

Vita and Bibliography

Aaron L. Fogelson
Professor

Birthdate: May 10, 1955
Birthplace: Paterson, New Jersey

Academic Degrees:

B.A. 1977 Wesleyan University
M.S. 1979 Courant Institute of Mathematical Sciences,
New York University
Ph.D. 1982 Courant Institute of Mathematical Sciences,
New York University

Professional Experience

1977-82 Research Assistant, New York University
1980-82 Lecturer, New York University
1982-84 NSF Postdoctoral Fellow, University of California and Lawrence
Berkeley Laboratory
1983-85 Lecturer, University of California, Berkeley
1985-86 Associate Research Scientist, Courant Institute of Mathematical
Sciences, New York University
1985-89 Assistant Professor, University of Utah (on leave 1985–1986)
1989 Visiting Member, Courant Institute of Mathematical Sciences,
New York University (April-July)
1989- Associate Professor, University of Utah (on leave 1992–93)
1992-93 Visiting Associate Professor, University of Washington
1994- Professor, University of Utah
2000- Adjunct Professor of Bioengineering, University of Utah
Jan 2006 Visiting Professor, Institute for High Performance Computing, Singapore

Academic Honors and Grants:

1976 Phi Beta Kappa
1977 Summa Cum Laude
1977-79 Courant Institute Research Assistantship
1979-82 SIAM Institute of Mathematics for Society (SIMS) Fellowship
1982-84 NSF Postdoctoral Fellowship
1985-86 NSF Research Grant (with Alexandre Chorin) (\$13,350)
1986-88 NSF Research Grant (\$48,100)
1988-90 UURC Grant (\$5,000)
1987-91 Alfred P. Sloan Research Fellowship
1988-91 NSF Research Grant (\$45,240)
1990-91 UURC Grant (\$5,000)
1991-93 NSF Research Grant (\$74,740)
1993-97 NSF Research Grant (\$290,000)

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- 1994 EIMCO Process Equipment Company (\$4989)
- 1996-99 NSF Research Grant - Creativity Extension (\$134,390)
- 1997-99 UU Seed Grant (with M.Lewis, D.Eyre, S.Kern) (\$35,000)
- 1998-99 UU Faculty Fellow Award (1998-99)
- 1998- NSF Research Grant (\$310,000)
- 1999-2000 John Simon Guggenheim Memorial Foundation Fellowship
- 2000- NSF Research Grant Supplement (\$53,000)
- 2002- NSF FRG Grant (with J.Keener) (\$1,014,555)
- 2002- NSF IGERT Grant (J.Keener PI) (\$2,940,000)
- 2003 Plenary speaker, SMB Annual Meeting, Dundee, Scotland.
- 2004- NSF RTG: Research Training Group in Mathematical and Computational Biology (J. Keener PI) (\$2,400,000)
- 2004 NSF ITR:Computational Tools for Multiscale Dynamical Modeling of Blood Clotting and Vascular Biology (Amount Requested: \$2,320,692 for Utah portion) 'Highly Recommended' but no award.
- 2006 NSF-NIGMS: Formation and Function of Physiological Gels (with J. Keener, R. Guy, and V. Hsu) (\$2,000,000)
- 2006 Plenary speaker invitation, ECCOMAS-CFD 2006, Egmond aan Zee, The Netherlands.

- 2007 (Pending) NIH: Computational Tools for Dynamical Modeling of Thrombosis

Professional Affiliations:

- Society for Industrial and Applied Mathematicians
- Society for Mathematical Biology
- International Society on Thrombosis and Hemostasis
- American Heart Association

Professional Activities:

- Chair of 2008 Gordon Research Conference on Theoretical and Mathematical Biology.
- Guest editor for a special issue of Computer Methods in Applied Mechanics and Engineering devoted to Immersed Boundary Methods
- Organizer of symposium on Immersed Boundary methods at the 7th World Congress on Computational Mechanics, July 2006.
- Chair of session on biofluids and biogels at the Gordon Research Conference on Theoretical and Mathematical Biology, June 2004.
- Co-organizer of International Conference on Mathematics in Biology, University of Utah, August 2000.

