

# Daniel Rockmore

Department of Mathematics  
Dartmouth College  
Hanover, NH 03755

*Telephone: (w) 603-646-3260 (h) 603-643-0169*

*Fax: (603)-646-1672*

*email: rockmore@cs.dartmouth.edu*

*www.cs.dartmouth.edu/~rockmore*

## ADMINISTRATIVE/ORGANIZATIONAL POSITIONS

Chair, Department of Mathematics, July 1, 2007-present

Chair, College Committee on Admissions and Financial Aid, 2007-2008

Director, Santa Fe Institute Summer School, 2005-present

Organizer, Special Session in Mathematics, AAAS Annual Meeting, 2007

Arnold Ross Public Lecture Committee, American Mathematical Society, 2006-2008

Short Course Subcommittee, American Mathematical Society, 2008-2011

Lead Mathematics Advisor, "Mathematics Revealed" Project, Annenberg Foundation, 2006-present (overseeing team of mathematicians and mathematics educators in the making of a 13 part video/text/web series funded by the Annenberg Foundation)

Advisory Committee, The Dartmouth AI Conference, the Next Fifty Years, Summer 2006

Program Organizer, "Toward a New World of Information Processing," January 19-20, 2006, Defense Advanced Research Projects Agency

Vice-Chair, Mathematics, 1998-2004

Chair Mathematics Search Committee, 2002-2005;

Chair of Bioinformatics Search Committee, 2005

Assistant Director, Mathematical Sciences Research Institute Industrial Internship Program (MSRI IIP), 2005-2006

NSF MSRI Committee of Visitors (1998)

NSF DMS Committee of Visitors (1998)

Dartmouth College IRB (1998-2000)

## ACADEMIC POSITIONS

(current) John G. Kemeny Parents Professor of Mathematics, Dartmouth College, Professor of Computer Science, Member of MD./Ph.D. Faculty, Member Faculty of Center for Cognitive Neuroscience;

(1996-2000) Dartmouth College, Departments of Mathematics and Computer Science, Associate Professor (tenured joint appointment), Member of MD./Ph.D. Faculty;

(1991-1996) Dartmouth College, Department of Mathematics and Computer Science, Assistant Professor (Adjunct Department of Computer Science, 1995).

(1989-1991) Columbia University, Department of Mathematics, Assistant Professor

(2000-2010) Santa Fe Institute, External Faculty

Visiting Positions: Institute for Advanced Study, Member (1995-1996, Fall 2002), NYU Courant Institute (Fall 2000, 2001-2002), Santa Fe Institute (Fall 1999, Summer 2000, 2001, 2003,2004), National Center for Atmospheric Research (Summers 1997, 1998, 1999), University of Chicago, Dept. of Computer Science (Winter 1992, 1993), Harvard Univ., Dept. of Mathematics (1992)

## **EDITORIAL BOARDS, PROGRAM COMMITTEE**

Princeton University Press, SFI Primers in Complex Systems series, Editorial Board

SPIE 2008, Computer Analysis in the Study of Art (Program Committee)

SPIE 2000, "Mathematical Methods in Biomedical Imaging " (Program Committee)

SIAM Review (Editorial Board 1998-2002)

Editor, Special Issue on Computer Algebra and Signal Processing, *Journal of Symbolic Computation*

## **BOARD MEMBERSHIPS**

(2000-2002) Defense Sciences Study Group (Institute for Defense Analyses - 2000-2002)

InSite One (Scientific Advisory Board) 2002-present

Memento Security (Advisory Board) 2007-present

Poindexter Systems (Scientific Advisory Board) 2002-2004

## **EDUCATION**

**Harvard University, Department of Mathematics** M.A. Mathematics, May 1986.  
Ph.D., June 1989.

**Princeton University** A.B. Mathematics, Cum Laude, 1984

## **AWARDS**

SIAM I. E. Block Community Lecture, 2008

SIAM Visiting Lecturer 2007-2008

Sigma Xi Distinguished Lecturer, 2005-2007

Longlisted for the Aventis Science Writing Prize, 2006 for "Stalking the Riemann Hypothesis," (Jonathan Cape, Publisher)

