-EM particle images," W. S. Tang, D. Silva-Sánchez, J. Giraldo-Barreto, B. Carpenter, S. Hanson, A. H. Barnett, E. H. Thiede, and P. Cossio, *J. Phys. Chem. B* **127**(24) 5410–5421 (2023).

[61] "Automatic, high-order, and adaptive algorithms for Brillouin zone integration," J. Kaye, S. Beck, A. H. Barnett, L. Van Muñoz, and O. Parcollet, *SciPost Phys.* **15**(2), 062 (2023). 15 pages.

[60] "Equispaced Fourier representations for efficient Gaussian process regression from a billion data points," P. R. Greengard, M. Rachh, and A. H. Barnett, *SIAM/ASA J. Uncert. Quant.*, **13**(1), 10.1137/23M1565310 (2025). 28 pages.

[59] "Eliminating artificial boundary conditions in time-dependent density functional theory using Fourier contour deformation," J. Kaye, A. H. Barnett, L. Greengard, U. De Giovannini, and A. Rubio, *J. Chem. Theory Comput.*, **19**(5), 1409–1420 (2023). `arxiv:2209.11027`

[58] "Delayed rejection Hamiltonian Monte Carlo for sampling multiscale distributions," C. Modi, A. H. Barnett, and B. Carpenter. *Bayesian Anal.* **19**(3), 815–842 (2024).

[57] "Quadrature by fundamental solutions: kernel-independent layer potential evaluation for large collections of simple objects," D. B. Stein and A. H. Barnett. *Adv. Comput. Math.* **48**, article 60 (41 pages), 2022. `arxiv:2109.08802`

[56] "A Bayesian approach for extracting free energy profiles from cryo-electron microscopy experiments using a path collective variable," J. Giraldo-Barreto, S. Ortiz, E. H. Thiede, K. Palacio-Rodriguez, B. Carpenter, A. H. Barnett, and P. Cossio. *Sci. Rep.* **11**, 13657 (16 pages), 2021. `arxiv:2102.02077`.

[55] "cuFINUFFT: a load-balanced GPU library for general-purpose nonuniform FFTs," Y.-H. Shih, G. Wright, J. Andén, J. Blaschke, and A. H. Barnett, *PDSEC2021*. (10 pages). `arxiv:2102.08463`.

[54] "Efficient high-order accurate Fresnel diffraction via areal quadrature and the nonuniform FFT," A. H. Barnett, *J. Astron. Telesc. Instrum. Syst.* **7**(2), 021211 (21 pages), 2021. `arxiv:2010.05978`

[53] "How exponentially ill-conditioned are contiguous submatrices of the Fourier matrix?", A. H. Barnett, *SIAM Rev.* **64**(1), (24 pages), 2022. `arxiv:2004.09643`

[52] "Recovering missing data in coherent diffraction imaging," D. Barmherzig, A. H. Barnett, C. L. Epstein, L. F. Greengard, J. F. Magland, and M. Rachh, *SIAM J. Imaging Sci.* **14**(2), (18 pages), 2021. `arxiv:2002.02874`

[51] "Aliasing error of the $\exp(\beta\sqrt{1-z^2})$ kernel in the nonuniform fast Fourier transform," A. H. Barnett, *Appl. Comput. Harmon. Anal.* **51**, 1–16 (2021). `arxiv:2001.09405`

[50] "A high-order integral equation-based solver for the time-dependent Schrödinger equation," J. Kaye, A. H. Barnett, and L. Greengard, *Comm. Pure Appl. Math.* **75**(8), 1657–1712 (2022). `arxiv:2001.06113`

[49] "SpikeForest: reproducible web-facing ground-truth validation of automated neural spike sorters," J. F. Magland, J. J. Jun, E. Lovero, A. J. Morley, C. L. Hurwitz, A. P. Buccino, S. Garcia, and A. H. Barnett, *eLife*, 9:e55167 (2020). 23 pages.

[48] "An integral equation method for the simulation of doubly-periodic suspensions of rigid bodies in a shearing viscous flow," J. Wang, E. Nazockdast, and A. H. Barnett, *J. Comput. Phys.* **424**, 109809 (39 pages), 2021. `arxiv:1912.04501`

[47] "Accurate quadrature of nearly singular line integrals in two and three dimensions by singularity swapping," L. af Klinteberg and A. H. Barnett, *BIT Numer. Math.* **61**, 83–118 (2021). `arxiv:1910.09899`

[46] "Solution of Stokes flow in complex nonsmooth 2D geometries via a linear-scaling high-order adaptive integral equation scheme," B. Wu, H. Zhu, A. H. Barnett, and S. Veerapaneni, *J. Comput. Phys.* **410**, 109361 (2020). 25 pages. `arxiv:1909.00049`

[45] "Factorization of the translation kernel for fast rigid image alignment," A. Rangan, M. Spivak, J. Andén, and A. H. Barnett. *Inverse Problems* **36** (2), 024001 (2020). 30 pages. `arxiv:1905.12317`

[44] "High-order discretization of a stable time-domain integral equation for 3D acoustic scattering," A. H. Barnett, L. Greengard, and T. Hagstrom, *J. Comput. Phys.* **402**, 109047 (2020). 24 pages.

[43] "Explicit unconditionally stable methods for the heat equation via potential theory," A. H. Barnett, C. L. Epstein, L. Greengard, S. Jiang, and J. Wang, *Pure Appl. Anal.* **1**(4), 709–742, (2019).

[42] "Geometry of the phase retrieval problem," A. H. Barnett, C. L. Epstein, L. F. Greengard, and J. Magland, *Inverse Problems* **36**(9), 094003 (2020). `arxiv:1808.10747v2`

[41] "A parallel non-uniform fast Fourier transform library based on an 'exponential of semicircle' kernel," A. H. Barnett, J. Magland, and L. af Klinteberg. *SIAM J. Sci. Comput.* **41**(5), C479–C504 (2019).

