

AMNON J. MEIR

Department of Mathematics
Auburn University, AL 36849-5310

office: 334-844-6580
334-844-4290

fax: 334-844-6555

e-mail: ajm@math.auburn.edu

home: 334-826-8054

web: <http://www.auburn.edu/~ajm>

EDUCATION

1989 Ph.D., Mathematics, Carnegie Mellon University, Pittsburgh, PA

1984 B.Sc., Aeronautical Engineering, Technion, Israel Institute of Technology, Haifa, Israel

POSITIONS

Primary positions

Since 2001 Professor, Department of Mathematics, Auburn University, Auburn, AL

1994–2001 Associate Professor, Department of Mathematics, Auburn University, Auburn, AL

1989–1994 Assistant Professor, Department of Mathematics, Auburn University, Auburn, AL

Secondary positions

Summer 1989, 1988, 1987 Staff Research Assistant, Los Alamos National Laboratory, Los Alamos, NM

Consulting positions

1993–2001 Consultant, American Computing, Inc.

RESEARCH INTERESTS

Numerical Analysis, Partial Differential Equations, Fluid Dynamics, Scientific Computing, Applied and Industrial Mathematics

GRANTS

Current

1. NIH - *“Improving the Detection Limits of Potentiometric and Optical Sensors”* co-principal investigator (with Chemistry: E. Bakker, principal investigator, and ETH Zurich, Chemistry: E. Pretsch, co-principal investigator) - Period of funding: September 1, 2000–August 31, 2004 - Award amount: \$ 650,621

Completed

1. Alabama Supercomputer Authority - *“On the Finite Element Method for the Velocity-Vorticity Formulation of Three-Dimensional, Viscous, Incompressible Flow”*, principal investigator - Period of funding: 1990 - Award amount: 100 hours of Cray time
2. Research Grant-in-Aid, Auburn University - *“On the Finite Element Method for the Velocity-Vorticity Formulation of Three-Dimensional, Viscous, Incompressible Flows”*, principal investigator - Period of funding: June 16, 1990–June 15 1991 - Award amount: \$ 8,633

3. American Computing Inc. - “*Numerical Approximation of Solutions of the Steady Navier Stokes Equations*”, principal investigator - Period of funding: June 16, 1993–September 15, 1993 - Award amount: \$8,010
4. American Computing Inc. - “*Numerical Approximation of Solutions of the Steady Navier Stokes Equations (Part II)*”, principal investigator - Period of funding: September 16, 1993–December 15, 1993 - Award amount: \$9,144
5. American Computing Inc. - “*Numerical Approximation of Solutions of the Steady Navier Stokes Equations (Part III)*”, principal investigator - Period of funding: June 16, 1994–September 15, 1994 - Award amount: \$11,128
6. NSF - “*Viscous Incompressible Magnetohydrodynamics: Analysis and Numerical Approximation*”, co-principal investigator (with P. G. Schmidt, principal investigator) - Period of funding: June 16, 1994–June 15, 1996 - Award amount: \$43,470
7. NSF - “*Viscous Incompressible Magnetohydrodynamics: Analysis and Numerical Approximation*”, co-principal investigator (with P. G. Schmidt, principal investigator) - Period of funding: June 16, 1996–June 15, 1999 - Award amount: \$120,964
8. DOE EPSCoR - “*Fusion Energy Research*”, co-principal investigator (with Physics: D. G. Swanson, principal investigator, R. F. Gandy, J. D. Hanson, S. F. Knowlton, M. S. Pindzola F. Robicheaux, and C. Watts, co-principal investigators) - Period of funding: October 1, 1998–September 30, 1999 - Award amount: \$200,000
9. NSF - “*Eighteenth Southeastern Atlantic Regional Conference on Differential Equations*”, principal investigator (with P. G. Schmidt, co-principal investigator) - Period of funding: November 1, 1998–October 31, 1999 - Award amount: \$6,550
10. DOE EPSCoR - “*Energy and Particle Transport in Fusion Plasmas*”, co-principal investigator (with Physics: D. G. Swanson, principal investigator, R. F. Gandy, J. D. Hanson, S. F. Knowlton, M. S. Pindzola F. Robicheaux, and C. Watts, co-principal investigators) - Period of funding: October 1, 1999–September 29, 2000 - Award amount: \$200,000
11. PRISM (College of Sciences and Mathematics, Auburn University) - “*Computational Science*” (funding for a Beowulf cluster) co-principal investigator (with Physics: J. D. Perez, principal investigator, Y. Lin, M. S. Pindzola, F. Robicheaux, Chemistry: M. L. McKee, and Mathematics: P. G. Schmidt, co-principal investigators) - Period of funding: October 1, 2001–September 30, 2002 - Award amount: \$100,000