NSF Presidential Faculty Fellowship 1995 - 2000

NSF Postdoctoral Fellowship 1991 - 1993

IBM Graduate Fellowship, 1988

NSF Graduate Fellowship, 1985 - 1987

Fulbright Fellowship to Israel for Mathematics, 1984

Phi Beta Kappa, 1984

## RECENT GRANT SUPPORT

- NSF SGER Digital Art Authentication Using Regularities in Spatial and Photometric Statistics, PI, 2008 – 2010, \$200,000
- AFOSR, Analysis for Advanced Optical Communications, PI, 2006-2008, \$467,193
- NIH Group Theoretic Methods in Protein Structure (co-PI), 2005-2009 \$ 441,147
- Dartmouth College, Artificial Intelligence Turns 50, PI, \$ 85,000
- NIMH/HBP "Hypothesis-Driven fMRI Research via Database Mining, Management, and Visualization" (co-PI) 2005-2007, (approx \$1M)
- NSF Documentary award "Living Math" (PI) 2002-2007 (\$300k)
- NSF ITR for Quantum Computing and Circuit Complexity (PI), 2002-2006 (\$160)
- NSF National fMRI Data Center, 1999 – 2006 (\$4.5M) (Co-PI)
- NIH Networked IRB (co-PI), 2002-2003, (\$300k)
- NSF Information Technology Research/SII, 2001-2003, \$574k, (Co-PI)
- NSF Documentary Award \$120k (PI)
- AFOSR \$175k, 2000–2003 (Co-PI)
- Keck Foundation National fMRI Data Center, (\$1M) (Co-PI)
- NSF Infrastructure Award for Computer Science, 1998 – 2003 (\$1.3M) (Co-PI)
- NSF REU, 1998 (\$5k) (PI)
- Dartmouth Interdisciplinary Initiation for Cognitive Neuroscience 1998 (\$30k) (PI)
- NSF Presidential Faculty Fellowship 1995 - 2000 (\$500k) (PI)

## BOOKS, FILMS

- From Mind to Machine - The Discovery of Artificial Intelligence* (with W. Conquest and B. Drake), 2007.
- The Math Life* (with W. Conquest and B. Drake), a 51 minute documentary about the people, process, and problems of modern mathematics. Distributed by Films for the Humanities and Sciences ([www.flims.com](http://www.flims.com)) and (as of 3/10/03) to appear on at least 55% (and at most 90%) of the Public Television marketplace.
- Stalking the Riemann Hypothesis*, Random House/Pantheon, April, 2005.
- Stalking the Riemann Hypothesis, (paperback) Pantheon Press, 2006, 304 pages, ISBN: 037542136X
- Modern Signal Processing* (w./ D. Healy - editors), Cambridge University Press, 2004.
- Music and Computers: A Theoretical and Historical Approach* (with P. Burk, L. Polansky, d. repetto, and M. Roberts), Key College Publishing, 2004.
- Cyclic Renormalization and Automorphism Groups of Rooted Trees* (with H. Bass, M. V. Espinar, and C. Tresser), Lecture Notes in Mathematics, Volume 1621, Springer-Verlag, NY 1996.

## PUBLICATIONS

- "FFTs on the Rotation Group" (w./P. Kostelec), *Journal of Fourier Analysis and Applications*, to appear.

