

ALINA CHERTOCK - CURRICULUM VITAE

AFFILIATION

Department of Mathematics, **North Carolina State University**

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EDUCATION

- 1991-1999 **Ph.D., Applied Mathematics**, School of Mathematical Sciences,
Tel-Aviv University, Israel
Thesis: *Strict stability of high-order compact implicit schemes -
the role of boundary conditions for hyperbolic PDE's*
Advisor: Professor S. Abarbanel
- 1984-1989 **M.Sc.** (Diploma of Higher Education), **Applied Mathematics**,
Faculty of Computational Mathematics and Cybernetics,
Moscow State University, Moscow, U.S.S.R
Thesis: *Numerical modeling of processes in semiconductors*
Advisor: Professor V. A. Trofimov

RESEARCH INTERESTS

Applied Nonlinear Partial Differential Equations, Scientific Computing, Numerical Analysis,
Multiscale Models, Uncertain Phenomena, Experimental Asymptotics.

ACADEMIC EMPLOYMENT

- 2007 – present **Associate Professor**, Department of Mathematics,
North Carolina State University
Visiting Associate Professor, Division of Applied Mathematics,
Brown University
- 2002 – 2007 **Assistant Professor**, Department of Mathematics,
North Carolina State University
- 2001 – 2002 **Visiting Assistant Professor**, Department of Mathematics,
University of California, Berkeley

- 1999 – 2001 **Postdoctoral Fellow**, Department of Mathematics,
University of California, Berkeley
Postdoctoral Fellow, Department of Mathematics,
Lawrence Berkeley National Laboratory, Berkeley
- 1996 – 1999 **Instructor**, School of Mathematical Sciences, Tel-Aviv University, Israel
Instructor, The Academic College of Tel-Aviv-Yaffo, Tel-Aviv, Israel
- 1991 – 1996 **Teaching Assistant**, School of Mathematical Sciences,
Tel-Aviv University, Israel

SCHOLARSHIPS AND AWARDS

- 2007-2010 **National Science Foundation Award**, PI, NCSU
- 2007 **SIAM Travel Award** to attend the International Congress of
Industrial and Applied Mathematics, Zürich, Switzerland
- 2006 **AMS Travel Award** to attend the International Congress of
Mathematicians, Madrid, Spain
- 2004 **Association for Women in Mathematics – National Science
Foundation (AWM-NSF) Travel Grant**
- 2004-2007 **National Science Foundation Award**, PI, NCSU
- 2003-2004 **Faculty Research and Professional Development Award**, NCSU
- 2002 **American Mathematical Society Travel Award** to attend
the International Congress of Mathematicians, Beijing, China
- 1998 **The Ami Harten Award** for Excellence in Applied Mathematics
Graduate Studies, Tel-Aviv University, Israel
- 1997 **The Nathan and Ruth El Josef Award** for Teaching Excellence,
Tel-Aviv University, Israel
- 1993-1996 **The Josef Buchmann Doctoral Scholarship Fund** in Mathematics
and Computer Sciences, Israel

PROFESSIONAL ACTIVITIES

- University Service:
 - Member of the Faculty Advisory Committee (FAC) within the Department of Mathematics at NCSU (2007-2009).
 - Member of the Graduate Program Committee within the Department of Mathematics at NCSU (2005-2008).
 - Organizer of the Departmental Numerical Analysis Seminar at NCSU (2003-2005).
 - Member of the Library committee within the Department of Mathematics at NCSU.
 - Member of a number of graduate students committees at NCSU.
 - Mentor of Teaching Assistants within the Department of Mathematics Department at NCSU.

- Referee: Journal of Computational Physics, Journal of Scientific Computing, Physica Letter A, Discrete and Continuous Dynamical Systems, Series B, United States-Israel Binational Science Foundation, Journal of Scientific Computing, SIAM Journal of Scientific Computing, Applied Numerical Mathematics, SIAM Journal of Numerical Analysis, Journal of Mathematical Analysis and Applications, Journal of Differential Equations, Computers and Fluids.
- Professional Societies: Society of Industrial and Applied Mathematics.

PhD STUDENTS

- Stephen May, Department of Mathematics, NCSU.

SPECIAL PROJECTS WITH STUDENTS

- Research Industrial Projects for Students (RIPS)-2003, Institute of Pure and Applied Mathematics, University of California, Los Angeles, July-August, 2003.
- Industrial Mathematical and Statistical Modeling Workshop for Graduate Students, Department of Mathematics and Center for Research in Scientific Computation, NCSU, July 25-August 2, 2005.
- Industrial Mathematical and Statistical Modeling Workshop for Graduate Students, Department of Mathematics and Center for Research in Scientific Computation, NCSU, July 24-August 1, 2006.