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Co-organizer of Symposium of Adaptive Solution Methods for Partial Differential Equations, University of Utah, June 1998.

Chair of session on biofluid dynamics at the Gordon Research Conference on Theoretical and Mathematical Biology, June 1996.

Co-organizer of minisymposium on biofluid dynamics, University of Utah, May 1996.

Organizer of session ‘Mathematical Models in Biomedical Research’, Biomedical Engineering Society Annual Meeting, Memphis State University, October 1993.

Workshop leader for Biological Fluid Dynamics Workshop: Modelling Flow with Immersed Elastic Structures, Pittsburgh Supercomputing Center, July 1991.

Organizer of Conference ‘Computational Methods for Fluid Dynamics and the Evolution of Fronts and Interfaces,’ University of Utah, October 1990.

Reviewer for:

National Science Foundation
National Institutes of Health
Department of Energy
NSERC, Canada

Referee for:

Journal of Computational Physics
Mathematics of Computation
Bulletin of Mathematical Biology
Journal of Mathematical Biology
American Journal of Physiology
Journal of Theoretical Biology
Journal of Supercomputing
SIAM Journal of Applied Mathematics
SIAM Journal of Scientific Computing
Numerical Algorithms
Mathematical Biosciences
Biophysical Journal
PNAS
Journal of Thrombosis and Haemostasis
Nature
Blood

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Ph.D. Thesis Advisor for:

Nien-Tzu Wang, June 1997, Computational Methods for Continuum Models of Platelet Aggregation

Andrew Kuharsky, September 1998, Mathematical Modeling of Blood Coagulation,

Haoyu Yu, December 1999, Three-dimensional Computational Modeling and Simulation of Platelet Aggregation on Parallel Computers

Chung-Seon Yi, 2001, Mathematical Models for Ionic Concentration Changes and Volume Shifts During Ischemia and Hypoxia

Robert Guy, 2004, Continuum Models of Platelet Aggregation: Closure Models, Computational Methods, and Simulation

Elijah Newren, 2007, Enhancing the Immersed Boundary Method: Stability, Volume Conservation, and Implicit Solvers.

Karin Leiderman and Lindsay Crowl, current.

M.Sc. Thesis Advisor for:

Elijah Newren, September 1998, Multilevel Distributed-Memory Solutions of Poisson's Equation

Thomas Anderson (CES program) 2001-2003, The effect of spatial heterogeneity on blood coagulation dynamics.

REU Advisor for:

Michael Woodbury, Models of Blood Clot Lysis, (started as REU, continued intermittently as grad student)

Nathan Hancock, Molecular Bond Breaking Under Dynamic Forcing, 2002-2004.

Yasmeen Hussain, current.

ACCESS Advisor for:

Yasmeen Hussain

Post-Doctoral Advisor for:

David Eyre

Nien-Tzu Wang

Robert Guy

Viktoria Hsu

Laura Miller

Jian Du

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New Courses Developed:

Math 564: Advanced Numerical Analysis and Computation
Math 574: Mathematical Modeling
Math 675: Computational Fluid Dynamics
Math 764,5,6: Numerical Solution of Partial Differential Equations
Math 6780: Modeling of the Cardiovascular System

Courses Taught:

Math 1170 Mathematics for Life Scientists I
Math 1180 Mathematics for Life Scientists II
Math 129 Business Calculus
Math 2270 Linear Algebra
Math 353(3150) Engineering Mathematics - PDEs
Math 354 Engineering Mathematics - Complex Variable
Math 512,513 Mathematical Biology
Math 5110,5120 Mathematical Biology
Math 5440 Introduction to PDEs
Math 560 Survey of Numerical Analysis
Math 561,2,3: Introduction to Numerical Analysis
Math 564: Advanced Numerical Analysis and Computation
Math 574: Mathematical Modeling
Math 661,2,3 Analysis of Numerical Methods
Math 6610,6620 Analysis of Numerical Methods
Math 6630 Numerical Solution of PDEs
Math 675: Computational Fluid Dynamics
Math 6750: Continuum Mechanics: Fluids
Math 6770: Cell Physiology
Math 6780: Modeling of the Cardiovascular System
Math 764,5,6: Numerical Solution of Partial Differential Equations