- The Power of Strong Fourier Sampling: Quantum Algorithms for Affine Groups and Hidden Shifts (w./C. Moore, A. Russell, and L. Schulman), *SIAM J. Computing*, **37**, 938–958 (2007)
- Steps toward Digital Authentication (w./G. Leibon), in *Matematica e cultura, 2007*, Michele Emmer (ed.), Springer-Verlag.
- Generic Quantum Fourier Transforms (w./C. Moore and A. Russell), *ACM Transactions on Algorithms*, **2**(4), pp. 707–723, 2006.
- A Digital Technique for Authentication in the Digital Arts (w./S. Lyu and H. Farid), *International Foundation for Art Research Journal*, spring, 2006.
- A Digital Technique for Art Authentication (w./S. Lyu and H. Farid), *PNAS*, vol. 101 (49), pp. 17006-17010 (2004).
- Rooted trees and iterated wreath products of cyclic groups (with R. Orellana and D. Rockmore), *Adv. in Appl. math.*, vol. 33, No. 3, (2004), 531-547.
- Sharing Neuroimaging Studies of Human Cognition, (w./ J. D. Van Horn, S. T. Grafton, and M. S. Gazzaniga), *Nature Neuroscience*, **7**, (2004), 473–481.
- Recent Progress in Group FFTs, in *Computation Noncommutative Algebra and Applications*, J. Byrne ed., Kluwer Acad. Pub., Netherlands, (2004) pp. 227–254.
- Towards Safe and Effective High-Order Legendre Transforms with Applications to FFTs for the 2-sphere, (w/D. M. Healy Jr. and P. Kostelec), *Advances in Computational Mathematics* **21** (1-2): 59-105, July 2004
- Two-dimensional wreath product transforms (with R. Foote and G. Mirchandani), *J. Symb. Comp.*, **37** (2) pp. 187–207, (2004).
- Computing isotypic projections with the Lanczos iteration (w./D. Maslen and M. Orrison), *SIAM J. Matrix Analysis and Applications*, **25** (3), 784–803, (2004).
- Generic Quantum FFTs (w/ C. Moore and A. Russell), *Proceedings of ACM-SIAM Symposium On Discrete Algorithms. 2004*, pp. 771-780.
- The Hidden Subgroup Problem in Affine Groups: Basis Selection in Fourier Sampling (w/ C. Moore, A. Russell, and L. Schulman), *Proceedings of ACM-SIAM Symposium On Discrete Algorithms. 2004*, pp. 1106–1115.
- Eigenvalues spacings for quantized cat maps (with A. Gamburd and J. Lafferty), *J. Phys A*, **36** (2003), no. 12, 3487–3499.
- FFTs for the 2-Sphere – Improvements and Variations (w/D. Healy, P. Kostelec and S. Moore), *J. Fourier Analysis and Appl.* **9** 4: 341–385, July 2003
- Data Mining and Network Analysis in the Life and Social Sciences: Potential Opportunities for the DoD and National Security, in IDA Paper P-3704, Defense Science Study Group 2000-2001 Papers 1-11, December 2002.
- Landscapes on spaces of trees (with O. Bastert, P. Stadler, and G. Tinhofer), *Appl. Math. Comput.*, **131** (2002), no. 2-3, 439–459.
- Fast Fourier transforms for fitness landscapes (with W. Hordijk, P. Kostelec, and P. Stadler) to appear in *Applied and Computational Harmonic Analysis*, **12** No. 1, Jan 2002, pp. 57-76.
- The Cooley-Tukey FFT and group theory (with D. Maslen) *Notices Amer. Math. Soc.* **48**(10), 2001, pp. 1151–1160.
- The Functional Magnetic Resonance Imaging Data Center (fMRIDC): the challenges and rewards of large-scale databasing of neuroimaging studies (with J. D. Van Horn, et. al.), *J. Roy. Soc.* **356** No. 1412, August 2001

- Nonlinear approximation theory on compact groups (with K.-L. Kueh, T. Olson, and K.-S. Tan), *J. Fourier Analysis and Appl.*, **7** No. 3, 2001, pp. 257–281
- Double coset decompositions and computational harmonic analysis on groups (with D. Maslen), *J. Fourier Anal. Appl.* **6**(4), 2000, pp. 349–388.
- FFTs for tensor and vector harmonics on the 2-sphere (with D. Healy, D. Maslen and P. Kostelec), *J. Computational Physics*, **162**, 2000, pp. 514–535.
- A wreath product group approach to signal and image processing: Part II – convolutions, correlations, and applications (with R. Foote, D. Healy, G. Mirchandani and T. Olson), *IEEE Trans. in Signal Processing*, **48**(3), 2000, pp. 749–767.
- A wreath product group approach to signal and image processing: Part I – Multiresolution Analysis, (with R. Foote, D. Healy, G. Mirchandani and T. Olson), *IEEE Trans. in Signal Processing*. **48**(1), 2000, pp. 102–132.
- Deciding finiteness for matrix groups over function fields (w/R. Beals and K. S. Tan), *Israel J. Math.* **109**, 1999, pp. 93–116.
- A Combinatorial Description of the Spectrum of the Tsetlin Library and its Generalization to Hyperplane Arrangements (with P. Bidigare, P. Hanlon), *Duke J. Math.*, **99**(1), 1999, pp. 135–174.
- Level spacings for Cayley graphs (with J. Lafferty). in *Emerging Applications of Number Theory*, D. Hejhal (ed.), Institute for Mathematics and its Applications, Volume 109, 1999, pp. 373–386.
- The  $*$ -product in kneading theory (with K. Brucks, R. Galeeva, P. Mumbre, and C. Tresser), *Fundamenta Math.* Vol. 152, 1997, pp. 189–209.
- Fast discrete polynomial transform with applications to data analysis on distance transitive graphs, (with J. Driscoll and D. Healy), *SIAM J. Comput.*, **26**, 1997, pp. 1066–1099.
- Spectral Techniques for Expander Codes, (with J. Lafferty) *1997 Symposium on the Theory of Computing*, pp. 160–167.
- Fast Fourier transforms for wreath products. *J. Applied and Computational Harmonic Analysis*, **2** (1995) 279–292.
- Adapted diameters and the efficient computation of Fourier transforms on finite groups (with D. Maslen), *Proceedings of 1995 ACM-SIAM Symposium on Discrete Algorithms*, pp. 253–262.
- A note on the order of finite subgroups of  $GL(n, \mathbf{Z})$  (with K.-S. Tan), *Archiv Math.*, **64** (1995) 283–288.
- Fast Fourier inversion for finite groups. *J. of Assoc. of Comp. Mach.*, **41**(1) (1994) 31–66.
- Efficient computation of isotypic projections for the symmetric group (with P. Diaconis). *DIMACS Series in Discrete Math.*, **11** (1993), 87–104.
- Deciding finiteness of matrix groups in deterministic polynomial time (with L. Babai and R. Beals). *Proc. of 1993 ISSAC*, 117–126.
- Symmetry stabilization for fast discrete monomial transforms and polynomial evaluation. (with S. Moore and D. Healy). *Lin. Alg. and Appl.*, **192** (1993) 249–299.
- Numerical investigation of the spectrum for certain families of Cayley graphs (with J. Lafferty). *DIMACS Series in Discrete Math. and Theor. Comp. Sci.*, **10** (1993), 63–73.
- Fast Fourier analysis for  $SL_2$  over a finite field and related numerical experiments. (with J. Lafferty) *J. of Experimental Mathematics*, **1** (1992) No. 2, 116–139.
- Renormalization for the  $n$ -torus. (with V. Baladi, N. Tongring, and C. Tresser). *Nonlinearity*, **5** (1992), 1111–1136.

