

## CURRICULUM VITAE

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### EDUCATION

- 1996 Ph. D. Division of Applied Mathematics, Brown University, Providence, RI.  
Thesis Advisor: David Gottlieb.
- 1991 Sc. M. Division of Applied Mathematics, Brown University, Providence, RI.
- 1989 B. S. Department of Mathematics, UCLA, Los Angeles, CA.

### PROFESSIONAL EXPERIENCE

- 2007- Associate Chair of Graduate Studies, Department of Mathematics & Statistics, Arizona State University.
- 2007- Professor, Department of Mathematics & Statistics, Arizona State University.
- 2001-2007 Associate Professor, Department of Mathematics & Statistics, Arizona State University.
- Fall 2005 Visiting Scientist, Institute of Mathematics and its Applications (IMA), Minneapolis, MN.
- Fall 2004 Visiting Scientist, National Institute of Geophysics and Vulcanology, Bologna, Italy.
- 1998-2001 Assistant Professor, Department of Mathematics & Statistics, Arizona

State University.

1996-1998 Postdoctoral Fellow, Center for Research in Parallel Computing, California Institute of Technology. Postdoctoral Supervisor: Herbert Keller.

## REFEREED JOURNAL PAPERS

1. C. Blakely, A. Gelb, and A. Navarra, *An Automated Method for Recovering Piecewise Smooth Functions on Spheres Free from Gibbs Oscillations*, Sampling Theory in Signal and Image Processing, to appear.
2. R. Archibald, A. Gelb, and J. Yoon, *Determining the Locations and Discontinuities in the Derivatives of Functions*, Applied Numerical Mathematics, online Feb 13 (2007).
3. A. Gelb, *Reconstruction of Piecewise Smooth Functions from Non-Uniform Grid Point Data*, Journal of Scientific Computing, **30:3**, 409–440 (2007).
4. A. Gelb and E. Tadmor, *Adaptive Edge Detectors for Piecewise Smooth Data Based on the MinMod Limiter*, Journal of Scientific Computing, **28:2-3**, 279–306 (2006).
5. R. Archibald, A. Gelb, S. Gottlieb and J. Ryan, *One-Sided Post-Processing for the Discontinuous Galerkin Method Using ENO Type Stencil Choosing and the Local Edge Detection Method*, Journal of Scientific Computing, **28:2-3**, 167–190 (2006).
6. A. Gelb and Z. Jackiewicz, *Determining Analyticity for Parameter Optimization of the Gegenbauer Reconstruction Method*, SIAM Journal on Scientific Computing, **27:3**, 1014–1032 (2006).
7. A. Gelb and J. Tanner, *Robust Reprojection Methods for the Resolution of the Gibbs Phenomenon*, Applied Computational and Harmonic Analysis, **20:1**, 3–25 (2006).
8. R. Archibald, A. Gelb, and J. Yoon, *Polynomial Fitting for Edge Detection in Irregularly Sampled Signals and Images*, SIAM Journal on Numerical Analysis, **43**, 259–279 (2005).
9. Y. Ha, C. L. Gardner, A. Gelb, and C.-W. Shu, *Numerical Simulation of High Mach Number Astrophysical Jets with Radiative Cooling*, Journal of Scientific Computing, **24:1**, 29–44 (2005).