STUDENTS

Completed

- M.Sc. - Zheng Zhang (1992) - *Approximate Solutions of the Laplace-Beltrami Equation on a Sphere*
- MAM - Can Demirkaya (1995) - *A Finite Element Stokes Solver*
- Ph.D. - Maria Charina-Kehrein (2002) - *A MHD Free Boundary Value Problem*

COURSES TAUGHT

Undergraduate

- Calculus 1, 2, and 3
- Business Mathematics with Calculus Applications
- Linear Differential Equations
- Topics in Linear Algebra
- Elementary Differential Equations
- Introduction to Mathematical Programming
- Introduction to Linear Algebra

Senior level/graduate

- Elementary Partial Differential Equations
- Introduction to Numerical Analysis 1 and 2
- Mathematical Modeling

Graduate

- Applied Mathematics 1 and 2
- Advanced Numerical Matrix Analysis
- Numerical Solution of Partial Differential Equations
- Advanced Topics in Numerical Analysis (Finite Elements, Boundary Elements, Multigrid Methods, and Computational Fluid Dynamics)
- Optimization Theory

PROFESSIONAL ACTIVITIES

Member

- American Mathematical Society
- Society for Industrial and Applied Mathematics

Conference organization

- Member program committee, Faculty Development Consortium First Annual Instructional Technology Conference, Auburn University and Tuskegee University, Tuskegee, March 20–22 1995
- Member steering committee (Chair 1998), Annual Southeastern-Atlantic Regional Conference on Differential Equations 1995–1998
- Chair organizing committee of the Eighteenth Southeastern Atlantic Regional Conference on Differential Equations, Auburn, October 16–17, 1998

Minisymposia organized by invitation

- Organizer (with P. G. Schmidt), special session on magnetohydrodynamics, Second World Congress of Nonlinear Analysts, Athens, Greece, July 10–17, 1996
- Organizer (with P. G. Schmidt), invited minisymposium on magnetohydrodynamics, 1998 SIAM Annual Meeting, Toronto, Canada, July 13–17, 1998
- Organizer (with P. G. Schmidt), special session on magnetohydrodynamics and related topics, Third World Congress of Nonlinear Analysts, Catania, Italy, July 19–26, 2000

Minisymposia organized

- Organizer (with P. G. Schmidt), minisymposium on complex flows, 1999 SIAM Annual Meeting, Atlanta, May 12–15, 1999
- Organizer (with T. Liakos and P. G. Schmidt), minisymposium on complex flows, 2002 SIAM Annual Meeting, Philadelphia, July 8–12, 2002

Originator, organizer

- Founded and organized IDEAS² Inter-Disciplinary Engineering and Science Seminar. A forum for presentations by researchers whose research has ties to several disciplines and is of interest to a diverse audience of scientists and engineers.
- Initiated and organized Auburn University SIAM Chapter (currently serving as the Faculty Advisor to the chapter).

Referee

- National Science Foundation
- Computers and Mathematics with Applications
- Discrete and Continuous Dynamical Systems
- Electronic Transactions on Numerical Analysis
- Heat and Mass Transfer
- International Journal for Numerical Methods in Fluids
- Journal of Nonlinear Analysis
- Metallurgical and Materials Transactions
- Numerical Methods for Partial Differential Equations
- SIAM Journal on Numerical Analysis
- SIAM Journal on Scientific and Statistical Computing
- Addison-Wesley Longman
- Addison-Wesley Publishing Co.
- Harper & Row, Publishers Inc.

