Alex H. Barnett

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Dartmouth College
Hanover, NH, 03755
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Born: 7th December, 1972
U.S. permanent resident

email: ahb at math.dartmouth.edu
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RESEARCH FOCUS

- Numerical analysis, scientific computing, partial differential equations: Helmholtz equation, high frequency and/or high order accuracy; eigenvalue, wave scattering and periodic problems; corner singularities, integral equations, fast algorithms.
- Mathematical physics: quantum chaos and ergodicity, Laplacian eigenfunctions, scarring, billiards.
- Applied mathematics: mathematical ecology (animal home range modeling), inverse problems in imaging (diffuse optical tomography), mathematics of music.

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

Associate Professor.   2011–present
Department of Mathematics, 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

Head Teaching Fellow.   January–June 2001
Department of Physics, Harvard University, Cambridge, MA

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

Teaching Fellow.   1994–1999
Department of Physics, Harvard University, Cambridge, MA

FELLOWSHIPS AND AWARDS

- *Neukom Institute CompX Faculty Grant*, co-PI, award amount $25,000   2013–2014
  "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"
- *Courant Instructorship*, New York University   2002–2005
- *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:

[28] "Robust computation of Dirichlet eigenvalues using the Fredholm determinant," L. Zhao and A. H. Barnett, *in preparation* (2013)

[27] "Robust and high-order accurate three-dimensional acoustic scattering from doubly-periodic structures," A. H. Barnett, L. Greengard, and Z. Gimbutas, *in preparation* (2013)

[26] "Spectrally-accurate quadratures for evaluation of layer potentials close to the boundary for the 2D Stokes and Laplace equations," A. H. Barnett, S. Veerapaneni, and B. Wu, *in preparation* (2013)

[25] "A spectrally accurate direct solution technique for frequency-domain scattering problems with variable media," A. Gillman, A. H. Barnett, and P.G. Martinsson, 29 pages, *submitted, BIT Numer. Math.* (2013)

[24] "Evaluation of layer potentials close to the boundary for Laplace and Helmholtz problems on analytic planar domains," A. H. Barnett, 22 pages, *in press, SIAM J. Sci. Comput.* (2013)

[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, 23 pages, *in press, Adv. Comput. Math.* (2013)

[22] "A fast direct solver for quasiperiodic scattering problems," A. Gillman and A. H. Barnett, 18 pages, *J. Comput. Phys.* **248** 309–322 (2013)

[21] "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)

[20] "Fast computation of high frequency Dirichlet eigenmodes via the spectral flow of the interior Neumann-to-Dirichlet map," A. H. Barnett and A. Hassell, `arxiv:1112.5665`, 48 pages, *in press, Comm. Pure Appl. Math.* (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:

"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)

"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)

"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).

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

"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).

"Quasi-orthogonality on the boundary for Euclidean Laplace eigenfunctions," A. H. Barnett, *preprint*, `math-ph/0601006`, available at `http://arxiv.org`, 21 pages (2004).

"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)

"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:

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:

`MPSpack` (coauthor T. Betcke, Reading, UK). A MATLAB toolbox to solve Helmholtz and scattering problems with particular solutions and integral equations (tutorial 45 pages, manual 38 pages); downloaded at least 700 times (2009-2012). Freely available at `http://code.google.com/p/mpspack`

Other codes for numerical solution of PDEs freely available at `http://math.dartmouth.edu/~ahb/software`

Partial list of researchers using these codes: B. Osting (UCLA), N. Nigam (SFU), M. Ganesh (Colorado Mines), D. Boas (Harvard), M. Porter (Oxford), M. Wright (ISVR, UK), P. Doyle (Dartmouth)

Publicity / outreach / education:

"convolution: *son et lumière*", A. H. Barnett, issue 01 of *Convolution. A journal for experimental criticism*, 4 pages (2011).

Computed eigenmodes for integrable and chaotic billiards, appearing in: P. Sarnak, "Recent progress on QUE" (2009); 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

SIAM Annual meeting, minisymposium, Chigaco	July 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), St John's College, Cambridge, England	June 1994

TEACHING

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

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

New York University

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

Harvard University

- Laboratory Electronics (TA)   Fall 2001
- The Physics of Music and Sound (head TA, created labs and content)   Spring 2001
- Advanced Quantum Mechanics (TA, graduate course)   Fall 1998
- *Microteaching Facilitator* for the Derek Bok Center   Fall 1997

- Mechanics (TA) — Fall 1996, 1997
- Principles of Physics (TA) — Summer 1996
- Introductory Mechanics and Relativity (TA) — Spring 1996
- Mechanics and Special Relativity (TA) — Fall 1995