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Presentations:

- 1982 Duke University
- 1982 National Institute of Health
- 1983 Lawrence Berkeley Laboratory
- 1983 Courant Institute
- 1983 SIAM National Meeting, Denver
- 1984 (invited) AMS-Summer Seminars on Large-Scale Computations in Fluid Mechanics, San Diego
- 1985 Biophysical Society Annual Meeting, Baltimore
- 1985 University of Maryland
- 1985 University of North Carolina
- 1985 Duke University
- 1985 University of Waterloo
- 1985 Northeastern University
- 1985 Yale University
- 1985 Colorado State University
- 1985 University of New Mexico
- 1985 Los Alamos National Laboratory
- 1985 University of Utah
- 1985 Stanford University
- 1985 IMACS 11th World Congress, Oslo, Norway
- 1986 Courant Institute
- 1986 (invited) SIAM Workshop on Cross-Disciplinary Research in Multi-phase Flow, Leesburg, VA
- 1986 American Physical Society Annual Fluid Mechanics Meeting, Columbus, OH
- 1986 University of Utah
- 1987 Conference on Nonlinearities in Biology and Medicine, Los Alamos, NM
- 1987 (invited) AMS-MAA Joint Meeting, Salt Lake City, UT
- 1987 Mt. Sinai Medical Center, New York
- 1988 Tulane University
- 1988 Courant Institute
- 1988 University of California at Los Angeles
- 1988 Cedars Sinai Medical Center, Los Angeles
- 1988 (invited) National Heart, Lung and Blood Institute, DTB Annual Meeting, Bethesda, MD
- 1988 Duke University (Biomathematics Center)
- 1988 Duke University (Department of Computer Science)
- 1989 Tulane University
- 1990 (invited) AMS-SIAM Special Session on Mathematical Biology, Albuquerque, NM
- 1990 (invited) Gordon Research Conference on Theoretical Biology
- 1990 (invited) University of Utah Conference on Computational Methods for Fluid Dynamics and the Evolution of Fronts and Interfaces, Salt Lake City, UT

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- 1991 (invited) Joint AMS-IMS-SIAM Summer Research Conference on Bio-fluiddynamics, Seattle, WA
- 1991 (invited) Pittsburgh Supercomputing Center's Biological Fluid Dynamics Workshop: Modeling Flows with Immersed Elastic Structures, Pittsburgh, PA
- 1991 (invited) Center for Biopolymer at Interfaces Semi-annual Meeting, University of Utah
- 1991 University of Michigan
- 1991 Washington State University
- 1992 University of Utah, Mechanical Engineering
- 1992 Brigham Young University, Chemical Engineering
- 1992 (invited) MSRI Workshop on Biofluid Dynamics
- 1993 University of Washington, Applied Mathematics
- 1993 University of British Columbia
- 1993 Gordon Research Conference: Biorheology of Cell Adhesion
- 1993 (invited) Biomedical Engineering Society Annual Meeting, Memphis, TN
- 1993 Tulane Univeristy
- 1994 University of Utah, College of Science
- 1994 University of Utah, Mathematics (Numerical Analysis)
- 1995 University of Utah, Mathematics (Math-Biology)
- 1996 University of Utah, Biofluid Dynamics Symposium, May 1996
- 1996 Gordon Research Conference on Theoretical Biology
- 1996 UU-BYU-USU Joint Meeting on Nonlinear Analysis
- 1997 University of Utah, Bioengineering
- 1998 (invited) Workshop on Cardiac Valve Prostheses, Hilton Head South Carolina, February 1998
- 1998 University of Tennessee, Department of Bioengineering
- 1998 (invited) Biomedical Engineering Society Annual Meeting, Cleveland Ohio
- 1999 (invited) Computational Modeling in Biological Fluid Dynamics Workshop, IMA, Minneapolis
- 1999 University of Utah, Applied Mathematics
- 1999 Worcester Polytechnic Institute
- 1999 North Carolina State University (Biomathematics)
- 1999 North Carolina State University (Numerical Analysis)
- 1999 (invited) Bioengineering Division, 1999 International Mechanical Engineering Congress and Exposition, Nashville, Tennessee, November 1999.
- 2000 (invited) International Workshop on Numerical Simulations of Polymer and Cell Dynamics, Bad Honnef, Germany, June 13-16, 2000.
- 2001 Tulane University, Mathematics Colloquium
- 2001 (invited) SIAM Annual Meeting, San Diego, July 10-13.
- 2001 (invited) University of Utah, GSAC Colloquium
- 2002 (invited) SIAM Annual Meeting, Philadelphia, July 7-11.
- 2002 (invited) SMB Annual Meeting, Knoxville, July 15-16.
- 2003 University of Utah, Undergrad Colloquium.
- 2003 Illinois Institute of Technology, Biomedical Engineering Seminar.
- 2003 (plenary)SMB Annual Meeting, Dundee, Scotland, August 6-9, 2003.
- 2003 University of Michigan, Distinguished Lecture in Mathematical Biology.
- 2004 University of Arizona