[40] "High-density, long-lasting, and multi-region electrophysiological recordings using polymer electrode arrays," J. E. Chung, H. R. Joo, J. L. Fan, D. F. Liu, A. H. Barnett, S. Chen, S. Geaghan-Breiner, M. P. Karlsson, M. Karlsson, K. Y. Lee, H. Liang, J. F. Magland, A. C. Tooker, L. F. Greengard, V. M. Tolosa, L. M. Frank. *NEURON* **101**(1), 21-31.e5 (2019).

[39] "A fully automated approach to spike sorting," J. E. Chung, J. F. Magland, A. H. Barnett, V. M. Tolosa, A. C. Tooker, K. Y. Lee, K. G. Shah, S. H. Felix, L. M. Frank, L. F. Greengard. *NEURON* **95**(6) 1381–1394 (2017).

[38] "A unified integral equation scheme for doubly-periodic Laplace and Stokes boundary value problems in two dimensions," A. H. Barnett, G. Marple, S. Veerapaneni, and L. Zhao. *Comm. Pure Appl. Math.*, **71**(11), 2334–2380 (2018).

[37] "Ubiquitous evaluation of layer potentials using quadrature by kernel-independent expansion," A. Rahimian, A. H. Barnett, and D. Zorin. *BIT Numer. Math.*, **58**(2), 423–456 (2018).

[36] "Rapid solution of the cryo-EM reconstruction problem by frequency marching," A. H. Barnett, L. Greengard, A. Pataki, and M. Spivak. *SIAM J. Imaging Sci.*, **10**(3), 1170–1195 (2017).

[35] "Comparable upper and lower bounds for boundary values of Neumann eigenfunctions and tight inclusion of eigenvalues," A. H. Barnett, A. Hassell, and M. Tacy, *Duke Math. J.*, **167**(16), 3059–3114 (2018).

[33] "A fast algorithm for simulating multiphase flows through periodic geometries of arbitrary shape," G. Marple, A. H. Barnett, A. Gillman, and S. Veerapaneni, *SIAM J. Sci. Comput.*, **38**(5), B740–B772 (2016).

[32] "Efficient numerical solution of acoustic scattering from doubly-periodic arrays of axisymmetric objects," Y. Liu and A. H. Barnett, *J. Comput. Phys.*, **324**, 226-245 (2016).

[31] "Validation of neural spike sorting algorithms without ground-truth information," A. H. Barnett, J. F. Magland, and L. Greengard, *J. Neurosci. Meth.*, **264**, 65–77 (2016)

[30] "A fast and robust solver for the scattering from a layered periodic structure containing multi-particle inclusions," J. Lai, M. Kobayashi, and A. H. Barnett, *J. Comput. Phys.* **298**, 194–208 (2015)

[29] "Spectrally-accurate quadratures for evaluation of layer potentials close to the boundary for the 2D Stokes and Laplace equations," A. H. Barnett, B. Wu, and S. Veerapaneni, *SIAM J. Sci. Comput.* **37**(4), B519–B542 (2015)

[28] "High-order boundary integral equation solution of high frequency wave scattering from obstacles in an unbounded linearly stratified medium," A. H. Barnett, B. J. Nelson, and J. M. Mahoney, *J. Comput. Phys.* **297**, 407–426 (2015)

[27] "Robust and efficient solution of the drum problem via Nyström approximation of the Fredholm determinant," L. Zhao and A. H. Barnett, *SIAM J. Numer. Anal.* **53** (4), 1984–2007 (2015)

[26] "Robust fast direct integral equation solver for quasi-periodic scattering problems with a large number of layers," M. H. Cho and A. H. Barnett, *Optics Express* **23**(2), 1775–1799 (2015)

[25] "A spectrally accurate direct solution technique for frequency-domain scattering problems with variable media," A. Gillman, A. H. Barnett, and P.G. Martinsson, *BIT Numer. Math.* **55**(1), 141–170 (2015)

[24] "Evaluation of layer potentials close to the boundary for Laplace and Helmholtz problems on analytic planar domains," A. H. Barnett, 22 pages, *SIAM J. Sci. Comput.* **36**(2), A427–A451 (2014)

[23] "High-order accurate Nyström discretization of integral equations with weakly singular kernels on smooth curves in the plane," S. Hao, A. H. Barnett, P. G. Martinsson, and P. Young, *Adv. Comput. Math.* **40** (1) 245–272 (2014)

[22] "Fast computation of high frequency Dirichlet eigenmodes via the spectral flow of the interior Neumann-to-Dirichlet map," A. H. Barnett and A. Hassell, *Comm. Pure Appl. Math.* **67**(3), 351–407 (2014)

[21] "A fast direct solver for quasiperiodic scattering problems," A. Gillman and A. H. Barnett, *J. Comput. Phys.* **248**, 309–322 (2013)

[20] "Quadrature by expansion: a new method for the evaluation of layer potentials," A. Klöckner, A. H. Barnett, L. Greengard, and M. O'Neil, *J. Comput. Phys.* **252**, 332–349 (2013)

[19] "Boundary quasi-orthogonality and sharp inclusion bounds for large Dirichlet eigenvalues," A. H. Barnett and A. Hassell, *SIAM J. Numer. Anal.* **49**, 1046–1063 (2011)

[18] "A new integral representation for quasi-periodic scattering problems in two dimensions," A. H. Barnett and L. Greengard, *BIT Numer. Math.* **51**, 67–90 (2011)

[17] "A few more words about James Tenney: dissonant counterpoint and statistical feedback," L. Polansky, A. H. Barnett, and M. Winter, *J. Math. Music*, **5** (2), 63–82 (2011)

[16] "A new integral representation for quasi-periodic fields and its application to two-dimensional band structure calculations," A. H. Barnett and L. Greengard, *J. Comput. Phys.*, **229** (19), 6898–6914 (2010)