Judge

- Student paper competition, SIAM-SEAS 2000, University of Georgia, Athens, March 24–25 2000

Reviewer

- Zentralblatt für Mathematik (more than 45 papers)
- Mathematical Reviews (more than 55 papers)
- Foundations of Physics

PUBLICATIONS

Articles

1. Normal Modes of Orthotropic Plates, Proceedings 12th International Congress on Acoustics, International Union of Pure and Applied Physics (IUPAP), Toronto, July 1986 (with M. D. Gunzburger and R. T. Schumacher).
2. On the Existence, Uniqueness, and Finite Element Approximation of Solutions of the Equations of Stationary, Incompressible Magnetohydrodynamics, *Math. Comp.* **56** 194 (1991) 523–563 (with M. D. Gunzburger and J. S. Peterson).
3. Vorticity Constraints in Velocity-Vorticity Formulation of Steady, Viscous, Incompressible Flow, in: *Numerical Methods in Laminar and Turbulent Flow*, Proceedings of the Seventh International Conference, C. Taylor, J. H. Chin and G. M. Homsy eds., Pineridge Press, Swansea, United Kingdom, 1991, 774–781 (with Q. Du and M. D. Gunzburger).

4. On Some Control Problems Related to MHD Flows, in: Numerical Methods in Laminar and Turbulent Flow, Proceedings of the Seventh International Conference, C. Taylor, J. H. Chin and G. M. Homsy eds., Pineridge Press, Swansea, United Kingdom, 1991, 1680–1689 (with L. S. Hou).
5. The Equations of Stationary, Incompressible Magnetohydrodynamics with Mixed Boundary Conditions, *Computers Math. Applic.* **25** 12 (1993) 13–29.
6. Finite Element Analysis of Magnetohydrodynamic Pipe Flow, *Appl. Math. Comput.* **57** 2&3 (1993) 177–196.
7. Thermally Coupled Magnetohydrodynamics Flow, *Appl. Math. Comput.* **65** 1–3 (1994) 79–94.
8. A Velocity-Current Formulation for Stationary MHD Flow, *Appl. Math. Comput.* **65** 1–3 (1994) 95–109 (with P. G. Schmidt).
9. Boundary Optimal Control of MHD Flows, *Appl. Math. Optim.* **32** 2 (1995) 143–162 (with L. S. Hou).
10. Thermally Coupled Stationary, Incompressible MHD Flow; Existence, Uniqueness and Finite Element Approximation, *Numerical Methods Partial Differential Equations* **11** 4 (1995) 311–337.
11. Variational Methods for Stationary MHD Flow Under Natural Interface Conditions, *Nonlinear Anal.* **26** 4 (1996) 659–689 (with P. G. Schmidt).
12. On DGS Relaxation: The Stokes Problem, Seventh Copper Mountain Conference on Multigrid Methods, N. D. Melson, T. A. Manteuffel, S. F. McCormick, and C. C. Douglas, eds., NASA Conference Publication 3339, Hampton, 1996, 551–563.
13. A Two-Level Discretization Method for the Stationary MHD Equations, *Electron. Trans. Numer. Anal.* **6** (1997) 198–210 (with W. J. Layton and P. G. Schmidt).
14. Analysis and Finite-Element Simulation of MHD Flows, with an Application to Seawater Drag Reduction, in: Proceedings of the International Symposium on Seawater Drag Reduction, Newport, July 22-23, 1998, 401–406 (with P. G. Schmidt).
15. An Elliptic Problem with Integral Constraints, with Application to Large-Scale Geophysical Flows, *Computational Geosciences* **2** 4 (1998) 337–346 (with Irad Yavneh).
16. Analysis and Finite-Element Simulation of MHD Flows, with an Applications to Liquid Metal Processing, in: Fluid Flow Phenomena in Metals Processing, N. El-Kaddah, ed., Minerals, Metals and Materials Society, Warrendale, PA, 561–569 (with P. G. Schmidt).
17. Analysis and Numerical Approximation of a Stationary MHD Flow Problem with Nonideal Boundary, *SIAM J. Numer. Anal.* **36** 4 (1999) 1304–1332 (with P. G. Schmidt).
18. Velocity, Potential, and Temperature Distributions in Molten Metals During Electromagnetic Stirring, Part I: Experimental Measurements, in: Rheology and Fluid Mechanics of Nonlinear Materials, D. A. Siginer, ed., American Society of Mechanical Engineers, Fluids Engineering Division FED-Vol. 249, 1999, 127–135 (with S. I. Bakhtiyarov, R. A. Overfelt, and P. G. Schmidt).
19. Velocity, Potential, and Temperature Distributions in Molten Metals During Electromagnetic Stirring, Part II: Numerical Simulations, in: Rheology and Fluid Mechanics of Nonlinear Materials, D. A. Siginer, ed., American Society of Mechanical Engineers, Fluids Engineering Division FED-Vol. 249, 1999, 87–96 (with S. I. Bakhtiyarov, R. A. Overfelt, and P. G. Schmidt).
20. Normal Pulse Voltammetry as Improved Quantitative Detection Mode for Amperometric Solvent Polymeric Membrane Ion Sensors, *Electroanalysis*, **12** 16 (2000) 1251–1257 (with S. Jadhav and E. Bakker).
21. On Electromagnetically and Thermally Driven Liquid-Metal Flows, *Nonlinear Anal.*, **47** 5 (2001) 3281–3294 (with P. G. Schmidt).
22. How do Pulsed Amperometric Ion Sensors Work? A Simple P.D.E. Model, accepted for publication, *SIAM Review* (with E. Bakker).
23. Experimental Measurements of Velocity, Potential, and Temperature Distributions in Molten Metals During Electromagnetic Stirring, accepted for publication, *ASME J. Appl. Mech.* (with S. I. Bhaktyarov, R. A. Overfelt, and P. G. Schmidt).