Computation of  $L$ -series for elliptic curves over function fields, (with K.-S. Tan), *Crelle's Jour.*, **424** (1992), 107-135.

Even  $n$ -colorings of the integers, flows on the  $n$ -torus, continued fractions and renormalization. (with R. Siegel, N. Tongring, and C. Tresser) *Chaos*, **1** (1991), 25-30.

Efficient computation of Fourier transforms on finite groups, (with P. Diaconis), *Journal of the American Mathematical Society*, **3** (1990), 297-332.

Fast Fourier analysis for abelian group extensions, *Adv. in Appl. Math.* **11**, (1990), 164-204.

Computation of Fourier transforms on the symmetric group, *Proceedings of 1989 Conference on Computers and Mathematics*, Springer-Verlag, NY, 1989, 156-165.

## CONFERENCE PROCEEDINGS ARTICLES

Multifractal analysis for Jackson Pollock (w./J. Coddington, J. Elton, and Y. Wang), SPIE 2007, to appear.

A Fast Hermite Transform with Applications to Protein Structure Determination (w./G. Leibon and G. Chirikjian), Proceedings of Symbolic Numeric Computation

Stochastic Analysis of Geometric Image Processing Using B-Splines, (w./ G. Rohde, D. Healy, C. Bernstein, A. Aldroubi), Proceedings of 2006 IEEE International Conference on Acoustics, Speech, and Signal Processing, pp. 1017-1020, 2006.

“Wavelet Analysis for Authentication,” (w./S. Lyu and H. Farid), Art+Math = X, Conference on the interface of Art and Mathematics, CU, Boulder, June 2005

Description of an interactive, sound making online computer music tutorial web book, International Conference Music and Computers 2002 Short Paper/Demo, Voices of Nature Conference, Goeborg (w./P. Burk, L. Polansky, d. repetto, M. Roberts)

Recent Progress and Applications of Group FFTs, *36th Asilomar Conference on Signals and Systems*, IEEE Publications, January, 2003.

Lesion Size Estimation Using Warped Registration of Interval Images, (w./J.B. Weaver, S. Periaswamy, H. Farid, D.N. Rockmore, C.J. Kasales, W. Black, D.M. Healy, Jr.), Proceedings of the Society of Magnetic Resonance, Glasgow, UK, April, 2001, p. 795

A National Data Center for the Storage and Retrieval of Neuroimaging Data (w./J. Aslam, D. Rus, P. Kostelec, J. Grethe, R. Fendrich, S. Grafton, and M. Gazzaniga. *Society for Neuroscience Abstracts*, 26(2):2235, 2000

Codes and iterative decoding on algebraic expander graphs (w./J. Lafferty) to be presented at ISITA 2000.

Differential Affine Motion Estimation for Medical Image Registration (w./S. Periaswamy, J. Weaver, D. Healy, P. Kostelec and H. Farid), presented at SPIE 2000, August 2000.

A rhomboidal local cosine transform (w./D. Healy and D. Warner), presented at SPIE 2000, August 2000.

Wreath Product Cyclic Group-Based Convolution: A New Class of Noncommutative Filters (w/G. Mirchandani, R. Foote, D. Healy and T. Olson) to be presented at ICASSP 2000, Istanbul, Turkey.

