Michael S. Siegel
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Citizenship: United States of America

Education

- Ph.D. in Mathematics, October 1989
  Courant Institute of Mathematical Sciences, New York University
  Doctoral Advisor: Russel Caflisch
  Thesis Title: *An Analytical and Numerical Study of Singularity Formation in the Rayleigh-Taylor Instability*

- Graduate Student, Ph.D. Program in Physics, Sept. 1986 to June 1987
  Massachusetts Institute of Technology

- M.S. in Mathematics, May 1986
  Courant Institute of Mathematical Sciences, New York University

- B.S. in Physics and in Mathematics, May 1984
  Duke University, Durham, North Carolina
  Graduated *Magna Cum Laude*

Work Experience

- Professor of Mathematics
  New Jersey Institute of Technology Sept. 2005–

- Associate Professor of Mathematics
  New Jersey Institute of Technology Sept. 1998 to Sept. 2005

- Visiting Researcher
  Oxford University Sept. 2001 to June 2002

- Assistant Professor of Mathematics
  New Jersey Institute of Technology Sept. 1995 to Sept. 1998

- National Science Foundation Postdoctoral Fellowship
  and Postdoctoral Research Fellow
  Ohio State University October 1991 to August 1995

- von Karman Instructor in Applied Mathematics
  California Institute of Technology October 1989 to September 1991

Research Interests

- Applied Mathematics and Scientific Computation
- Theoretical and Computational Fluid Dynamics: Vortex Dynamics, Interfacial Fluid Dynamics, Singularity Formation, Crystal Growth
- Moving Boundary Problems in Materials Science
- Biomechanics

Grants

1. National Science Foundation
   "Focused Research Group: Singularity formation for the three-dimensional Euler equations and related problems,"
   July 1, 2004-June 30, 2007, *$253,522* (Total award, *$889,722*),
   (Collaborative Grant with Russ Caflisch, Tom Hou and Dale Pullin),
   PI/Project Director

2. National Science Foundation
   " Major Research Instrumentation: Acquisition of a computer cluster for the Center of Applied Mathematics and Statistics at NJIT, "
   Sept. 1, 2004-Aug. 30, 2007, *$270,870*,
   co-PI (with Daljit Ahluwalia, Qun Ma), lead author of proposal.

3. National Science Foundation
   "Analysis and numerical computations of moving boundaries in fluid dynamics and materials science,"
   July 23, 2001-July 31, 2005, *$88,000*,
   PI

4. NJ-I-Tower
   "Course development proposal: Mathematics computation laboratory,"
   November 2002 *$5,000*

5. National Science Foundation
   "Surfactant effects in viscous fingering,"
   July 1997 to June 2000, *$75,000*,
   PI

6. National Science Foundation
   "Scientific computing resources and environments in the mathematical sciences (SCREMS)," (joint with Dawn Lott-Crumpler, Jonathon Luke, Eliza Michalopoulou and Demetrius Papageorgiou),
   November 1998 to November 2000, *$61,297*

7. National Science Foundation
   Mathematical Sciences Postdoctoral Research Fellowship,
   October 1991 to August 1994, *$66,000*

Publications

1. A localized approximation method for vortical flows, (with R. E. Caflisch and O. Orellana), *SIAM J. Appl. Math.*, **50**, pp. 1517–1532, 1990.

2. Singularity formation on vortex sheets, in *Topological Aspects of the Dynamics of Fluids and Plasmas*, eds. H. Moffatt, G. Zaslavsky, P. Compte and M. Tabor, Kluwer Academic, pp. 337–349, 1992.

3. Singularity formation during Rayleigh-Taylor instability, (with G. Baker and R. E. Caflisch), *J. Fluid Mech.*, **252**, pp. 51–78, 1993.

4. A study of singularity formation in the Kelvin-Helmholtz instability with surface tension, *SIAM J. Appl. Math*, **55,** pp. 865–891, 1995.

5. A well-posed numerical method to track isolated conformal map singularities in Hele-Shaw flow, (with G. Baker and S. Tanveer), *J. Comput. Phys.*, **120**, p. 348–364, 1995.

6. Singular perturbation of smoothly evolving Hele-Shaw solutions, (with S. Tanveer), *Phys. Rev. Lett.*, **76**, 419, 1996.

7. Singular effects of surface tension in evolving Hele-Shaw flows, (with S. Tanveer and W-S. Dai), *J. Fluid Mech.*, **323**, pp. 201–236, 1996.

8. Singularities and interfacial patterns in Hele-Shaw flow, (with G. Baker and S. Tanveer), *Proceedings of the Fifth International Conference on Hyperbolic Problems: Theory, Numerics and Applications*, ed. J. Glimm, World Scientific, pp. 339–351, 1996.