[15] "An exponentially convergent nonpolynomial finite element method for time-harmonic scattering from polygons," A. H. Barnett and T. Betcke, *SIAM J. Sci. Comput.* **32** (3), 1417–1441 (2010)

[14] "Perturbative analysis of the Method of Particular Solutions for improved inclusion of high-lying Dirichlet eigenvalues," A. H. Barnett, *SIAM J. Numer. Anal.* **47**, 1952–1970 (2009)

[13] "Stability and convergence of the Method of Fundamental Solutions for Helmholtz problems on analytic domains," A. H. Barnett and T. Betcke, *J. Comput. Phys.* **227** (14), 7003–7026 (2008)

[12] "Analytic steady-state space use patterns and rapid computations in mechanistic home range analysis," A. H. Barnett and P. R. Moorcroft, *J. Math. Biol.* **57** (1), 139–159 (2008)

[11] "Quantum mushroom billiards," A. H. Barnett and T. Betcke, *CHAOS* **17**, 043125, 13 pages (2007)

[10] "Mechanistic home range models and resource selection analysis: a reconciliation and unification," P. R. Moorcroft and A. H. Barnett, *Ecology* **89** (4), 1112–1119 (2008)

[9] "Asymptotic rate of quantum ergodicity in chaotic Euclidean billiards," A. H. Barnett, *Comm. Pure Appl. Math.* **59**, 1457–1488 (2006)

[8] "Effective scattering coefficient of the cerebral spinal fluid in adult head models for Diffuse Optical Imaging", A. Custo, W. M. Wells III, A. H. Barnett, E. M. C. Hillman, and D. A. Boas, *Applied Optics* **45**, 4747–55 (2006)

[7] "A fast numerical method for time-resolved photon diffusion in general stratified turbid media," A. H. Barnett, *J. Comput. Phys.* **201**, 771–797 (2004)

[6] "Robust inference of baseline optical properties of the human head with 3D segmentation from magnetic resonance imaging," A. H. Barnett, J. P. Culver, A. G. Sorensen, A. M. Dale, and D. A. Boas, *Applied Optics* **42**, 3095–3108 (2003)

[5] "Parametric evolution for a deformed cavity," D. Cohen, A. H. Barnett, and E. J. Heller, *Phys. Rev. E* **63**, 046207, 12 pages (2001)

[4] "Mesoscopic scattering in the half-plane: squeezing conductance through a small hole," A. H. Barnett, M. Blaauboer, A. Mody, and E. J. Heller, *Phys. Rev. B* **63**, 245312/1 (2001)

[3] "Rate of energy absorption for a driven chaotic cavity," A. H. Barnett, D. Cohen, and E. J. Heller, *J. Phys. A* **34**, 413–437 (2001)

[2] "Deformations and dilations of chaotic billiards: dissipation rate, and quasi-orthogonality of the boundary wavefunctions," A. H. Barnett, D. Cohen, and E. J. Heller, *Phys. Rev. Lett.* **85**, 1412–15 (2000)

[1] "Substrate-based atom waveguide using guided two-color evanescent light fields," A. H. Barnett, S. P. Smith, M. Olshanii, K. S. Johnson, A. W. Adams, M. Prentiss, *Phys. Rev. A* **61**, 023608, 11 pages (2000)

Conference proceedings, technical reports:

[12] "Equispaced Fourier representations enable fast iterative Gaussian process regression," A. H. Barnett, P. Greengard, and M. Rachh, *Yale technical report TR1562*, 29 pages (2022)

[11] "Robust periodization of frequency-domain integral equation solvers," A. H. Barnett, *Report for Oberwolfach Workshop*, 4 pages (2016)

[10] "Unimodal clustering using isotonic regression: ISO-SPLIT," J. F. Magland and A. H. Barnett, 23 pages (2015). `stat.ME/1508.04841v2`

[9] "New tools for the high-order solution of frequency-domain wave scattering problems at high frequencies and in periodic geometries," A. H. Barnett, *Report for Oberwolfach Workshop*, 4 pages (2013)

[8] "Estimates on Neumann eigenfunctions at the boundary, and the 'Method of Particular Solutions' for computing them," A. Hassell and A. H. Barnett, *Spectral Geometry* (P. S. P. M. proceedings of the International Conference on Spectral Geometry, July 2010, Dartmouth College), 195–210 (2012)

[7] "Robust high-order numerical scattering from multi-layer dielectric gratings using a new integral representation for quasi-periodic fields," A. H. Barnett and L. Greengard, *extended abstract*, WAVES2011 The 10th International Conference on Mathematical and Numerical Aspects of Wave Propagation (4 pages).

[6] "Tensor product of kernel models," O. de la Cruz, A. H. Barnett, H. Tang, and S. Holmes, NIPS *extended abstract*, 4 pages (2010).

[5] "Accurate and robust computation of photonic crystal band structure using second-kind integral equations," A. H. Barnett and L. Greengard, *extended abstract*, Proceedings of WAVES2009: The 9th International Conference on Mathematical and Numerical Aspects of Wave Propagation, 2 pages (2009).

[4] "Quasi-orthogonality on the boundary for Euclidean Laplace eigenfunctions," A. H. Barnett, *technical report*, `math-ph/0601006`, 21 pages (2004).

[3] "Bayesian estimation of optical properties of the human head via 3D structural MRI," A. H. Barnett, J. P. Culver, A. G. Sorensen, A. M. Dale, and D. A. Boas, *Proc. SPIE* **5138**, 9 pages (2003)

[2] "Fast computation of the time domain diffusion forward model for optical tomography in the Born approximation," J. J. Stott, Q. Zhang, and A. H. Barnett, 23 pages (2003).

[1] "Bayesian Comparison of Models for Images," A. H. Barnett and D. J. C. MacKay, in *Maximum Entropy and Bayesian Methods*, Proceedings of MAXENT94 (Kluwer, 1996), p. 239–248

Books:

Geometry of the Phase Retrieval Problem. A. H. Barnett, C. L. Epstein, L. F. Greengard, and J. F. Magland. (307 pages, Cambridge University Press, 2022).