A Smooth Non-Rectangular Time-Frequency Segmentation of  $L^2(R^2)$  Int. Conf. on Image Processing '97 (w/D. Warner and D. Healy)

Spectral Techniques for Expander Codes and Generalized Cyclic Codes (with J. Lafferty) in ISIT 97

An FFT for the 2-sphere and applications (w/ D. Healy and S. Moore), in ICASSP 96

Wreath Products for Image Processing (w/D. Healy and T. Olson) in ICASSP 96

An FFT for the 2-sphere and imaging applications (with D. Healy and S. Moore) in IMDSP96

## TECHNICAL REPORTS, PAPERS UNDER REVIEW

“A fast Hermite transform - theory and applications,” (w./G. Leibon, R. Taintor, G. Chirikjian, and W. Park), submitted for publication.

“Deblurring of Motionally Averaged Images with Applications to Single-Particle Cryo-Electron Microscopy,” (w./G. Chirikjian, W. Park, and D. Madden), arXiv: 0710.0690, submitted for publication.

“Fast Fourier Transforms for the Rook Monoid,” (w./M. Malandro), arXiv:0709.4175, submitted for publication.

“Optimal Well-Temperament: A General Mathematical Approach to the Problem of Tuning Musical Scales,” (w./L. Polanksy, D. Repetto, and K. Johnson), submitted for publication.

“Evolution of community structure in the world trade web”, (w./I. Tzekina and K. Danthi), arXiv:0709.2630, submitted for publication.

“FFTs on the Rotation Group” (w./P. Kostelec), Santa Fe Institute Working Papers Series Paper 03-11-060, 200, *submitted for publication*.

“A simple computational method for the identification of disease-associated loci in complex pedigrees” (w./M. Pollak and G. Leibon), arXiv:0710.5625.

On the Reconstruction of fMRI Analysis from Raw Study Data (w./P. Kostelec), in progress.

Ruffles and the turning point algebra (with P. Doyle), number to be assigned.

The windowed correlation: minimizing the adverse effects of the windowing function (with S. Periaswamy, P. Kostelec, J. Weaver and D. Healy), Department of Mathematics, Dartmouth College, April 2000. TR00-196

Landscapes on spaces of trees (with O. Bastert, P. Stadler, and G. Tinhofer), Santa Fe Institute Technical Report SFI 01-01-006.

Two-dimensional wreath product group-based signal processing (with R. Foote and G. Mirchandani) number to be assigned.

The windowed correlation: minimizing the adverse effects of the windowing function (with S. Periaswamy, P. Kostelec, J. Weaver and D. Healy), Department of Mathematics, Dartmouth College, April 2000. TR00-195

Computing with the finite Fourier transform is mathematics! Department of Mathematics, PMA-TR00-194, Department of Mathematics, Dartmouth College, February 2000

Fast Fourier transforms for fitness landscapes (with W. Hordijk, P. Kostelec, and P. Stadler) Santa Fe Institute, SFI-99-10-068.

FFTs for tensor and vector harmonics on the 2-sphere (with D. Healy, D. Maslen and P. Kostelec) Department of Mathematics, Dartmouth College PMA-TR99-192.

Nonlinear approximation theory on finite groups (with K.-L. Kueh, T. Olson, and K.-S. Tan) Department of Mathematics, Dartmouth College PMA-TR99-191.

FFTs for the 2-Sphere – Improvements and Variations (w/D. Healy and S. Moore) Department of Computer Science, Dartmouth College PCS-TR96-292. (May, 1996)

Efficiency and Stability Issues in the Numerical Computation of Fourier Transforms and Convolutions on the 2-Sphere (w/D. Healy and S. Moore) Department of Computer Science, Dartmouth College PCS-TR94-227. (May, 1994)

## WORKS IN PROGRESS

On the fractal nature of the equities market, I (w./A. Anderson, G. Leibon, S. Pauls, R. Savell)

On the fractal nature of the equities market, II (w./A. Anderson, G. Leibon, S. Pauls, R. Savell)

*Living Math* (w./W. Conquest and B. Drake), a video documentary on the new applied math of the life sciences.

## SOFTWARE

See “Fast Fourier Analysis on Groups” webpage for software for computing FFTs on different groups.

## EXPOSITORY WORKS

“Economics and Markets as Complex Systems,” Santa Fe Institute Bulletin, to appear.

“Stylometry!,” Santa Fe Institute Bulletin, Winter 2006, pp. 10-17.

“A style of number for a number of styles,” *Chronicle of Higher Education*, June 9, 2006.

“Cancer as a Complex System,” Santa Fe Institute Bulletin, Spring 2005, vol. 20, No. 1, pp. 18-21.