10. R. Archibald, J. Hu, A. Gelb, and G. Farin, *Improving the Accuracy of Volumetric Segmentation Using Pre-Processing Boundary Detection and Image Reconstruction*, IEEE Transactions on Image Processing, **13:4**, 459–466 (2004).
11. A. Gelb, *Parameter Optimization and Reduction of Round Off Error for the Gegenbauer Reconstruction Method*, Journal of Scientific Computing, **20:3**, 433–459 (2004).
12. J. P. Gleeson, O. M. Roche, J. West, and A. Gelb, *Modelling Annular Micromixers*, SIAM J. Appl. Math., **64:4**, 1294–1310 (2004).
13. R. Archibald, K. Chen, A. Gelb, and R. Renaut, *Improving Tissue Segmentation of Human Brain MRI Through Pre-Processing by the Gegenbauer Reconstruction Method*, NeuroImage, **20:1**, 489–502 (2003).
14. R. Archibald and A. Gelb, *A Method to Reduce the Gibbs Ringing Artifact in MRI Scans While Keeping Tissue Boundary Integrity*, IEEE Medical Imaging, **21:4**, 305–319 (2002).
15. R. Archibald and A. Gelb, *Reducing the Effects of Noise in Image Reconstruction*, Journal of Scientific Computing, **17:1–4**, 167–180 (2002).
16. C. L. Gardner, A. Gelb, and J. Hernandez, *A Comparison of Modern Hyperbolic Methods for Semiconductor Device Simulation: NTK Central Scheme vs. CLAWPACK*, VLSI Design **15**, 721–728 (2002).
17. A. Gelb, Z. Jackiewicz and B. Welfert, *Absorbing Boundary Conditions of the Second Order for the Pseudospectral Chebyshev Methods for Wave Propagation*, Journal of Scientific Computing, **17:1–4**, 501–512 (2002).
18. A. Gelb and E. Tadmor, *Spectral Reconstruction of Piecewise Smooth Functions from Their Discrete Data*, Mathematical Modelling and Numerical Analysis, **36:2**, 155–175 (2002).
19. A. Gelb, *A Hybrid Approach to Spectral Reconstruction of Piecewise Smooth Functions*, Journal of Scientific Computing, **15**, 293–322 (2001).
20. A. Gelb and J. P. Gleeson, *Spectral Viscosity for Shallow Water Equations in Spherical Geometry*, Monthly Weather Review, **129:9**, 2346–2360 (2001).
21. A. Gelb and E. Tadmor, *Enhanced Spectral Viscosity Approximations for Conservation Laws* Applied Numerical Mathematics **33**, 3–21 (2000).

22. A. Gelb and E. Tadmor, *Detection of Edges in Spectral Data II: Nonlinear Enhancement*, SIAM Journal on Numerical Analysis, **38:4**, 1389–1408 (2000).
23. A. Gelb and E. Tadmor, *Detection of Edges in Spectral Data*, Applied and Computational Harmonic Analysis **7**, 101–135 (1999).
24. A. Gelb, *The Resolution of Gibbs Phenomenon for Spherical Harmonics*, Mathematics of Computation **66:218**, 699–717 (1997).
25. A. Gelb and D. Gottlieb, *The Resolution of Gibbs Phenomenon for “Spliced” Functions in One and Two Dimensions*, Computers & Mathematics with Applications **33:11**, 35–58 (1997).
26. A. Gelb, D. Gottlieb, and N. Paldor, *Wind Set Up Relaxation on a Sloping Beach*, Journal of Computational Physics **138**, 644–664 (1997).

## REFEREED CONFERENCE PROCEEDINGS

1. J. P. Gleeson, O. M. Roche, J. West, and A. Gelb, *Modelling Annular Micromixers*, Technical Proceedings of the 2003 Nanotechnology Conference and Trade Show, **1**, 206–209 (2003).
2. R. Archibald and A. Gelb, *Reducing the Effects of Noise in MRI Reconstruction*, IEEE International Symposium on Biomedical Imaging Conference Proceedings, 497–500 (2002).
3. A. Gelb and R. Archibald, *Reducing the Gibbs Ringing Artifact in MRI Scans While Maintaining Tissue Boundary Integrity*, IEEE International Symposium on Biomedical Imaging Conference Proceedings, 923–926 (2002).
4. A. Gelb and D. Gottlieb, *The Resolution of Gibbs Phenomenon for “Spliced” Functions in One and Two Dimensions*, Proceedings of the Third IMACS International Symposium on Iterative Methods in Scientific Computation, Computation **4**, 275–282 (1997).

## NON-REFEREED TECHNICAL REPORTS

1. A. Gelb and A. Navarra, *Recovering Grid-Point Values Without Gibbs Oscillations in Two Dimensional Domains on the Sphere*, Center for Research on Parallel Computation, California Institute of Technology, 1997.