MENTORING

Postdoctoral:

Adrianna Gillman (JWY Instructor) — July 2011–July 2014

Min Hyung Cho (IACM Instructor) — July 2012–July 2015

Graduate students:

Yuxiang (Larry) Liu (Ph. D. expected '16; Physics) — Dec 2012–present
Electromagnetic scattering from periodic arrays of bodies of revolution

Lin Zhao (Ph. D. expected '15) — May 2012–present
Integral equation methods for Laplace eigenvalue problems

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

Undergraduate students:

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

James Brofos '15 (supported by $4000 from NSF) — 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 $4000 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) — January 2010–May 2011
Three-dimensional tracking of nuclear mitosis

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 (Caltech, co-advisor Mason Porter)   Summer 2006
A computational study of the quantization of billiards with mixed dynamics

SERVICE TO DEPARTMENT AND UNIVERSITY

Conference organizer:
Organizer (one of four), *International Conference on Spectral Geometry*, Dartmouth College   July 2010

Seminar organizer:
Applied and Computational Mathematics Seminar, Dartmouth (hosted ≥ 60 talks)   May 2006–present

Mathematics education:
Periods, Pitches and Pipes: middle-school music/math teaching 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
Committee member, Applied Mathematics Qualifying Examination, Lin Zhao   Spring 2012
Committee member, Applied Mathematics Qualifying Examination, Katherine Kinnaird   Spring 2010

Outreach:
Faculty Advisor, Dartmouth SIAM Student Chapter   March 2012–present
Advisory Committee, Leslie Center for the Humanities   Winter 2011–present
Faculty Advisory Board, Dartmouth Undergraduate Journal of Science (DUJS)   Fall 2007–present
Adjunct faculty, Physics Department, Dartmouth   2013–present
Affiliated faculty, Electro-Acoustic Music Program, Dartmouth   2007–present
Research talks for Dartmouth Graduate Recruiting Open House   2006, 2007, 2009, 2011, 2013
Research talks for Dartmouth Mathematics Society   2006, 2008, 2009, 2010
Mathematical model building, Dartmouth Mathematics Society   October 2006
First-year advising   Fall 2007, 2008, 2010, 2011
Guest lecturer, Music 3 (Music and Technology), Dartmouth   November 2006

University committees:
Committee on Organization and Policy (elected position)   2013–present
Committee on Student Life   2011–2013

Department committees & duties:
Advisor to Graduate Students   2011–2013
Undergraduate Program Committee   2005, 2008–2010
Recruiting Committee   2007–2008, 2010–2011, 2012–2013
Equipment Committee   2007–2008
Graduate Program Committee   2006–2007, 2012–2013
Mirkil Book Committee   2006–2007
Graduate Admissions Committee   2005, 2006, 2011
Computing Committee   2005–2006

OTHER PROFESSIONAL ACTIVITIES

Conferences & seminar organizer, outreach:
Scientific Committee, *International Conference on Mathematical and Numerical Aspects of Wave Propagation (WAVES2013)*, Tunisia   July 2013
Organizer (one of five), *Integral Equations Methods: Fast Algorithms and Applications*, BIRS   Dec 2013
Organizer (with L. Demanet), minisymposium on high-frequency Helmholtz, SIAM CSE, Boston Feb 2013

Scientific Committee, *International Conference on Mathematical and Numerical Aspects of Wave Propagation (WAVES2011)*, Vancouver, BC   July 2011
Organizer (with L. Demanet), two minisymposia on numerical waves, ICIAM, Vancouver, BC   July 2011
Organizer (with J. Zhang), Applied Mathematics Laboratory Seminar, Courant Institute, NYU   2002–2003
Organizer, Creating Careers in Physics series, Harvard Physics Department   1999–2000
Co-organiser, Boston Area Undergraduate Physics Competition   1998–2001

Editorial boards:
Advances in Computational Mathematics   2012–present

Referee, review panels:
SIAM Journal on Scientific Computing, SIAM Journal on Applied Mathematics, SIAM Journal on Numerical Analysis, Journal of Computational Physics, Advances in Computational Mathematics, Notices of the AMS, Communications in Mathematical Physics, Mathematics of Computation, Journal of Mathematical Analysis and Applications, Inverse Problems, Proceedings of the Royal Society of London A, Journal of Physics A, Engineering Analysis with Boundary Elements, Numerical Functional Analysis and Optimization, 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; National Science Foundation.

Member: Society for Industrial and Applied Mathematics, Optical Society of America.