“From Buzz to Action: SFI in the media,” Santa Fe Institute Bulletin, Special 20th Anniversary Edition, Fall, 2004, vol, 19, No. 2, pp. 4-5

“The Holy Grail of Complexity Science,” Santa Fe Institute Bulletin, Special 20th Anniversary Edition, Fall, 2004, vol, 19, No. 2, pp. 11-13

“Cancer’s Complex Nature,” Santa Fe Institute Bulletin, Special 20th Anniversary Edition, Fall, 2004, vol, 19, No. 2, pp. 28-29

“Jilted by Sweden, Feted by Norway, Mathematics Finally Gets Its Due”, *Chronicle of Higher Education*, April 9, 2004.

“Are you my Mother...Tongue?” Santa Fe Institute Bulletin, vol. 19, No. 1, Winter, 2004, pp. 10-15.

“Seeing the Stars in Math”, *Connect Magazine*, Volume 16 Issue 3, January/February, 2003.

“So You Think You Want to be in Pictures?”, *Math FORUM*, Mathematical Association of America, February, 2003. (Also, MAA Online, February 2003).

“Exploiting a Beautiful Mind”, *Chronicle of Higher Education*, January 25, 2002.

“Proving Your Life” - a review of “Proof” for the St. Louis Repertory Theatre Playbill

“Square This!”, *Dallas Morning News*, To appear.

“Halving your Cake”, *Dallas Morning News*, July 1, 2001.

“Data are most useful when shared”, *Chronicle of Higher Education*, March 16, 2001 (with M. Gazzaniga)

*The FFT – an algorithm the whole family can use*, invited for IEEE/AIP Computing in Science & Engineering, special “Top 10 Algorithms of the Last 100 Years”, January 2000.

“Homework”, “The whole is the sum of its parts”, “Objects, arrows and rectangles”, in *Visual Proof: The Experience of Mathematics in Art*, ed. D. Wallace, Dartmouth College, Hanover, NH, to appear.

“The Chance Lectures” (with J. L. Snell), Video-CD.

“Count on Numbers to Always be there”, *The Boston Globe*, August 8, 2000.



“The Logic of Love”, Dallas Morning News, July 7, 2000.

“Uncertainty is Certain in Mathematics and Life”, Chronicle of Higher Education, June 23, 2000.

“In Painting or Math, Practice Precedes Art”, Dallas Morning News, July 20, 1999.

“The Nines Have It”, Dallas Morning News, September 9, 1999.

“The Exotic, Sensual, Paradoxical Pi”, Chronicle of Higher Education, March 12, 1999.

Book Review: On K.C. Cole’s “The Universe and the Teacup”, *A.M.S. Notices*, March 1999.

“To Teach, Per Chance, to Dream”, a discussion of the Chance Project, with J. L. Snell, *A.M.S. Notices*, September, 1999.

“Mathematical Metaphors Abound in Art and Fiction”, New York Times, Science Times Essay, September 1, 1998.

Radio Essayist, National Public Radio, Sounds Like Science, “Happy Pi Day”, (March 14, 1999), “Mathematical Models”, (April 24, 1999) “Math’s a Beach” (June 26, 1999)

Vermont Public Radio Commentator (Radio Essayist on Mathematics) “Math in the Movies” (October 13, 1998), “What Does a Mathematician Do?” (October 28, 1998), “A Slice of Pi” (November 17, 1998), “Fuzzy Thinking” (January 20, 1999), “Pleasantville” (March 18, 1999). “Mathematical Models” (June 16, 1999) “Mathematical Monkeys” (May 26, 1999), “Math’s a Beach” (July 21, 1999), “The Rare Beauty of Nine” (9 Sep, 1999), “My Computer Ate My Homework” (22 Sep, 1999), “Mathvertising” (6 Oct, 1999), “Name that Function” (3 Nov, 1999), “Jackson Pollock” (1 Dec, 1999), “Millennial Thoughts” (December 23, 1999), “The Geometry of Life” (January 2000), “A Dog Named Moe” (March 29, 2000) “Getting lost to get found” (4 May, 2000) “The Logic of Love” (5 July, 2000) “Can you hear the shape of your date?” (19 July, 2000) “In Search of New Numbers” (11 Nov, 2000), “Many Men, No Votes” (7 Feb, 2001), “Halving Your Cake” (16 April, 2001), “Wrestling with the Squared Circle” (24 May, 2001), “Six Hugs Away” (2 Oct, 2001), “Four degrees of Kelvin” (11 Oct, 2001), “New York Zeros” (26 Jun, 2002), “Math at the movies” (25 Jul, 2002), “Science Heroes and ‘QED’ (10 Jul, 2002) “Little Things” (March, 2004) “Married Math” (April, 2004) “Math Superheros ” (June, 2005) “Bursting at the Seams” (June 2005)

## NSF PANELS

NSF MSBS Panel (2004)

NSF CAREER Mentor Panel (2003)

NSF CAREER Panel (2002)

NSF Computation in ANTC Panel (Fall 2002)

NSF Discrete Math and Combinatorics Panel (1999)

NSF MSRI Committee of Visitors (1998)

NSF DMS Committee of Visitors (1998)

NSF-DARPA Optimizing Portable Applications Libraries (Fall 1996)

NSF-DARPA Massive Data Sets Initiative (Fall 1996)

## LECTURE SERIES

MSRI, “Modern Signal Processing” (w. D. Healy), Summer 2001.