24. Numerical Simulation of Velocity, Potential, and Temperature Distribution in Molten Metals During Electromagnetic Stirring, submitted for publication, ASME J. Appl. Mech. (with S. I. Bhaktyarov, R. A. Overfelt, and P. G. Schmidt).
25. Dynamic Diffusion Model for Pulsed Amperometric Polymeric Membrane Ion Sensors, (with E. Bakker and R. Long, in preparation).

Reports (not appearing as publications, above)

1. On the Existence, Uniqueness and Finite Element Approximation of Solutions of the Equations of Stationary, Incompressible MHD, Los Alamos Report LA-UR-2708, Los Alamos National Laboratory, Los Alamos, NM, 1989 (with M. D. Gunzburger and J. S. Peterson).
2. Analysis of Some Boundary Optimal Control Problems for the MHD Equations with Mixed Boundary Conditions, Research Report No. 93-01, Department of Mathematics and Statistics, Simon Fraser University (with L. S. Hou).

Other Publications

1. Magnetohydrodynamics, article for the World Book Encyclopedia (to appear).

Book reviews

1. M. D. Gunzburger and R. A. Nicolaides, eds.: *"Incompressible Computational Fluid Dynamics: Trends and Advances"*, Cambridge University Press, 1993, Found. Phys. **24** 5 (1994) 825–828.

Thesis

1. Existence, Uniqueness and Finite Element Approximation of Solutions of the Equations of Stationary, Incompressible MHD, Ph.D. Thesis, Carnegie Mellon University, Pittsburgh, 1989.

PRESENTATIONS

Invited conference and mini-symposium talks

1. Faculty Development Consortium First Annual Instructional Technology Conference Auburn University and Tuskegee University, Tuskegee, March 20–22, 1995
2. Southeastern Section Meeting of the American Mathematical Society, University of Memphis, Memphis, March 21–22, 1997
3. SIAM 45th Anniversary and Annual Meeting, Stanford, July 14–18, 1997
4. SIAM Annual Meeting, University of Toronto, Toronto, July 13–17, 1998
5. A conference in honor of Olga Ladyzhenskaya; Recent Trends and Advances in PDEs and Numerical PDEs, Iowa State University, Ames, August 2–5, 1998
6. SIAM Annual Meeting, Atlanta, May 12–15, 1999
7. 1999 CAIMS (Canadian Applied and Industrial Mathematics Society) Annual Meeting, Quebec City, Canada, June, 11–13, 1999
8. Third World Congress of Nonlinear Analysts, Catania, Italy, July 19–26, 2000
9. The International Union of Theoretical and Applied Mechanics congress ICTAM 2000, Chicago, August 27–September 2, 2000
10. AMS 2001 Spring Western Section Meeting, Las Vegas, April 21–22, 2001
11. SIAM Annual Meeting, Philadelphia, July 8–12, 2002

Invited colloquium talks

1. Dixieland Analysis Seminar, Emory University, Atlanta, April 3, 1990
2. Interdisciplinary Seminar, University of Michigan, Ann Arbor, January 21, 2000
3. Dixieland Analysis Seminar, Emory University, Atlanta, April 4, 2000