CONFERENCES: ORGANIZER

- Minisymposium on Computational Aspects of Transport Phenomena, SIAM Annual Meeting, New Orleans, July 11-15, 2005.
- Minisymposium on Numerical Methods for Multicomponent Flows, The 2nd International Conference on Scientific Computing and Partial Differential Equations & The First East Asia SIAM Symposium, Hong Kong, December 12-16, 2005.
- Minisymposium on Numerical Methods for Multicomponent Flows, ICIAM, Zürich, July 16-20, 2007.

CONFERENCE, COLLOQUIUM AND SEMINAR TALKS

1. 12th International Conference on Hyperbolic Problems Theory, Numerics, Applications, College Park, MD, June 9-13, 2008 (invited).
2. 6th International Conference on Scientific Computing and Applications, Pusan National University, Busan, Korea, June 2-5, 2008.
3. 7th AIMS International Conference on Dynamical Systems, Differential Equations and Applications, Arlington, TX, May 18-21, 2008 (invited).

4. Division of Engineering and Applied Science, California Institute of Technology, February 2008 (invited).
5. Department of Mathematics, University of Maryland, February 2008 (invited).
6. Center for Scientific Computation and Mathematical Modeling (CSCAMM), University of Maryland, February 2008 (invited).
7. Division of Applied Mathematics, Brown University, January 2008 (invited).
8. SIAM Conference on Analysis of Partial Differential Equations, Mesa, AZ, December 10-12, 2007.
9. Statistical and Applied Mathematical Sciences Institute, Program on Random Media, Interface Problems Workshop, Research Triangle Park, NC, November 2007 (invited).
10. Mathematics Department, Tulane University, New Orleans, October 2007 (invited).
11. 6th International Congress on Industrial and Applied Mathematics, ICIAM 2007, Zürich, Switzerland, July 16-20, 2007 (minisymposium organizer).
12. The 7th International Conference on Spectral and High-Order Methods, Beijing, China, June 18-22, 2007.
13. INdAM International Workshop on Nonlinear Hyperbolic Problems, Rome, Italy, May 28-June 1, 2007.
14. Numerical Methods for Degenerate Elliptic Equations and Applications, Banff International Research Station for Mathematical Innovation and Discovery (BIRS), Banff, Canada, December 9-14, 2006 (invited).
15. Mathematics Department, Tulane University, New Orleans, November 2006 (invited).
16. European Conference on Computational Fluid Dynamics, Egmond aan Zee, Netherlands, September 2006 (invited).
17. 11th International Conference on Hyperbolic Problems Theory, Numerics, Applications, Lyon, France, July 17-21, 2006.
18. SIAM Conference on Analysis of Partial Differential Equations, Boston, MA, July 10-12, 2006.
19. School of Mathematical Sciences, Tel-Aviv University, Israel, June 2006 (invited).
20. Mathematics Department, Tulane University, New Orleans, June 2006 (invited).
21. Multiscale Modeling of Materials: Mathematics and Computation, Tacoma, WA, May 25-30, 2006 (invited).
22. Nonlinear Diffusions: Entropies, Asymptotic Behavior and Applications, Banff International Research Station for Mathematical Innovation and Discovery (BIRS), Banff, Canada, April 15-20, 2006 (invited).
23. Mathematics Department, Tulane University, New Orleans, March, 2006 (invited).