Discriminating Data: Correlation, Neighborhoods, and the New Politics of Recognition, W. H. K. Chun, with mathematical illustrations by A. H. Barnett. (318 pages, MIT Press, 2021). I contributed 17 hand-drawn tutorial pages on topics in statistics, machine learning, and physics.

Spectral Geometry (P. S. P. M. proceedings of the International Conference on Spectral Geometry, July 2010, Dartmouth College). Editors: A. H. Barnett, C. S. Gordon, P. A. Perry, and A. Uribe. 339 pages (2012).

Software:

FINUFFT. Non-uniform fast Fourier transform library (2018–)   `http://finufft.readthedocs.io`
Parallel CPU (C++/OpenMP) and GPU (CUDA) versions. GitHub: >80 forks, >300 stars. 10^4 PyPI/month. Wrappers from Python, MATLAB/Octave, C, Fortran, Julia. Dozens of known users and dependent codes.

SpikeForest / MountainSort.   `http://spikeforest.flatironinstitute.org`
Spike-sorting software and validation website project. Lead developer: J. Magland. (2016–).

MPSpack.   `https://github.com/ahbarnett/mpspack`
A MATLAB toolbox to solve Helmholtz wave and scattering BVPs with particular solutions and integral equations (tutorial 45 pages, manual 38 pages); downloaded $>10^3$ times (2009–2016).

Around twenty other software tools (of varying scope, including `glspect`, `BIE2D`, `BIE3D`, etc) at:
`https://github.com/ahbarnett`
`https://www.simonsfoundation.org/flatiron/software/?type=40178`

Outreach, cross-disciplinary work, education, press:

"Echoing Resynthesis," by W. H. K. Chun and A. H. Barnett; article on algorithms of Florian Hecker for exhibition catalog, Equitiable Vitrines gallery, Los Angeles, CA (2023).

Figures of nodal surfaces of 3D random plane waves appearing in: "Topology of the nodal set of random equivariant spherical harmonics on $\mathbb{S}^3$," J. Jung and S. Zelditch, *Intl. Math. Res. Notices*, 2021 (11), 8521–8549; and "Filament structure of random waves," M. Tacy, `arxiv:2105.11086` (2021).

"Making a computational tool even faster," Simons Foundation 2019 Annual Report.
`https://annualreports.simonsfoundation.org/2019/making-a-fast-computational-tool-even-faster`

"Snapshots of modern mathematics from Oberwolfach: Fast solvers for highly oscillatory problems," A. H. Barnett, 11 pages (2017). `https://publications.mfo.de/handle/mfo/1370`

"convolution: *son et lumière*," A. H. Barnett, issue 01 of *Convolution. A journal for experimental criticism*, 4 pages (2011). `http://convolutionjournal.com/no-1`

Computed eigenmodes for integrable and chaotic billiards, appearing in: S. Dyatlov, "Quantum ergodicity in theorems and pictures", Notices AMS (2023); S. Dyatlov, "Around quantum ergodicity", Ann. Math. Québec **46** 11–26 (2022); S. Dyatlov, "Macroscopic limits of chaotic eigenfunctions", Proc. ICM 2022; P. Sarnak, "Recent progress on the quantum unique ergodicity conjecture", Bull. AMS **48**(2) 211–228 (2011); D. Mackenzie, *What's Happening in the Mathematical Sciences, Volume 8* (AMS, 2011); S.-Y. Koyama, *From*

primes and zetas to arithmetic quantum chaos (Nihon Hyoronsha, 2010); and S.-Y. Koyama, "Arithmetic quantum chaos and zeta functions", Suurikagaku, **571** (2011)

Cover of *Notices of the American Mathematical Society*, January 2008. I created all images (modes $1, 10, 10^2$, $10^3, 10^4, 10^5$ of a planar chaotic cavity), and eigenvalue data for article "Quantum Chaos" by Z. Rudnick.

Quantum chaos research featured in "A Decade of Science at Dartmouth", W. Schpero and C. Chiang, *Dartmouth Undergraduate Journal of Science*, Spring 2008.

INVITED RESEARCH TALKS

Interfaces and Unfitted Discretization Methods, Mittag-Leffler Institute, Stockholm   September 2025

ICOSAHOM, Montréal   July 2025

Distinguished Lectures in Applied Mathematics (research lecture plus public outreach lecture), CRM, Montréal
May 2025

Distinguished Seminar in Computational Science and Engineering, MIT, Cambridge, MA   April 2025

Singular Functions for PDEs, SIAM CSE, Fort Worth, TX   March 2025

IBM Watson Experimental Sciences Seminar, Yorktown Heights, NY   November 2024

[SIAM CSE 23, ICOSAHOM 23, and ICIAM 23: invited, declined, to reduce CO_2 and travel]

Flatiron-wide Autumn Meeting, Flatiron Institute   October 2023

Imperial/UCL Numerical Seminar, London, UK   April 2023

Applied Mathematics Seminar, Yale   March 2023

Analysis-Applied Math-Physics Seminar, Dalhousie University (online)   January 2023

Numerical Analysis and Scientific Computing seminar, NYU   November 2022

Applied and Computational Mathematics Seminar, Dartmouth College   October 2022

Challenges in Computational Methods for Integral Equations, Casa Mátematica Oaxaca, Mexico May 2022

NJIT Applied Mathematics Colloquium, Newark, NJ   November 2021

Panel discussant for book release of *Discriminating Data* (online)   November, December 2021

SIAM Annual Meeting (online)   July 2021

ICOSAHOM, Vienna (online)   July 2021

CCM Seminar, Flatiron Institute (online)   March 2021

Starshade Science and Industry Partnership (SIP) telecon, NASA/JPL (online)   March 2021