Contributed talks

1. Virginia Tech-ICAM Conference on Numerical Solutions of Partial Differential Equations, Virginia Tech, Blacksburg, September 24–27, 1988
2. UAB - Georgia Tech International Conference on Differential Equations and Mathematical Physics, University of Alabama in Birmingham, Birmingham, March 15–21, 1990
3. The Tenth Annual Southeastern-Atlantic Regional Conference on Differential Equations, Virginia Tech, Blacksburg, November 16–17, 1990
4. The Eleventh Annual Southeastern-Atlantic Regional Conference on Differential Equations, Mississippi State University, Starkville, October 25–26, 1991
5. Georgia Tech - UAB International Conference on Differential Equations and Mathematical Physics, Georgia Tech, Atlanta, March 22–28, 1992
6. 16th Annual Meeting Southeastern-Atlantic Section of SIAM, University of Alabama in Huntsville, Huntsville, April 3–4, 1992
7. First World Congress of Nonlinear Analysts, Tampa, August 19–26, 1992
8. Midwest-Southeastern-Atlantic Second Joint Regional Conference on Differential Equations, University of Kentucky, Lexington, November 13-15, 1992
9. Mississippi State Annual Conference on Differential Equations & Computational Simulations, Mississippi State University, Starkville, March 19–20, 1993
10. The Thirteenth Annual Southeastern-Atlantic Regional Conference on Differential Equations, University of North Carolina at Wilmington, Wilmington, October 15–16, 1993
11. UAB - Georgia Tech International Conference on Differential Equations and Mathematical Physics, University of Alabama in Birmingham, Birmingham, March 13–17, 1994
12. Eighteenth Annual Meeting South-eastern-Atlantic Section of SIAM, Wake Forest University, Winston-Salem, March 25-26, 1994
13. Colorado Conference on Iterative Methods, Breckenridge, April 5–9, 1994
14. The Fourteenth Annual Southeastern-Atlantic Regional Conference on Differential equations, University of Tennessee, Knoxville, October 21–22, 1994
15. Seventh Copper Mountain Conference on Multigrid Methods, Copper Mountain, April 3–7, 1995
16. Symposium on Advances and Trends in Computational Mathematics, The University of Texas at Austin, Austin, April 20–22, 1995
17. The Fifteenth Annual Southeastern-Atlantic Regional Conference on Differential equations, North Carolina State University, Raleigh, October 13–14, 1995
18. Eighth Copper Mountain Conference on Multigrid Methods, Copper Mountain, April 7–11, 1997
19. Third Mississippi State Conference on Differential Equations & Computational Simulations, Mississippi State University, Starkville, May 16–17, 1997
20. Fourth SIAM Conference on Mathematical and Computational Issues in the Geosciences, Albuquerque, June 16–19, 1997
21. Tenth International Conference on Domain Decomposition Methods, Boulder, August, 10–14, 1997
22. HEDP-MHD-Workshop, Sandia National Laboratory, Albuquerque, January 14, 1998
23. International Symposium on Seawater Drag Reduction, Newport, July 22-23, 1998
24. Fourth Mississippi State Conference on Differential Equations & Computational Simulations, Mississippi State University, Starkville, May 21–22, 1999

Workshops participated

1. “*AMS-SIAM Summer Seminar in Applied Mathematics, Vortex Dynamics and Vortex Methods*”, University of Washington, Seattle, June 18–29, 1990 (partial support from the AMS)

2. “*Computational Methods in Materials Science*”, Center for Nonlinear Analysis, Carnegie Mellon University, Pittsburgh, September 16–18, 1992
3. “*The Earth’s Climate as a Dynamical System*”, Argonne National Laboratory, Chicago, September 25–26, 1992
4. “*AMS-SIAM Summer Seminar in Applied Mathematics, Mathematics of Numerical Analysis: Real Number Algorithms*”, Park City, August 7–11, 1995 (partial support from the AMS)
5. “*NSF/TFCC (National Science Foundation/IEEE Task Force on Cluster Computing) Workshop on Teaching Cluster Computing*”, University of North Carolina at Charlotte, Charlotte, July 11–13, 2001

OTHER ACTIVITIES

Consultant

- American Computing Inc.
- South Central Bell

System administrator

- Network of Sun workstations

Committee member

- University Senate Academic Computing Committee 1994–1998
- Computer Committee 1990–1998 and 2000–
- College of Science and Mathematics Dean’s Committee on Electronic Classrooms 1997–1998
- University Senate, substituted as senator Summer 2000
- Graduate Studies Committee 2000–
- Hiring Committee 2002–
- University Senate Library Committee 2002–
- Faculty Advisor Auburn University SIAM Chapter 2002–