24. The 2nd International Conference on Scientific Computing and Partial Differential Equations & The First East Asia SIAM Symposium, Hong Kong, December 12-16, 2005 (minisymposium organizer).
25. Elizabeth C. Crosby Speaker Series, Department of Mathematics, University of Michigan, Ann Arbor, November 2005 (invited).
26. SIAM Annual Meeting, New Orleans, LA, July 11-15, 2005 (minisymposium organizer).
27. The International Symposium on Finite Volumes for Complex Applications IV, Marrakech, Morocco, July 4-8, 2005.
28. International Conference on Scientific Computing, Nanjing, China, June, 2005 (invited).
29. Workshop on Stiff Sources and Numerical Methods for Conservation Laws, The American Institute of Mathematics (AIM), Palo Alto, CA, April 4-8, 2005 (invited).
30. SIAM-SEAS Annual Meeting, Charleston, SC, March 25-26, 2005.
31. Division of Applied Mathematics, Brown University, February 2005 (invited).
32. SIAM Conference of Analysis of PDEs, Houston, TX, December 6-8, 2004.
33. Department of Mathematics, University of North Carolina, Chapel Hill, October 2004 (invited).
34. Mathematics Department, Tulane University, New Orleans, October 2004 (invited).
35. Tenth International Conference on Hyperbolic Problems: Theory, Numerics and Applications, Osaka, Japan, September 13-17, 2004.
36. Conference on Analysis, Modeling, and Computation of PDE and Multiphase Flow, Stony Brook University of New-York, August 3-5, 2004.
37. SIAM Annual Meeting, Portland, OR, July 12-16, 2004.
38. The 6th International Conference on Spectral and High-Order Methods, Brown University, June 21-25, 2004.
39. Schemes for Multidimensional Wave Structures in Hyperbolic Systems, Hamburg University of Technology, Germany, March 1-4, 2004 (invited).
40. The First Chilean Workshop on Numerical Analysis and Partial Differential Equations, Concepcion, Chile, January 13-16, 2004.
41. Center for Scientific Computation and Mathematical Modeling (CSCAMM), University of Maryland, November 2003 (invited).
42. Department of Mathematics, Duke University, November 2003 (invited).
43. International Workshop on Multiphase and Complex Flow Simulation for Industry, Cargese, Corsica, October 20-24, 2003.
44. Division of Applied Mathematics, Brown University, September 2003 (invited).

45. The European Conference on Numerical Mathematics and Advanced Applications, Prague, Czech Republic, August 18-22, 2003.
46. 5th International Congress on Industrial and Applied Mathematics, ICIAM 2003, Sydney, Australia, 7-11 July, 2003.
47. Division of Engineering and Applied Science, California Institute of Technology, July 2003 (invited).
48. The Second IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory”, Athens, GA, April 7-10, 2003.
49. Department of Electrical Engineering, North Carolina State University, January 2003 (invited).
50. Mathematics in Nanoscale Science and Engineering, Workshop IV: Modeling and Simulation for Materials, IPAM, University of California, Los Angeles, November 19-22, 2002.
51. Mathematics Department, Tulane University, October 2002 (invited).
52. Third International Symposium on Finite Volume for Complex Applications, Porquerolles, France, June 24-28, 2002.
53. Nonlinear Differential Equations, Mechanics and Bifurcation, Duke University, May 20-22, 2002.
54. Department of Mathematics, University of California, Berkeley, March 2002 (invited).
55. Department of Mathematics, University of Houston, March 2002 (invited).
56. Ninth International Conference on Hyperbolic Problems: Theory, Numerics and Applications, Pasadena, CA, March 25-29, 2002.
57. Fourth International Workshop on Vortex Flows and Related Numerical Methods, Santa-Barbara, March 17-20, 2002.
58. Department of Mathematics, University of North Carolina, Chapel Hill, February 2002 (invited).
59. Department of Mathematics, North Carolina Carolina State University, Raleigh, February 2002 (invited).
60. Department of Mathematics, University of Delaware, February 2002 (invited).
61. Department of Mathematics, University of Kentucky, Lexington, January 2002 (invited).
62. Department of Mathematics, Texas A&M University, January 2002 (invited).
63. AMS National Meeting, San-Diego, January 6-9, 2002.
64. Department of Mathematics, University of Massachusetts, Amherst, December 2001 (invited).
65. Mathematics Department, Tulane University, New Orleans, October 2001 (invited).

66. SIAM Annual Meeting, San-Diego, CA, July 9-13, 2001.
67. The 5th International Conference on Spectral and High-Order Methods, Uppsala, Sweden, June 6-10, 2001.
68. Geometrically Based Motions, Institute of Pure and Applied Mathematics, University of California, Los Angeles, May 14-18, 2001.
69. Department of Mathematics, University of Michigan, Ann Arbor, October 2000 (invited).
70. Mathematical Challenges of 21st Century, University of California, Los Angeles, 7-12 August, 2000.
71. Nonlinear Analysis 2000, Courant Institute, New York University, May 28-June 2, 2000.
72. Division of Applied Mathematics, Brown University, September 1999 (invited).