9. Optimal patterns for suturing wounds, (with H. R. Chaudhry, B. Bukiet, T. Findley, A. B. Ritter, N. Guzelsu), *Journal of Biomechanics*, **31**, pp. 653–662, 1998.

10. Adaptation of passive rat left ventricle in diastolic dysfunction (with H. R. Chaudhry, B. Bukiet, T. Findley, A. B. Ritter and N. Guzelsu), *J. Theor. Biol.*, **201**, pp. 37–46, 1999.

11. Influence of surfactant on rounded and pointed bubbles in two-dimensional Stokes flow, *SIAM J. Appl. Math.*, **59**, pp. 1998–2027, 1999.

12. Cusp formation for time-evolving bubbles in two-dimensional Stokes flow, *J. Fluid Mech.*, **412**, pp. 227–257, 2000.

13. Cusp formation and tip-streaming instabilities for time-evolving interfaces in two-dimensional Stokes flow, *Proceedings of the IUTAM Symposium on Nonlinear waves in Multi-Phase Flow*, ed. H.-C. Chang, Kluwer, pp. 139–148, 2000.

14. Effects of small surface tension in Hele-Shaw multifinger dynamics: an analytical and numerical study (with E. Paune and J. Casademunt), *Phys. Rev. E*,**66** 046205, pp.1–13, 2002.

15. Persistence of Memory in Drop Breakup: The Breakdown of Universality (with P. Doshi, I. Cohen, W. W. Zhang, P. Howell, O. A. Basaran, and S. R. Nagel), *Science*, **302**, pp. 1185–1188, 2003.

16. Evolution of material voids for highly anisotropic surface tension, (with M. Miksis and P. Voorhees), *J. Mech. Phys. Solids*, **52**(6), pp. 1319-1353 (2004).

17. Global existence, singular solutions and ill-posedness for the Muskat problem (with R. E. Caflisch and S. D. Howison), *Comm. Pure Appl. Math.*, **57**, pp. 1374–1411, 2004.

18. A mathematical model of core annular flow with surfactant (with S. Kas-Danouche and D. Papageorgiou), *Divulgaciones Matematicas*, **12**(2), pp. 117-138, 2004.

19. The evolution of a slender non-axisymmetric drop in an extensional flow (with P. D. Howell), *J. Fluid Mech.*, **521**, pp. 155-180, 2004.

20. Exact solutions for the evolution of a bubble in Stokes flow, a Cauchy transform approach (with D. Crowdy), *SIAM J. Appl. Math.*, to appear (accepted), 2005.

21. A semi-analytic approach to Euler singularities (with R. Caflisch), *Methods and Applications of Analysis*, to appear (accepted), 2005.

22. Steady deformation and tip-streaming of a slender bubble with surfactant in an extensional flow (with M. Booty), *J. Fluid Mech.*, to appear (accepted) 2005.

23. Surface tension driven breakup of an air bubble in a viscous liquid (with P. D. Howell and W. W. Zhang), *Phys. Fluids*, submitted 2005.

24. On long wave equations for the evolution of axisymmetric fluid jets (with D. Papageorgiou and M. Booty), *in preparation* 2004.

25. Nonlinear stability of core annular film flows in the presence of surfactant (with Said Kas-Danouche and D. Papageorgiou), *in preparation*, 2004.

26. Influence of surfactant on the break-up of a fluid jet in a viscous surrounding (with Muhammed Hameed, Charles Maldarelli, and D. Papageorgiou), *in preparation*, 2004.

Ph.D. Student Supervision

- Thesis advisor for Xinli Wang, Ph.D. (expected, 2008).
- Thesis advisor for Muhammed Hameed, Ph.D. (2005). Thesis title: Influence of surfactant on the pinch-off of nearly inviscid fluid jets.
- Thesis co-advisor for Said Kas-Danouche, Ph.D. (2002). Thesis title: Interfacial Hydrodynamics of Annular Films.
- External advisor and member of defense committee for Eduard Paune, University of Barcelona Ph.D. (2002). Thesis title: Interfacial dynamics in two-dimensional viscous flows.

Conferences/Symposia Organized

1. Workshop on "Analysis, Computations, and Experiments on Pinch-off in Liquid Jets," (with Huaxiong Huang, York University; Robert Miura, New Jersey Institute of Technology; Demetrius Papageorgiou, New Jersey Institute of Technology),
   Banff International Research Station for Mathematical Innovation and Discovery (BIRS),
   Banff, Canada, March 12 to March 26, 2005.