- 2004 XVIIIth International Fibrinogen Workshop,
University of North Carolina, Chapel Hill,
July 17-20, 2004.
- 2004 University of Utah, Biology Department
- 2005 (invited) CRM, Universite de Montreal, Workshop on Mini-invasive
procedures in medicine and surgery: Mathematical and numerical challenges,
Montreal May 23-27, 2005
- 2005 (invited) Biomedical Engineering Society Fall Meeting, Baltimore MD, Sept 29-Oct 1, 2005
- 2005 Bowdoin College mathematics colloquium
- 2006 (invited) Institute for High Performance Computing, Singapore
- 2006 Claremont Colleges mathematics colloquium
- 2006 (plenary) Physiological Flow Network Meeting, Oxford, UK
- 2006 Nottingham University, 'Bridging the physical/life science divide' lecture, Nottingham UK
- 2006 University of California, Irvine
- 2006 (keynote) VIIth World Congress on Computational Mechanics, Los Angeles, CA, July 16-22, 2006.
- 2006 (keynote) Computational Methods Session, 5th World Congress on Biomechanics,
Munich, Germany, July 29-August 4.
- 2006 (invited) Thrombosis Modeling Session, 5th World Congress on Biomechanics,
Munich, Germany, July 29-August 4.
- 2006 (invited) Conference on Applications of Mathematics in Biology, Physiology,
and Medicine, Courant Institute of Mathematical Sciences,
New York University, Oct 20-21, 2006
- 2007 (invited) Conference on Frontiers in Applied and Computational Mathematics,
New Jersey Institute of Technology, Newark, NJ, May 15-16, 2007.
- 2007 Brown University Center for Fluid Mechanics
- 2007 Tulane University Mathematics Colloquium
- 2007 Tulane University Applied Mathematics Seminar

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Bibliography:

1. ‘A Mathematical Model and Numerical Method for Studying Platelet Adhesion and Aggregation in the Early Stages of Blood Clotting,’ Ph.D. thesis, New York University, 1982.
2. ‘A Mathematical Model and Numerical Method for Studying Platelet Adhesion and Aggregation During Blood Clotting,’ *J. Comput. Phys.*, 56(1984), 111-134.
3. ‘A Mathematical Model and Numerical Study of Platelet Aggregation During Blood Clotting,’ *Lectures in Applied Mathematics, 22, Large-scale Computations in Fluid Mechanics*, Proc. of the 15th AMS-SIAM Summer Seminar on Applied Math., Scripps Institute of Oceanography, 1983, Vol. 1, pp. 119-148, American Mathematical Society, Providence, RI, 1985.
4. ‘Presynaptic Calcium Diffusion from Various Arrays of Single Channels: Implications for Transmitter Release and Synaptic Facilitation,’ (with Robert S. Zucker), *Biophysical J.*, 48(1985), 1003-1017.
5. ‘Mathematical and Computational Aspects of Blood Clotting,’ *Proceedings of the 11th IMACS World Congress*, Oslo, Norway, 1985.
6. ‘Relationship Between Transmitter Release and Presynaptic Calcium Influx When Calcium Enters Through Discrete Channels,’ (with Robert S. Zucker), *Proc. Nat. Acad. Sci.*, 83(1986), 3032-3036.
7. ‘Can Presynaptic Depolarization Release Transmitter Without Calcium Influx?’ (with R. S. Zucker and L. Lando), *J. Physiol., Paris*, 81(1986), 237-245.
8. ‘Numerical Solution of the 3D Stokes’ Equations in the Presence of Suspended Particles,’ (with Charles S. Peskin), *Proceedings of the SIAM Multiphase Flow Workshop*, Leesburg, VA June 1986.
9. ‘Mathematical Models in Physiology’ (with C. Peskin, D. McQueen, D. Tranchina, H.M. Lacker and R. Novick), *Proc. of Conference on Technological Advances in Models for Biomedical Research (EMBS/IEEE)*, Boston, Nov. 1987.
10. ‘A Fast Numerical Method for Solving the Three-dimensional Stokes’ Equations in the Presence of Suspended Particles,’ (with Charles S. Peskin), *J. Comput. Phys.*, 79(1988), 50-69.
11. ‘TNPACK - A Truncated Newton Minimization Package for Large-Scale Problems: I. Algorithm and Usage’ (with Tamar Schlick). This is both a paper and a software package, *ACM TOMS*, 18(1992), 46-70.