PACM Colloquium, Princeton   February 2020

Workshop on *Machine Learning of Organic Force Fields*, Flatiron Institute, NY   December 2019

UC Berkeley/LBL Applied Mathematics Seminar   November 2019

Widely Applied Mathematics seminar, SEAS, Harvard   October 2019

Mathematical Fluids, Materials and Biology, U. Michigan   June 2019

High-Order Discretizations and Quadrature for Integral Eqn. Methods, SIAM CSE, Spokane, WA Feb 2019

Frontiers in Computational and Applied Mathematics, NJIT, Newark, NJ   August 2018

ICOSAHOM (two invited minisymposium talks), Imperial College, London, UK   July 2018

Flatiron Friday Seminar, Simons Foundation, NY   June 2018

Applied Mathematics Seminar, Yale   April 2018

Aerospace & Mechanical Engineering Seminar, USC   April 2018

Fast Algs. for Generating Static and Dynamically Changing Point Configs., ICERM, Brown   March 2018

Scientific Computing and Numerical Analysis (SCAN) seminar, Cornell	February 2018
Flatiron Institute Board Meeting, Simons Foundation	January 2018
Workshop on *Random geometries / Random topologies*, ETH Zurich	December 2017
Scientific Computing Colloquium, FSU, Tallahassee	November 2017
Flatiron Institute Lunch & Learn Seminar, NYC	November 2017
SIAM Conference on Computational Science and Engineering, Atlanta	March 2017
IMA workshop, *Mathematical and Numerical Modeling in Optics*, U. Minnesota	December 2016
Math/ICES numerical analysis seminar, UT Austin	December 2016
Oberwolfach Workshop on Fast Solvers for Highly Oscillatory Problems. MFO, Germany	November 2016
SIAM Annual meeting, Boston	July 2016
SIAM Conference on Computational Science and Engineering, Salt Lake City	March 2015
PACM Colloquium, Princeton	February 2015
SCDA Journal Club, Simons Foundation	November 2014
CBMS-NSF Conference on Fast Direct Solvers for Elliptic PDE, Dartmouth College	June 2014
Numerical Analysis and Scientific Computing Seminar, Courant Institute, NYU	March 2014
Integral Equations Methods: Fast Algorithms and Applications, BIRS, Banff	December 2013
Numerical analysis and PDE seminar, U. of Delaware	November 2013
Colloquium, U. of Arizona, Tuscon, AZ	November 2013
Colloquium, Mathematics Dept, Tufts University	September 2013
Physics Colloquium, UMass Boston	April 2013
Middlebury College, VT	April 2013
Applied Mathematics Seminar, NJIT, Newark, NJ	March 2013
SIAM Conference on Computational Science and Engineering, Boston	February 2013
Numerical Analysis and Scientific Computing Seminar, Courant Institute, NYU	February 2013
Widely Applied Math Seminar, DEAS, Harvard	January 2013
Oberwolfach Workshop on Computational Electromagnetism and Acoustics. MFO, Germany	January 2013
Applied Math Colloquium, U. Michigan	November 2012
Integrated Applied Mathematics Seminar, UNH.	November 2012
Applications of Integral Equation Methods, minisymposium, SIAM Annual Meeting, Minneapolis	July 2012
Workshop on *Geometry of eigenvalues and eigenfunctions*, CRM, Univ. de Montréal	June 2012
Challenges in Geometry, Analysis, and Computation, Yale University (poster)	June 2012
Frontiers in Computational and Applied Mathematics, NJIT, Newark, NJ	May 2012
Analysis/PDE Seminar, UNC Chapel Hill	April 2012
Mathematical Physics and Harmonic Analysis Seminar, Texas A&M University	February 2012
Modern Numerical Methods for Waves: Periodic Geometries, ICIAM, Vancouver	July 2011
WAVES2011, Vancouver (contributed talk)	July 2011
Applied and Computational Mathematics Seminar, Dartmouth	May 2011; January 2012; February 2012
New England Numerical Analysis Day, UMass Dartmouth	April 2011
CSC Seminar, Simon Fraser University, Vancouver, BC	March 2011

Numerical Analysis and Scientific Computing Seminar, Courant Institute, NYU	January 2011
Applied Mathematics and Computational Science Colloquium, U. Penn	January 2011
Conference in honor of 65th birthday of Eric Heller, ITAMP, Harvard	October 2010
Integral Equation Methods, Fast Algorithms and Applications, IMA workshop, Minnesota	August 2010
Frontiers in Computational and Applied Mathematics, NJIT, Newark, NJ	May 2010
Numerical solution of the Painlevé equations, ICMS, Edinburgh, UK	May 2010
Applied Analysis Seminar, Louisiana State University	March 2009
Dartmouth Mathematics Colloquium	November 2009
MIT Applied Mathematics Colloquium	November 2009
Computational Optical Sensing and Imaging Seminar, CU Boulder	September 2009
Topological Complexity of Random Sets, AIM workshop, Palo Alto	August 2009
WAVES2009, Pau, France (contributed talk)	June 2009
Colloquium & PDE/Analysis Seminar (two separate talks), ANU, Canberra, Australia	February 2009
Laplacian Eigenvalues & Eigenfunctions: Theory, Computation, Application, IPAM, UCLA	February 2009
Workshop on Numerical and Analytical Methods for Wave Scattering, Manchester, UK	June 2008
Workshop on quantum chaos, CRM (Univ. de Montréal)	June 2008
Frontiers in Computational and Applied Mathematics, NJIT, Newark, NJ (contributed poster)	May 2008
McGill Applied Mathematics Seminar, Montreal	March 2008
Applied Mathematics Seminar, U. Delaware	November 2007
Numerical analysis seminar, Manchester, UK	July 2007
Three separate mini-symposium talks, ICIAM, Zurich	July 2007
PDE/Analysis Seminar, ANU, Canberra, Australia	February 2007
Heller Group Seminar, Physics Department, Harvard	December 2006
Applied Mathematics Seminar, UMass Amherst, MA	November 2006
Dartmouth Physics Colloquium	October 2006
SIAM Annual Meeting, Boston (contributed talk)	July 2006
Joint MIT/Harvard Analysis Seminar	March 2006
Computations in Science Seminar, U. Chicago	November 2005
Institute of Sound and Vibration Research, Southampton University, UK	June 2005
Computational Mathematics and Applications Seminar, Computing Laboratory, Oxford, UK	June 2005
Numerical Analysis and Scientific Computing Seminar, Courant Institute, NYU	December 2004
Applied Mathematics Colloquium, Columbia University	October 2004
Workshop on Semi-classical Theory of Eigenfunctions and PDEs, CRM (Univ. de Montréal)	June 2004
Applied Mathematics Seminar, Yale University	March 2004
Applied Mathematics Laboratory Seminar, Courant Institute, NYU	February 2004
European Conference on Biomedical Optics, Munich, Germany (contributed talk)	June 2003
Theoretical & Computational Biology Seminar Series, Mount Sinai School of Medicine, NY	May 2003
Applied Mathematics Seminar, Courant Institute, NYU	November 2002
Photon Migration Imaging Seminar, Harvard Medical School	May 2002