2. First Annual SIAM Conference on Partial Differential Equations
   Minisymposium on "Rigorous Results for Partial Differential Equations from Interfacial Fluid Dynamics,"
   Houston, TX, December 6-8, 2004

Invited Conference Talks

1. Minisymposium on Multiscale, Multiphase, Multiphysics CFD
   Third M.I.T. Conference on Computational Fluid and Solid Mechanics
   Boston, MA June 2005.

2. Frontiers in Applied and Computational Mathematics 2005
   New Jersey Institute of Technology
   Boston, MA May 2005.

3. Minisymposium on Rigorous Results for Partial Differential Equations from Interfacial Fluid Dynamics
   First Annual SIAM Conference on Partial Differential Equations
   Houston, TX December 2004.

4. NIRT Annual Meeting: Formation and Self Assembly of Quantum Dots
   Northwestern University
   Chicago, IL August 2002.

5. Minisymposium on Modeling, Analysis and Computations in Materials Science
   SIAM Annual Meeting
   Philadelphia, PA July 2002.

6. Minisymposium on Hele-Shaw Flow, SIAM Dynamical Systems Meeting
   Snowbird, Utah May 2001.

7. Analysis and Modeling of Industrial Jetting Processes
   University of Minnesota, Minneapolis, MN January 2001.

8. IUTAM Symposium on Free Surface Flows
   University of Birmingham, Birmingham, United Kingdom July 2000.

9. IUTAM Symposium on Nonlinear Waves in Multi-Phase Flow
   University of Notre Dame, South Bend, Indiana July 1999.

10. Hele-Shaw Flow Centennial Meeting
    Oxford University, Oxford, United Kingdom August 1998.

11. Mini-Symposium on High Resolution and Robust Interface Methods and Applications, SIAM Annual Meeting, Toronto, Canada July 1998.

12. Mini-Symposium on Blood Flow in Arteries, Nineteenth Annual Meeting of the Canadian Applied Mathematics Society, Vancouver, British Columbia, Canada May 1998.

13. Session on Fundamental Research in Fluid Mechanics:
    Stability and Nonlinear hydrodynamics
    American Institute of Chemical Engineers Annual Meeting
    Los Angeles, CA November 1997.

14. Conference on Singularities in Euler and Navier-Stokes Equations
    Ohio State University April 1997.

15. Meeting on Vortices, Dislocations and Line Singularities
    in Partial Differential Equations
    Ciba Foundation and Royal Society, London October, 1996.

16. Workshop on Partial Differential Equations:
    Theory, Computations and Applications
    Instituto de Matematica Pura e Aplicada, Rio de Janeiro July, 1995.

17. Mini-Symposium on Dynamics of Complex Singularities,
    SIAM Dynamical Systems Conference
    Snowbird, Utah May 1995.

18. Special Session in Fluid Mechanics,
AMS Regional Meeting
Stillwater, Oklahoma July, 1993.

19. Mini-Symposium on Viscoelastic Fluids:
Complex Flows, Instabilities, and Bifurcations,
SIAM Annual Meeting
Philadelphia, PA July, 1993.

20. Conference on Singularities in Physical Systems,
Utah State University Logan, UT June, 1993.

21. NATO Workshop on Topological Aspects
of the Dynamics of Fluids and Plasmas,
Institute for Theoretical Physics, UC Santa Barbara Santa Barbara, CA
November, 1991.

Invited Departmental Seminars

1. Department of Mathematical Sciences
University of Delaware March 2005.

2. Department of Mathematical Sciences
New Jersey Institute of Technology February 2003.

3. Department of Mathematics
UCLA, Los Angeles, CA January 2003.

4. Department of Physics
University of Barcelona, Spain November 2002.

5. Department of Mathematics
University of Nottingham, Nottingham, United Kingdom February 2002.

6. Department of Applied Mathematics and Theoretical Physics
Cambridge University, Cambridge, United Kingdom February 2002.