## CURRENT SUPPORT

- NSF Division of Mathematics and Physical Sciences (co-PI, 100% allocation): “RUI: Adaptive High-Order Methods for Solving PDEs,” 2006-2008, ASU sub-award amount \$37,000.
- NSF Division of Mathematics and Physical Sciences (PI, 25% allocation): “High Order Reconstruction Using Spectral Methods,” 2005–2008, \$226,547.
- NSF Division of Mathematics and Physical Sciences REU Supplement (PI, 100%): “High Order Reconstruction Using Spectral Methods,” 2005–2007, \$10,000.
- NSF Division of Shared Cyberinfrastructure (PI, 60%): “Collaborative Research ITR: An Integrated Simulation Environment for High Resolution Computational Methods in Electromagnetics with Biomedical Applications,” 2004–2008, ASU award amount \$280,000.
- NIH National Institute of Biomedical Imaging and Bioengineering (co-PI, 30%): “Improvements in MR and Dynamic PET Imaging Algorithms,” 2003–2006, \$510,875.
- NSF Division of Mathematical Sciences Infrastructure Program (co-PI, 15%): “Scientific Computing Research in Mathematical Sciences,” 2004–2007, \$80,298.

## PRIOR FUNDING

- NSF Division of Earth Sciences, Geophysics Program (co-PI, 33%): “Experiments Aimed at Improving Global Seismic Tomography,” 2002–2005, \$180,500.
- NSF Computational Mathematics (PI, 100%): “High Resolution Finite Difference Methods and Spectral Algorithms for Piecewise Smooth Data,” 2001–2004, ASU sub-award \$16,504.

## UNIVERSITY FUNDING

- Matching funds on Sloan Fellowship from ASU VPR/CLAS/SSERC, 1999–2000, \$35,000.
- Faculty Grant in Aid, Arizona State University: (PI, 100%): “A New Numerical Method for Weather Forecasting Models,” 1999–2000, \$4800.

## PRESENTATIONS AT CONFERENCES AND SYMPOSIA

1. “Reconstructing Piecewise Smooth Images from Fourier Spectral Data,” International Conference on Spectral and Higher Order Methods (ICOSAHOM), Keynote speaker, Beijing, China, June 2007.
2. “Spectral Viscosity Approximations for the Shallow Water Equations on a Sphere,” SIAM Mathematics and Geophysics Conference, Avignon, France, June 2005.
3. “Multivariate Local Edge Detection on Scattered Data,” 6th International Conference on Spectral and High-Order Methods, Providence, RI, June 2004.
4. “Multivariate Local Edge Detection on Scattered Data,” SIAM Conference on Imaging Science, Salt Lake City, UT, May 2004.
5. “Simulation of a 2D MESFET Using the Tadmor Central Scheme,” SIAM Conference on Computational Science and Engineering, San Diego, CA, February 2003.
6. “Reducing the Effects of Noise in Image Reconstruction,” IEEE Biomedical Imaging Conference, Washington, DC, July 2002.
7. “High Resolution Image Reconstruction in the Presence of Noise,” Intermountain/Southwest Conference on Interdisciplinary and Industrial Mathematics, Logan, UT, March 2002.
8. “Hyperbolic Central Schemes for Electrodynamics,” SIAM Annual Meeting, mini-symposium co-organizer, San Diego, CA, July 2001.
9. “A Hybrid Approach to Spectral Reconstruction of Piecewise Smooth Functions,” 5th International Conference on Spectral and High-Order Methods, Uppsala, Sweden, June 2001.
10. “Edge Detection and Applications to Computer Tomography Problems,” SIAM Annual Meeting, mini-symposium organizer, Rio Grande, Puerto Rico, July 2000.
11. “The Enhanced Spectral Viscosity Method for Numerical Models,” 4th International Conference on Spectral and High-Order Methods, Tel Aviv, Israel, July 1999.

## INVITED COLLOQUIA AND SEMINAR TALKS

1. "Reconstructing Piecewise Smooth Images from Fourier Spectral Data," Higher order and spectral methods workshop, Xiamen, China, June 2007.
2. "Image Reconstruction from Fourier Data," Department of Mathematics REU Summer Program, Northern Arizona University, July 2006.
3. "Recent Advances in Reconstruction Methods for Piecewise Smooth Functions," Department of Mathematics Colloquium, University of Wyoming, April 2006.
4. "Recent Advances in Reconstruction Methods for Piecewise Smooth Functions," Department of Computational and Applied Mathematics Colloquium, Rice University, January 2006.
5. "Region Extraction Using Edge Detection and B-Splines," Institute of Mathematics and its Applications (IMA), Minneapolis, MN, December 2005.
6. "High Order Reconstruction Methods for Piecewise Smooth Functions," Institute of Mathematics and its Applications (IMA), Minneapolis, MN, October 2005.
7. "Recent Advances in Reconstruction Methods for Piecewise Smooth Functions," Computational Mathematics Seminar, Brown University, October 2005.
8. "Reconstruction of Piecewise Smooth Functions," Applied Mathematics Seminar, Uppsala University, Sweden, May 2005.
9. "Reconstruction of Piecewise Smooth Functions," Applied Mathematics Seminar, University of Delaware, April 2005.
10. "Reconstruction of Piecewise Smooth Functions," Department of Mathematics Colloquium, Rensselaer Polytechnic Institute, March 2005.
11. "Reconstruction of Piecewise Smooth Functions," Computational Mathematics Seminar, Purdue University, March 2005.
12. "Reconstruction of Piecewise Smooth Functions," Department of Mathematics Colloquium, Colorado State University, February 2005.
13. "Multivariate Edge Detection," Department of Mathematics Colloquium, University of Arizona, February 2005.