LIST OF PUBLICATIONS

All papers can be downloaded from www.math.ncsu.edu/~acherto

1. A. Chertock, Y. Karamzin, V. Trofimov, *On a numerical algorithm for nonlinear differential equations describing some processes in photoreceivers*, Journal of Mathematical Modeling, **3** (1991), pp. 95–103 (in Russian).
2. S. Abarbanel, A. Chertock, *Strict stability of high-order compact implicit finite-difference schemes - the role of boundary conditions for hyperbolic PDEs. Part I*, Journal of Computational Physics, **160** (2000), pp. 42–66.
3. S. Abarbanel, A. Chertock, A. Yefet, *Strict stability of high-order compact implicit finite-difference schemes - the role of boundary conditions for hyperbolic PDEs. Part II*, Journal of Computational Physics, **160** (2000), pp. 67–87.
4. G. I. Barenblatt, M. Bertsch, A. E. Chertock, V. M. Prostokishin, *Self-similar intermediate asymptotics for a degenerate parabolic filtration-absorption equation*, Proceedings of National Academy of Sciences, **97** (2000), pp. 9844–9848.
5. A. Chertock, D. Levy, *Particle methods for dispersive equations*, Journal of Computational Physics, **171** (2001), pp. 708–730.
6. A. Chertock, *On the stability of a class of self-similar solutions to the filtration-absorption equation*, European Journal of Applied Mathematics, **13** (2002), pp. 179-194.
7. A. Chertock, D. Levy, *Particle methods for the KdV equation*, Journal of Scientific Computing, **17** (2002), pp. 491-499.
8. A. Chertock, A. Kurganov, P. Rosenau, *Formation of discontinuities in flux-saturated degenerate parabolic equations*, Nonlinearity, **16** (2003), pp. 1875-1898.
9. A. Chertock, A. Kurganov, *On a hybrid finite-volume particle method*, Mathematical Modelling and Numerical Analysis, **38** (2004), pp. 1071–1091.

10. A. Chertock, D. Levy, *On wavelet-based numerical homogenization*, SIAM Journal of Multiscale Modeling & Simulation, **3** (2004), pp. 65-88.
11. A. Chertock, A. Kurganov, *Conservative locally moving mesh method for multifluid flows*, Finite Volumes for Complex Applications IV (2005), pp 273-284.
12. A. Chertock, A. Kurganov, G. Petrova, *Fast explicit operator splitting method. Application to the polymer system*, Finite Volumes for Complex Applications IV (2005), pp. 63-72.
13. A. Chertock, A. Kurganov, P. Rosenau, *On strongly degenerate saturated-diffusion equations with convection*, Nonlinearity, **18** (2005), pp. 609–630.
14. A. Chertock, A. Kurganov, G. Petrova, *Finite-volume-particle methods for models of transport of pollutant in shallow water*, Journal of Scientific Computing, **27** (2006), pp. 189-199.
15. A. Chertock, A. Kurganov, *On a practical implementation of particle methods*, Applied Numerical Analysis, **56** (2006), pp. 1418–1431.
16. A. Chertock, A. Kurganov, Yu. Rykov, *A new sticky particle method for pressureless gas dynamics*, SIAM Journal on Numerical Analysis, **45** (2007), pp. 2408-2441.
17. A. Chertock, E. Kashadan, A. Kurganov, *Propagation of diffusing pollutant by a hybrid Eulerian-Lagrangian method*, Hyperbolic Problems: Theory, Numerics, Applications (Lyon 2006), pp. 371-380, Springer, 2008.
18. A. Chertock, A. Kurganov, *A simple eulerian finite-volume method for compressible fluids in domains with moving boundaries*, Communications in Mathematical Sciences, **6**, 2008, to appear.
19. A. Chertock, A. Kurganov, G. Petrova, *Fast explicit operator splitting method for convection-diffusion equations*, International Journal for Numerical Methods in Fluids, in press.
20. A. Chertock, A. Kurganov, *Computing multivalued solutions of pressureless gas dynamics by deterministic particle methods*, Communications in Computational Physics, to appear.
21. A. Chertock, D. Gottlieb, A. Solomonoff, *Modified optimal prediction and its application to a particle-method problem*, Journal of Scientific Computing, to appear.
22. A. Chertock, S. Karni, A. Kurganov, *Interface tracking method for compressible multifluids*, Mathematical Modelling and Numerical Analysis, M2AN, accepted.
23. A. Chertock, A. Kurganov, *A positivity preserving central-upwind scheme for chemotaxis and haptotaxis models*, Numerische Mathematik, submitted.
24. A. Chertock and A. Kurganov, *On splitting-based numerical methods for convection-diffusion equations*, Quaderni di Matematica, submitted.
25. A. Chertock, C. Doering, E. Kashdan and A. Kurganov, *A fast explicit operator splitting method for passive scalar advection*, Mathematical Modelling and Numerical Analysis, M2AN, submitted.

WORK IN PROGRESS

1. *On the application of lacunae-based methods for Maxwell's equations.*
2. *A particle method for a family of fluid transport equations.*
3. *A particle method for the KdV-Burgers equation.*
4. *Balanced schemes for the shallow water equations with a bottom topography and Coriolis forces.*