## CONFERENCES/WORKSHOPS ORGANIZED

Toward a New World of Information Processing, DARPA, January, 2006.

Chance Lectures in Statistics (w. L. Snell), at Dartmouth, December 1997, 1998, 2000 (produced CD w. B. Drake)

Mind/Brain Symposium in Cognitive Neuroscience (w. M. Gazzaniga), at Dartmouth, February, 1999.

Mind Symposia (w/M. Gazzaniga) at Dartmouth, monthly, 1999-00, 2000-01.

## SOME RECENT TALKS

I. E. Block Community Lecture, Annual SIAM Meeting, July, 2008

February Fourier Talks, University of Maryland, February, 2008

A Multifractal Analysis of Jackson Pollock, SPIE, San Jose, January 27, 2008.

Chief of Naval Operations Strategic Studies Group, Naval War College, Newport, RI, November 27, 2007

Museum of Modern Art, NYC, November 8, 2007

Dutchess Community College 50th Anniversary, October 25, 2007

SFI Risk Forum, NYC, October 18, 2007

Distinguished Lecturer, Purdue University Fort Wayne, October 15, 2007

American Political Science Association, August 30, 2007

Santa Fe Institute, Public Lecture, June 17, 2007

Middlebury College Colloquium, FFT, May 2, 2007

Princeton University, Computational and Applied Mathematics Colloquium, April 2007

Swarthmore College, Sigma Xi, FFT, April, 2007

Stylometry, 2007 AAAS Annual Meeting, San Francisco, January 2007

SUNY New Paltz, Science and Engineering Colloquium Series, Artful Mathematics, November, 2006

Johns Hopkins University, Applied Math Colloquium, FFTs for Inverse Semigroups, November, 2006

Santa Fe Institute Business Network, "From Mind to Machine," November, 2006

Indiana University, "FFT's - an algorithm the whole family can use," April, 2006

Indiana University, "Artful Mathematics," Spring 2006.

Hood Museum, Symposium "Who Really Wielded the Paintbrush?" March, 2006

Aberdeen Proving Ground, "Stalking the Riemann Hypothesis", Sigma Xi Lecture, March, 2006

Weisman Art Museum, Minneapolis, Minnesota, "Mathematics: Maker and Muse for Modern Art," February, 2006.

University of Minnesota, "Math Matters" series, invited lecture, "Artful Mathematics," February, 2006

Christie's Auction House, "Digital Techniques in Authentication," November, 2005

"Signal Classification for Primate Communication," Encoding/Decoding Workshop, Santa Fe Institute, June 2005.

“Wavelet Analysis for Authentication,” Art+Math = X, Conference on the interface of Art and Mathematics, CU, Boulder, June 2005

Digital Art Authentication, at “To be or not to be a connoisseur?, Symposium in Honor of Hans Vlieghe,” U. Leuven, Belgium, May 2005

“Digital Techniques for Artistic Style,” NYU Applied Math Colloquium, May 2005

University of North Carolina, Greensboro, Sigma Xi Lecture, “Artful Mathematics - The Quantification of Style,” April 2005

“Digital Techniques for Art Authentication,” Santa Fe Institute, March, 2005

“Digital Techniques for Art Authentication,” New York Metropolitan Museum of Art, February, 2005

“Digital Techniques for Art Authentication,” Williamstown Conservation Center, January, 2005

Prosser Lectures, “The Art of Mathematics: The Quantification of Style”, November, 2004

Allegheny College Mathematics Lectures for Undergraduates (series): “Stalking the Riemann Hypothesis”, “The Art of Mathematics”, “The Math Life”, October, 2004.

“Digital Techniques for Art Authentication,”, Vanderbilt, May, 2004

“Chaos,” Bridgewater Associates, March, 2004.

“FFTs on the Rotation Group,” Tufts University, November, 2003.

“Quantum Chaos,”, UC Davis, Spring, 2003.

“Fast Fourier Transforms on Groups”, Institute for Advanced Study, December, 2002.

“Quantum Chaos and  $SL(2,p)$ ”, Institute for Advanced Study, December, 2002.

“Databases in the Life Sciences”, Santa Fe Insitute, May, 2002.