Applied Mathematics Laboratory Seminar, Courant Institute, NYU	December 2001
Statistics Seminar, University of Toronto	September 2001
Pan-American Advanced Study Institute on Quantum Chaos, Ushuaia, Argentina	October 2000
14th Maximum Entropy Workshop (MAXENT94), Cambridge, UK	June 1994

TEACHING

Flatiron Institute

- 2D boundary integral equations and the Nyström method, in *Computational Tools for PDEs with Complicated Boundaries and Interfaces*, Flatiron Institute   June 2024
- Nonuniform FFTs at Flatiron: lessons from developing a small numerical library, in *Flatiron-Wide Autumn Meeting*   October 2023
- The GMRES method to solve square linear systems and its convergence rate, in *Scientific Computing and Concepts Seminar*   October 2021
- The joys and pitfalls of numerical computing, in *Flatiron-Wide Algorithms and Mathematics III*, $F_\omega(\alpha+m)^3$ October 2021
- Writing good functions (2-hour workshop, co-presenter), *SciWare*   November 2020
- Function approximation and differential equations, in *Flatiron-Wide Algorithms and Mathematics*, $F_\omega(\alpha+m)!$ October 2019

Dartmouth College   *(the six new courses I created are shown by asterisks)*

- Math 5: The Mathematics of Music and Sound (non-majors)*   Spring 2007, Fall 2008, 2010, 2011
- Math 11: Multivariable Calculus   Fall 2010, 2015
- Math 22: Linear Algebra with Applications   Summer 2006, Fall 2016, Summer 2017
- Math 23: Differential Equations   Fall 2005, 2007
- Math 46: Introduction to Applied Mathematics (majors)*   Spring 2007, 2008, 2009, 2011
- Math 50: Probability and Statistical Inference   Winter 2006
- Math 53: Chaos! (dynamical systems, for majors)*   Fall 2007, 2009, 2011, 2015
- Math 56: Computational and Experimental Mathematics (majors)*   Spring 2013, 2014
- Math 116/126: Numerical PDEs & Waves* (graduate)   Winter 2006, Fall 2008, Winter 2012
- Math 116: Great Papers in Numerical Computation* (graduate)   Spring 2014
- Math 147: Graduate Teaching Seminar (with M. Groszek or R. Orellana)   Summer 2012, 2013, 2014, 2017

New York University

- Business Calculus   Fall 2004
- Mathematical Wave Dynamics (honors VIGRE course, with O. Bühler)   Spring 2004
- Linear Algebra   Fall 2003
- Multivariable Calculus   Spring 2003
- Undergraduate Math Lab (honors VIGRE course, with P. Sarnak)   Fall 2002

Harvard University

- TA / head TA, 8 semesters in physics; *Microteaching Facilitator* for Derek Bok Center   1995–2001

MENTORING

Postdoctoral mentees:

Nour Al Hassanieh (Flatiron Research Fellow, CCM, Flatiron Institute)	September 2023–present
Fruzsina Agocs (Flatiron Research Fellow, CCM, Flatiron Institute) *now: Assistant Professor, Computer Science, CU Boulder*	October 2021–July 2024
Daniel Fortunato (Flatiron Research Fellow, CCM, Flatiron Institute) *now: Associate Research Scientist, CCB/CCM, Flatiron Institute*	September 2020–2023

Jason Kaye (Flatiron Research Fellow, CCM, Flatiron Institute)   September 2019–2022
now: Associate Research Scientist, CCQ/CCM, Flatiron Institute

James Jun (Associate Research Scientist, CCM, Flatiron Institute)   September 2018–May 2020
now: Research Scientist, Meta Reality Labs

Jun Wang (Flatiron Research Fellow, CCB, Flatiron Institute)   October 2017–August 2020
now: Assistant Professor, Tsinghua University, China

Min Hyung Cho (IACM Instructor, Mathematics, Dartmouth College)   July 2012–June 2015
now: Associate Professor, Mathematics & Statistics, UMASS Lowell

Adrianna Gillman (JWY Instructor, Mathematics, Dartmouth College)   July 2011–June 2014
now: Associate Professor, Applied Mathematics, CU Boulder

Graduate students:

Yuxiang Larry Liu (Ph.D. '16; Physics. Now: Quantitative researcher, Citadel)   January 2013–June 2016
The numerical solution of frequency-domain acoustic and electromagnetic periodic scattering problems

Lin Zhao (Ph.D. '15. Now: Software engineer, Lacework, NYC)   May 2012–June 2015
Boundary integral equations and their applications

Matt Mahoney (Ph.D. '09; advised for one year)   July 2006–July 2007
Global numerical methods for eigenmodes with gravity