14. "Spectral Methods for Piecewise Smooth Functions," Computational Science and Engineering Seminar, University of Arizona, February 2005.
15. "Spectral Methods for Piecewise Smooth Functions," Department of Mathematics Seminar, Politecnico di Milano, Italy, December 2004.
16. "Spectral Methods for Piecewise Smooth Functions," Department of Mathematics Seminar, Politecnico di Torino, Italy, December 2004.
17. "Spectral Methods for Piecewise Smooth Functions," National Institute of Geophysics and Vulcanology, Bologna, Italy, December 2004.
18. "Spectral Methods for Piecewise Smooth Functions," Department of Mathematics Seminar, University of Modena, Italy, December 2004.
19. "Spectral Methods for Piecewise Smooth Functions," Department of Modelling and Scientific Computing, Ecole Polytechnique Fédérale de Lausanne, Switzerland, November 2004.
20. "Higher Order Finite Difference Methods for Advection Diffusion Problems," National Institute of Geophysics and Vulcanology, Bologna, Italy, October 2004.
21. "Spectral Viscosity for Shallow Water Equations on a Sphere," National Institute of Geophysics and Vulcanology, Bologna, Italy, October 2004.
22. "High Order Reconstruction Algorithms for Medical Imaging," Barrett Medical Research Lab, University of Arizona, April 2004.
23. "Multivariate Local Edge Detection Method on Scattered Data," Department of Mathematics Colloquium, University of New Mexico, November 2003.
24. "Research Opportunities for Undergraduates in Image Reconstruction," Department of Mathematics REU Summer Program, Northern Arizona University, June 2003.
25. "Spectral Methods for Piecewise Smooth Functions," Applied Mathematics Seminar, Duke University, March 2003.
26. "Spectral Methods for Piecewise Smooth Functions," Center for Scientific Computation and Mathematical Modeling Seminar, University of Maryland, March 2003.

27. "The Resolution of the Gibbs Phenomenon for Discontinuous Problems," Department of Mathematics Colloquium, Cork University, Ireland, February 2003.
28. "Applications of Spectral Methods," Applied Mathematics Seminar, Colorado State University, September 2002.
29. "Spectral Methods for Discontinuous Problems," Lawrence Livermore National Laboratory, April 2002.
30. "Reducing the Effects of Noise in Image Reconstruction," Department of Mathematics Colloquium, University of Wyoming, September 2001.
31. "Reducing the Effects of Noise in Image Reconstruction," Computational Mathematics Seminar, Brown University, September 2001.
32. "A Hybrid Approach to Spectral Reconstruction of Piecewise Smooth Functions," Applied Mathematics Seminar, Stanford University, November 2000.
33. "Enhanced Spectral Viscosity Approximations for Conservation Laws," Applied Mathematics Seminar, Georgia Institute of Technology, April 2000.
34. "Edge Detection and Reconstruction of Piecewise Smooth Functions from Their Spectral Data," IEEE Communications and Signal Processing, Phoenix Chapter, March 2000.
35. "Enhanced Spectral Viscosity Approximations for Conservation Laws," Numerical Analysis Seminar, Texas A&M University, March 2000.
36. "Edge Detection and Reconstruction of Piecewise Smooth Functions on Spheres," National Center for Atmospheric Research, August 1999.
37. "Advances in the Edge Detection Method," Computational Mathematics Seminar, Brown University, March 1999.
38. "Advances in the Edge Detection Method," Department of Scientific Computing Colloquium, Uppsala University, Sweden, March 1999.
39. "The Enhanced Spectral Viscosity Method for Partial Differential Equations," IMGA-CNR Seminar, Bologna, Italy, June 1998.