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12. ‘TNPACK - A Truncated Newton Minimization Package for Large-Scale Problems: II. Implementation Examples’ (with Tamar Schlick), *ACM TOMS*, 18(1992), 71-111.
13. ‘Particle-Method Solution of Two-Dimensional Convection-Diffusion Equations’, *J. Comput. Phys.*, 100(1992), 1-16.
14. ‘Continuum Models of Platelet Aggregation: Formulation and Mechanical Properties’, *SIAM JAM*, 52(1992), 1089-1110.
15. ‘Activation Waves and Threshold Phenomena in Platelet Aggregation’ (with Victor Moll), *Partial Differential Equations* (J.Weiner and J.Hale, Eds.) Longman Scientific and Technical, Essex, England, 1992.
16. ‘Continuum Models of Platelet Aggregation: Mechanical Properties and Chemically-induced Phase Transitions,’ *Fluid Dynamics in Biology*, (A.Y. Cheer and C.P. van Dam, Eds.), Contemporary Mathematics Series, American Mathematical Society, Providence, RI, 1993.
17. ‘Truncated Newton Methods and the Modeling of Complex Immersed Elastic Structures’ (with Lisa Fauci), *Comm. Pure Appl. Math.*, (46)(1993), 787-818.
18. ‘Activation Waves in a Model of Platelet Aggregation: Existence of Solutions and Stability of Travelling Fronts’ (with Victor Moll), *Jrl. Math. Biol.*, (31)(1993), 675-701.
19. ‘Optimal Smoothing in Function-transport Particle Methods for Diffusion Problems’ (with Robert Dillon), *J. Comput. Phys.*,(109)(1993), 155-163.
20. ‘Expansion Behavior of Filtration Media’, Technical Report to EIMCO Process Equipment Company, November, 1994.
21. ‘Platelet Dense Granule Centralization and the Persistence of ADP Secretion’ (with Nien-Tzu Wang), *Amer. Jrl. Physiology*, (270) (*Heart Circ. Physiol.* 39): H1131-H1140,(1996)
22. ‘Modeling Biofilm Processes Using the Immersed Boundary Method’, (with Robert Dillon, Lisa Fauci, and Donald Gaver), *J. Comput. Phys.*,(129)(1996), 57-73.
23. ‘Membrane Binding-site Density Can Modulate Activation Thresholds in Enzyme Systems’, (with Andrew Kuharsky), *J. Theor. Biol.*, 193, (1998), 1-18.
24. ‘Functional geometry of ciliated tentacular arrays in active suspension feeders’ (with David Eyre and Daniel Grunbaum), *J. Exp. Biol.*, 201, (1998), 2575-2589.