Summer interns (Flatiron Institute):

Srinath Kailasa (CCM; co-mentored with M. Rachh)   June–August 2022

Tanya Wang (CCM; co-mentored with M. Rachh)   July–August 2021

Michael Doppelt (CCM)   June–August 2020

Andrea Malleo (CCM)   June–August 2019

Daniel Fortunato (CCM)   June–August 2019

Yu-Hsuan Melody Shih (Numerical Algorithms Group, CCB)   June–August 2018, July 2019

Hannah Lawrence (Numerical Algorithms Group, CCB)   June–August 2017

Undergraduate students (Dartmouth College):

Paula Chen '17 (senior thesis)   Fall 2016–Spring 2017
Neural spike sorting algorithms for overlapping spikes

Luis Martinez '16 (Physics; senior thesis)   Spring 2016
Bubbles in my scalar field soup: a study on oscillons in cosmology

Matthew Jin '17 (supported by $4k from my NSF grant)   June 2014–2016
Topological statistics of nodal surfaces of random waves

John Conley '15 (Presidential Scholar)   September 2013–May 2014
Modeling optical waveguides and solar cells

James Brofos '15 (supported by $4k from my NSF grant)   June–August 2013
Behavior and solution of layer densities for close-to-touching curves

Ben Southworth '13 (supported by start-up; co-advisor Brenden Epps)   June–July 2013
Stability of the SVD for measurement of eigenfunctions of a linear system

Bradley Nelson '13 (supported by $4k Richter Memorial Fund; senior thesis)   March 2012–May 2013
Integral equations for waves in variable-index media

Hahn Nguyen '14 (first-year WISP intern, Women in Science Program)   January–June 2011
Accurate evaluation of layer potentials up to the boundary

Kyle Konrad '12 (senior thesis, Neukom Scholar)   March 2011–June 2012
Nodal domain counts of chaotic eigenfunctions

Vipul Kakkad '13 (Presidential Scholar)   January–March 2012
Optimization of tubular bell mode frequencies

Taylor Sipple '13 (Presidential Scholar)   June–December 2011
Method of particular solutions for polygon and Dirichlet-Neumann eigenmodes

Kathleen Champion '11 (Presidential Scholar and senior thesis; co-supervisor Amy Gladfelter, Biology)
Three-dimensional tracking of nuclear mitosis   January 2010–May 2011

Zoe Lawrence '10 (senior thesis, with 'high honors'; co-supervisor Dorothy Wallace)   Spring 2010
The spatiotemporal dynamics of African Cassava Mosaic Disease

Emmanuel Mensah '09 (independent study)   Spring 2009
The inverse source problem in medical imaging (published in DUJS, November 2009)

Yong Su '09 (senior thesis, with 'high honors'; Neukom Scholar)   September 2008–March 2009
Computing the capacitance of the unit cube

Evan Tice '09 (computer science major; co-supervisor Amy Gladfelter, Biology)   January 2008–June 2009
Automated image tracking of cell movement and division (awarded Kemeny Prize, 2008)

Chetan Mehta '08 (senior thesis, with 'high honors')   June 2007–May 2008
Optimal optode location in Diffuse Optical Tomography

Chor Lam '08 (Presidential Scholar)   January–June 2008
Chaos in billiards

Vissuta Jiwariyavej '09 (sophomore WISP intern, Women in Science Program)   January–June 2007
A clap can chirp: waves and echoes in the racquetball court

William A. Webb (summer research student, Caltech; co-advisor Mason Porter)   Summer 2006
A computational study of the quantization of billiards with mixed dynamics

External doctoral thesis committees:

Paul Beckman (NYU, Ph.D 2025)

Sepand Kashani (EPFL, Ph.D 2024)
Computational imaging: a multi-facet perspective

Fredryk Fryklund (KTH, Ph.D 2021); as opponent I also gave a 30 min background talk.
Integral equations and function extension techniques for numerical solution of PDEs

Jason Kaye (NYU, Ph.D 2019)
Integral equation-based numerical methods for the time-dependent Schrödinger equation

Leonardo Andrés Zepeda-Núñez (MIT, Ph.D 2015)
Fast solvers for the Helmholtz equation

SERVICE AND OUTREACH

Seminar organizing:

Scientific Computing Seminar / Discussion Group, Flatiron Institute (around 50 meetings so far)   2020–
CCM Colloquium (formerly Numerical Analysis Seminar), Flatiron Institute (≥ 50 invited talks) 2017–2021
Applied and Computational Mathematics Seminar, Dartmouth College (≥ 90 invited talks)   2006–2016
Organizer (with J. Zhang), Applied Mathematics Laboratory Seminar, Courant Institute, NYU 2002–2003
Organizer, Creating Careers in Physics series, Harvard   1999–2000

Outreach/educational:

The Simons Sessions I: jazz and mathematics (with Stephon Alexander), Flatiron Institute   October 2020
Research talk for Simons Foundation New Hire Workshop   November 2019

Research talk for Simons Foundation Staff Meeting	February 2019
Research talk for Flatiron Institute Board Meeting	January 2018
Guest lecture, *Mathematics and Music*, Hanover High School, NH	May 2016
Two-hour workshops on *Math and Music* for high-school teachers, Math for America	January, March 2016
Co-supervisor, *Exploring Mathematics*, 2-week "camps" ages 11-17, Dartmouth	Summer 2012–2014, 2017
Periods, Pitches and Pipes: middle-school music/math module (with Megan Martinez)	June 2013
The Mathematical Overtones of Music, lecture, JHU Center for Talented Youth, Odyssey Series	May 2011
Interactive Learning in the Sciences, session given for DCAL (teaching center)	October 2007
Cross-disciplinary classroom visits by professional musicians to Math 5, 53	2007–2011
Guest lectures (1 week graduate level), Math 117, Dartmouth College	Summer 2012, 2013
Affiliated faculty, Electro-Acoustic Music Program, Dartmouth	2007–2017
Research talks for Dartmouth Mathematics Society	2006, 2008, 2009, 2010, 2011
Judge, DMAX Makeathon	May 2014
Research talk at Thugz Institute of Science, Dartmouth	April 2014
Mathematical model building, Dartmouth Mathematics Society	October 2006
Guest lecture, Music 3 (Music and Technology), Dartmouth	November 2006