7. Department of Mathematics
Imperial College, London January 2002.

8. Department of Mathematics
University of Manchester, Manchester, United Kingdom December 2001.

9. Center for Industrial and Applied Mathematics
Oxford University, Oxford, United Kingdom November 2001.

10. Engineering Sciences and Applied Mathematics
Northwestern University July 2001.

11. Department of Mathematics
University of Minnesota September 2000.

12. Department of Mathematics
University of California, Irvine September 2000.

13. Department of Mathematics
University of Delaware February 2000.

14. Department of Mathematics
Ohio State University March 1999.

15. Department of Applied Mathematics and Statistics
SUNY Stony Brook February 1999.

16. Department of Mechanical Engineering
New Jersey Institute of Technology December 1997.

17. Center for Industrial and Applied Mathematics
Oxford University, Oxford, United Kingdom October 1996.

18. Department of Mathematics
Courant Institute, NYU April 1996.

19. Fluid Mechanics Seminar
Levich Institute, City University of New York February 1996.

20. Department of Mathematics
New Jersey Institute of Technology March 1995.

21. Department of Mathematics
Illinois Institute of Technology February 1995.

22. Department of Mathematics
University of Manchester, Manchester, United Kingdom January 1995.

23. Department of Mathematics
Wichita State University March 1993.

24. Department of Mathematics
University of California, Santa Barbara February 1993.

25. Department of Mathematics
University of Michigan December 1992.

26. Department of Mathematics
Iowa State University February 1991.

27. Department of Mathematics
University of California, Los Angeles November 1990.

28. Department of Applied Mathematics
California Institute of Technology November 1990 and April 1989.

29. Department of Mathematics
Stanford University November 1989.

30. Department of Mathematics
Ohio State University March 1989.

31. Department of Applied Mathematics
University of Colorado, Boulder March 1989.

Contributed Conference Presentations (last three years)

1. American Physical Society, Division of Fluid Dynamics
Annual Meeting
Seattle, WA November 2004.

2. Frontiers of Applied Mathematics (FACM '04)
(with Muhummed Hameed)
NJIT, Newark, NJ May 2004.

3. American Physical Society, Division of Fluid Dynamics
Annual Meeting (4 contributed talks)
Secaucus, NJ November 2003.

4. American Physical Society, Division of Fluid Dynamics
Annual Meeting (3 contributed talks)
Dallas, TX November 2002.

5. American Physical Society, Division of Fluid Dynamics
Annual Meeting
San Diego, CA November 2001.

Departmental Service

- Associate Director of the Center for Applied Mathematics and Statistics (CAMS), NJIT, Sept. 2003–present
Co-direct activities of the center, including coordination and assistance with grant submissions, seminars and colloquia, CAMS Reports and other publications, and attend funding agency meetings

- Coordinator, Calculus III, Sept. 2002–Jan. 2004
Direct 10 common sections of Calculus III ($\sim$ 350 students). Introduced online homework system for Calculus III.

- Lead author of three departmental proposals for computing equipment.

- Proposed and implemented new course, *Math 240: Mathematics Computation Laboratory* (joint with Lou Kondic and Jonathan Luke).
- Designed and implemented several experiments (including a Hele-Shaw cell) for the CAPSTONE undergraduate laboratory, 1999-2001.
- Colloquium coordinator, 1995-1998.

Committees

- Fall 1995 and Spring 1996
  Seminar Committee
  Committee on Computation
- Fall 1996 and Spring 1997
  Seminar Committee
  Curriculum and Advising Committee
- Fall 1997 and Spring 1998
  Seminar Committee (Chairperson)
- Fall 1998 and Spring 1999
  Graduate Advising Committee
  Graduate Recruitment Committee
- Fall 1999 and Spring 2000
  Seminar Committee (Chairperson)
  Graduate Recruitment Committee
- Fall 2000 and Spring 2001
  Graduate Advising Committee
  Graduate Recruitment Committee
- Fall 2001 and Spring 2002
  On Sabbatical
- Fall 2002 and Spring 2003
  Undergraduate Curriculum Committee (Chair)
  Calculus III Coordinator
- Fall 2003 and Spring 2004
  Calculus III Coordinator (Fall)
  Associate Director of the Center of Applied Mathematics and Statistics
- Fall 2004 and Spring 2005
  Associate Director of the Center for Applied Mathematics and Statistics

Miscellaneous Scientific Activities and Honors

- Reviewer for NSF, DOE and for various journals including *Journal of Fluid Mechanics, European Journal of Applied Mathematics, SIAM Journal of Scientific and Statistical Computing, SIAM Journal of Applied Mathematics, Europhysics Letters, Physics of Fluids*, *Physical Reviews Letters, Physical Review E* and *SIAM Journal of Mathematical Analysis*

- Featured Review for *Mathematical Reviews*

- Reviewer of Papers submitted to XXI International Congress of Theoretical and Applied Mechanics

- Invited participant, Workshop on Thin Films, IMA (University of Minnesota), 1995

- Invited participant, "Hot Topics" Workshop on Analysis and Modeling of Industrial Jetting Processes, IMA (University of Minnesota), 2001

- Invited as long term senior participant in program "Bridging Time and Length Scales in Materials Science and Biophysics," Fall 2005, Institute for Pure and Applied Mathematics, UCLA

- External member of Ph.D. defense committee for Shaojie Tang, CCNY (1999), H. H. Wei, CCNY (2000) and Eduard Paune, University of Barcelona (2002).