40. “The Resolution of the Gibbs Phenomenon for Spherical Harmonics,” IMGA-CNR Seminar, Bologna, Italy, May 1997.

## **COURSES TAUGHT**

- Finite Difference Methods for Hyperbolic Partial Differential Equations (graduate).
- Spectral Methods for Hyperbolic Partial Differential Equations (graduate).
- Computational Methods for Problems in Biology and Epidemiology (graduate).
- Numerical Analysis I (graduate/undergraduate).
- Numerical Analysis II (graduate/undergraduate).
- Differential Equations (undergraduate).
- Linear Algebra (undergraduate).
- Calculus II (undergraduate).
- Calculus I (undergraduate).
- Business Calculus (undergraduate).

## **ADDITIONAL RELATED TEACHING ACTIVITIES**

- Undergraduate Honors Student Supervision: Calculus, Linear Algebra, Numerical Analysis I and Numerical Analysis II.
- Instructor for Graduate Reading Courses.
- Preparing Future Math Faculty Co-advisor, 2001–2003, 2006–.
- Graduate Student Seminar Organizer: Mathematical Analysis of Large Data Sets, 2006.

## **STUDENT AND POST-DOCTORAL SUPERVISION**

- Doctoral Dissertation Advisor for Rochus Boerner, *Construction of MRAs and Wavelets with Arbitrary Integer Dilation Factor  $a = 2, 3 \dots$* , Ph.D. 2004.
- Doctoral Dissertation Advisor for Richard Archibald, *Boundary Detection and Reconstruction in Magnetic Resonance Imaging*, Ph. D. 2002.
- Post-Doctoral Supervisor for Dr. Rodrigo Platte, 2006.
- Post-Doctoral Supervisor for Dr. James Gleeson, 1999–2000.
- Undergraduate Research Advisor for Christopher Blakely, 2004.
- Current Doctoral Dissertation Advisor for Dennis Cates, Russ Park, and Rishu Saxena.
- Current Undergraduate Honors Thesis Advisor for William Rosenthal and Miguel Sanchez.

## PROFESSIONAL SERVICE

- Department of Mathematics and Statistics:
  - Chair of Graduate Studies (2007–).
  - Review Committee (2007–).
  - Graduate Student Mentoring Committee Chair (2005–2006).
  - Graduate Reorganization Committee (2006–2007).
  - Graduate Committee (2001–2004).
  - Personnel and Budget Committee (2002–2004).
  - Colloquium Committee (1998–2000, 2006–2007).
  - Program Review Committee (2000–2001).
  - M.S. and Ph.D Examination Committees (2001–).
  - Hiring Committees (2001, 2002, 2005).
  - Affirmative Action Training (2003).
- Arizona State University:
  - CLAS Faculty Senate (2005–2007).

- CLAS Academic Standards Committee (1999–2001).
- Academic Community Service:
  - Editorial Boards:
    - \* Applied Numerical Mathematics (2006– ).
    - \* Journal of Scientific Computing (2006– ).
  - Peer Review of Articles
    - \* Applied Numerical Mathematics.
    - \* Electronic Letters on Computer Vision and Image Analysis.
    - \* International Journal for Numerical Methods in Fluids.
    - \* Journal of Approximation Theory.
    - \* Journal of Computational and Applied Mathematics.
    - \* Journal of Computational Physics.
    - \* Journal of Fourier Analysis and Applications.
    - \* Journal of Scientific Computing.
    - \* Mathematical Biosciences and Engineering.
    - \* Mathematics of Computation.
    - \* Pattern Recognition Letters.
    - \* Sampling Theory in Signal and Image Processing.
    - \* SIAM Journal on Numerical Analysis.
    - \* SIAM Journal on Scientific Computing.
  - Review of Research Proposals
    - \* National Science Foundation.
    - \* Swedish Research Council.

## HONORS AND AWARDS

- Alfred P. Sloan Research Fellowship, \$35,000, 1999.
- Nominated for the College of Liberal Arts and Sciences Distinguished Teaching Award, Arizona State University, 1999.
- Nominated for the Outstanding Mentor Award for the Graduate Women’s Association, Arizona State University, 2002.