Flatiron Institute and Center committees & duties:

Chair, Flatiron Research Fellow hiring committee, CCM	2020–2025
Organizing committee, *Flatiron-Wide Autumn Meeting (FWAM)*, on software best practices	2023
SciWare Steering Committee, SCC	2021–2023
Intern czar, CCM	2021
Chair / wrangler-in-chief, inaugural *Flatiron-Wide Algorithms and Mathematics (FWAM)*	2019

University committees & duties (Dartmouth College):

Chair, Committee on Organization and Policy (elected position)	Fall 2015
Committee on Organization and Policy (elected position)	2013–2016
Committee on Student Life	2011–2013
Advisory Committee, Leslie Center for the Humanities	Winter 2011–Spring 2013
Faculty Advisory Board, Dartmouth Undergraduate Journal of Science (DUJS)	Fall 2007–2017
First-year advising	Fall 2007, 2008, 2010, 2011

Department committees & duties (Dartmouth College):

Teaching Assistant Discussion Group	Fall 2017
Faculty Advisor, Dartmouth SIAM Student Chapter	March 2012–Nov 2015
Advisor to Graduate Students	2011–2013
Committee member, Applied Mathematics Qualifying Examination, Lin Zhao	Spring 2012
Committee member, Applied Mathematics Qualifying Examination, Katherine Kinnaird	Spring 2010
Graduate Program Committee	2006–2007, 2012–2014, 2015–2017
Graduate Admissions Committee	2005, 2006, 2011
Undergraduate Program Committee	2005, 2008–2010
Recruiting Committee	2007–2008, 2010–2011, 2012–2013
Computing Committee	2005–2006, 2015–2016
Equipment Committee	2007–2008
Mirkil Book Committee	2006–2007
Research talks for Dartmouth Graduate Recruiting Open House	2006, 2007, 2009, 2011, 2013

OTHER PROFESSIONAL ACTIVITIES

Conference organizing:

Organizer (with H. Wilber and S. Dirckx), two minisymposia on singular functions, SIAM CSE, Fort Worth, TX   March 2025

Organizing committee, *Computational Tools for PDEs with Complicated Boundaries and Interfaces*, Flatiron Institute   June 2024

Organizer (with 3 others), *Computational Methods for Multiple Scattering* workshop, Isaac Newton Institute,

Cambridge, UK   April 2023
Organizing committee, *Frontiers in Applied and Computational Mathematics*, NJIT   August 2018
Organizer (with 3 others), *Modern Advances in Computational and Applied Mathematics*, Yale   June 2017
Organizer (with L. Zepeda-Núñez), two minisymposia on the high-frequency Helmholtz equation, SIAM
Annual Meeting, Boston   July 2016
Organizer (with 3 others), *CBMS-NSF Conference on Fast Direct Solvers for Elliptic PDE*, Dartmouth
College   June 2014
Organizer (with 4 others), *Integral Equations Methods: Fast Algorithms and Applications*, BIRS
                                                                             December 2013
Organizer (with L. Demanet), minisymposium on the high-frequency Helmholtz equation, SIAM CSE, Boston
                                                                             February 2013
Organizer (with L. Demanet), two minisymposia on numerical waves, ICIAM, Vancouver, BC   July 2011
Organizer (with 3 others), *International Conference on Spectral Geometry*, Dartmouth College   July 2010
Organizer (with 3 others), Boston Area Undergraduate Physics Competition   1998–2001

Journal leadership and book series:

Co-Editor in Chief, Advances in Computational Mathematics (ACOM)   2017–present
Editorial committee for AMS Mathematical Surveys and Monographs   2023–2027
Guest editorial board, Special Issue on *Advances in Computational Integral Equations*, ACOM   2021
Editorial board, Advances in Computational Mathematics   2012–2017

Referee service:

I typically review six full journal articles per year. I have reviewed for:

SIAM Journal on Scientific Computing, SIAM Journal on Applied Mathematics, SIAM Journal on Numerical Analysis, Journal of Computational Physics, Communications in Pure and Applied Mathematics, Advances in Computational Mathematics, Notices of the AMS, Journal of the AMS, Communications in Mathematical Physics, Mathematics of Computation, Journal of Mathematical Analysis and Applications, Journal of Differential Equations, Inverse Problems, Proceedings of the Royal Society of London A, Journal of Physics A, Journal of Scientific Computing, Engineering Analysis with Boundary Elements, Numerical Functional Analysis and Optimization, Pure and Applied Analysis, Experimental Mathematics, Constructive Approximation, Applied Optics, Waves in Random and Complex Media, Wave Motion, NeuroImage, Journal of Electronic Imaging, Physics in Medicine and Biology, Transactions on Medical Imaging, Journal of the Optical Society of America A, Nonlinear Dynamics, Canadian Journal of Physics, New Journal of Physics, AMS Mathematical Reviews, Johns Hopkins Press, SIAM book series.

Grant review and scientific panels:

National Science Foundation
NSERC (Canada)
Israel Science Foundation
Scientific Committee, *International Conference on Mathematical and Numerical Aspects of Wave Propagation (WAVES)*   2011, 2013, 2015, 2017, 2019, 2022, 2024
Scientific Committee, *International Association for Boundary Element Methods (IABEM)*   2018
Scientific Committee, *SIAM-NNP (New York-NJ-Penn regional SIAM group), Annual Meeting* 2023, 2024
Expert Reviewer, IEEE Milestone proposal for the fast Fourier transform   2024

Memberships:

Society for Industrial and Applied Mathematics