“Group FFTs”, AFOSR Signal Processing meeting on Burlington Vermont, June 2002.

“Recent Progress on Group FFTs”, 36th Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, November 2002.

“FFTs on Groups”, two-part lecture series at New York University (October, 2001)

“Data-mining and Network Analysis in the Life and Social Sciences”, Institute for Defense Analyses, December 2001

“The Way of Math” - video documentary presentation at the Institute for Defense Analyses, December 2001

Panel participant, presentation of clip from “The Math Life” video documentary at American Math Society meeting, San Diego, January 2002

University of Michigan Departmental Colloquium, February 2002

Statistics Colloquium (U. Vermont, March 2000)

Defense Sciences Study Group (IDA, January 2000)

Algebra Seminar (Yale Univ., December 1999)

Visual Proof/Art and Mathematics (Dartmouth College, October, 1999)

International Conference on Number Theory and Its Applications, National Central University, Taiwan (Invited Lecture, October 1999)

Conference on harmonic analysis and applications, U. Maryland (October 1999).

Image Processing, multiresolution analysis and statistics, Georgia Tech (Invited Lecture, September 1999)  
 NSF-RI Meeting in Computer Science, Las Cruces, NM (August 1999)  
 IMACS-ACA Invited Lecture, Madrid (June 1999).  
 MIT, Applied Math Colloquium, (May, 1999).  
 Princeton University, Analysis seminar, (April, 1999).  
 Cornell University, Department of Mathematics Colloquium, (February, 1999).  
 Columbia University, Department of Mathematics Colloquium, (January, 1999).  
 Yale University, Discrete Math Colloquium, (December 1998.)  
 Mathematics Colloquium, U. Mass., Amherst (December 1998)  
 Discrete Mathematics Colloquium, Yale (December 1998)  
 Celera Corp. (November, '98)  
 NYU, Applied Math Colloquium (October, '98)  
 DIMACS Workshop in Astrophysics and Algorithms: Massive Astronomical Data Sets (May 1998, Princeton)  
 Combinatorics of New England (May '98)  
 DIMACS Workshop in Discrete Mathematical Chemistry (March 1998, Rutgers)  
 Spectral Methods in Medical Signal Processing, Munich (Invited Lecture, February. '98)  
 Colloquium Speaker, National Taiwan University (January, '98)  
 Taipei Academia Sinica, Center for Theoretical Studies Conference on Number Theory (Invited Lecture, January '98)  
 Bios Group, Technical presentation on group theory and data analysis  
 Colloquium speaker, Department of Mathematics, University of Vermont (October '97)  
 SIAM Parallel Processing (March 1997) - Invited Minisymposium Presentation

## STUDENTS MENTORED

Martin Malandro, Ph.D. (Math, year 2)  
 Giulio Genovese, Ph.D. (Math, year 2)  
 Robert Savell, Ph. D. (Computer Science), '05, (Research Associate, Engineering, Dartmouth College)  
 Michael Orrison, Ph. D. (Math), '01 (Associate Prof., Math, Harvey Mudd)  
 Peter Kostelec (Postdoctoral Fellow, Math), (Research Fellow, Lincoln Labs)  
 Dan Becker '00 (Senior Thesis, CS) "Spectral analysis for voting data"  
 Robert Taintor, '07, Presidential Scholar, "Fast Hermite Transforms"  
 Alyssa Anderson, '07, (Senior Thesis, Math), "Financial Networks"  
 Eric Greenberg '00 (Senior Thesis, CS) "Auroral Absorption", High Honors  
 Karolyn Abram '00 (Presidential Scholar, Senior Thesis, CS) "Medical registration", High Honors

Shayna Rich '99 (Senior Thesis, Math) “Quantum Field Theory”, Honors

Douglas Warner (co-Ph.D. adviser Math. w/D. Healy - now at Vexcel Corp.)

Kevin Coopman (Senior Thesis - applying to Appl. Math. grad. school) Honors

Vikram Srimurthy, '95 (Senior Thesis, Math) “Computation in the Turning Point Algebra”, Honors

Todd Whitman (Senior Thesis - UMN math grad. school)

## **COURSES TAUGHT**

Undergraduate: Information Theory, Basic Probability, Mathematical Statistics, Honors Probability, Calculus, Groups and Symmetry, Applied Algebra, Calculus, Calculus for Physics and Chemistry, Music and Computers, Discrete Mathematics in Computer Science, Mathematics in the Social Sciences, Introduction to Fourier Analysis, Algebra

Graduate: Algebra I, Algebra II, Expander Graphs, Topics in Combinatorics, Image Processing, Numerical Analysis, Topics in Applied Math