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25. ‘Computational Methods for Continuum Models of Platelet Aggregation’, (with Nien-Tzu Wang), *Journal on Computational Physics*, 151, (1999), 649-675.
26. ‘Immersed Interface Methods for Neumann and Related Problems in Two and Three Dimensions’, (with James Keener), *SIAM J. Sci. Comput.*, 22, (2000), 1630-1654.
27. ‘Surface-mediated Control of Blood Coagulation: The Role of Binding Site Densities and Platelet Deposition’, (with Andrew Kuharsky), *Biophysical Journal*, 80, (2001), 1050-1074.
28. ‘IBIS: Immersed Boundary and Interface Software Package’, (with David Eyre), <http://www.math.utah.edu/IBIS>
29. ‘IBIS: Immersed Boundary and Interface Software Users Guide’, (with David Eyre), <http://www.math.utah.edu/IBIS>
30. ‘Computational Engineering and Science Program at the University of Utah’, (with Carleton DeTar, Christopher R. Johnson, and Christopher A. Sikorski), Proceedings of the 2001 International CES conference, San Francisco, May, 2001.
31. ‘Probabilistic Modeling of Platelet Aggregation: Effects of Activation Time and Receptor Occupancy’, (with Robert D. Guy), *Jrl. Theoret. Biol.*, 219, (2002) 33-53.
32. ‘A Mathematical Study of Volume Shifts and Ionic Concentration Changes During Ischemia and Hypoxia’, (with Chung-Seon Yi, James Keener, and Charles Peskin), *Jrl. Theoret. Biol.*, 220, (2002), 83-106.
33. ‘Computational Modeling of Blood Clotting: Coagulation and Three-dimensional Platelet Aggregation’, (with Haoyu Yu and Andrew Kuharsky), in *Polymer and Cell Dynamics: Multiscale Modeling and Numerical Simulations*, Alt et al (Editors), Birkhaeuser-Verlag, Basel, 2003.
34. ‘Platelet-Wall Interactions in Continuum Models of Platelet Aggregation: Formulation and Numerical Solution’, (with Robert D. Guy), *Mathematical Medicine and Biology*, 21, (2004), 293-334.
35. ‘Stability of Approximate Projection Methods on Cell-Centered Grids’, (with Robert D. Guy), *Journal of Computational Physics*, 203, (2005), 517-538.
36. ‘Coagulation under flow: The influence of flow-mediated transport on the initiation and inhibition of coagulation’, (with Nessay Tania), *Pathophysiology of Haemostasis and Thrombosis*, 34, (2005), 91-108.
37. ‘Fibrin gel formation in a shear flow’, (with R. Guy and J. Keener), *Mathematical Medicine and Biology*, 24(2007), 111-130.

38. 'Unconditionally stable discretizations of the Immersed Boundary Method', (with E. Newren, R. Guy and R. M. Kirby), *Journal of Computational Physics*, 222(2007), 702-719.
39. 'A Re-examination of Molecular Bond Breaking Under Dynamic Forcing', (with N. Hancock, J. Keener, R. Litvinov, and J. Weisel), under revision.
40. 'Cell-based Models of Blood Clotting', in *Single Cell Based Models in Biology and Medicine*, A. Anderson, M. Chaplain, and K. Rejniak (eds), Birkhauser, 2007.
41. 'Immersed-Boundary-Based Models of Intravascular Platelet Aggregation', (with Robert Guy), *Computer Methods in Applied Mechanics and Engineering*, 2007, to appear.
42. 'A Wave-Propagation Algorithm for Viscoelastic Fluids with Spatially and Temporally Varying Properties', (with Robert Guy), *Computer Methods in Applied Mechanics and Engineering*, 2007, to appear.
43. 'A Comparison of Implicit Solvers for the Immersed Boundary Equations', (with Elijah Newren, Robert Guy, and Robert M. Kirby), *Computer Methods in Applied Mechanics and Engineering*, 2007, to appear.
44. 'The Effects of Spatial Inhomogeneities on Flow Through the Endothelial Surface Layer', *J. Theor. Biol.*, (with Karin Leiderman and Laura Miller), under revision.
45. 'An Efficient and Robust Method for Simulating Two-Phase Gel Dynamics', (with Grady Wright and Robert Guy), *SIAM J. Sci. Comput.* under revision.

Preparation Date: 12/14/07