

Curriculum Vitae

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Personal Statistics

- Born: June 18, 1953 at Stillwater, MN, USA (US citizen)
- Married (1977) to Roberta L. McFadden, four children

Education

- Ph.D. (Mathematics), Courant Institute of Mathematical Sciences, New York University, New York, NY, 1979.
- M.S. (Mathematics), Courant Institute of Mathematical Sciences, New York University, New York, NY, 1977.
- B.A. (Chemical Physics, Mathematical Sciences, Mathematics), Rice University, Houston, TX, 1975.

Professional Experience

- Mathematical and Computational Sciences Division, Information Technology Laboratory, National Institute of Standards and Technology (formerly National Bureau of Standards), Gaithersburg, MD: Leader, Mathematical Modeling Group, 10/99 – present; Mathematician, 1/82 - 10/99.
- Courant Institute of Mathematical Sciences, New York University: Associate Research Scientist – Research Scientist, 6/79 – 1/82; Research Assistant – Assistant Research Scientist, 8/75 – 6/79.

Visiting Positions

- Laboratory of Molecular Pharmacology, National Cancer Institute, NIH, 9/05–Present.
- Courant Institute of Mathematical Sciences, New York University, 1/06 – Present.
- Honorary Senior Research Fellow, School of Mathematics, University of Bristol, UK, 1993 - 1996.
- Institute for Mathematics and its Applications, University of Minnesota; 9/90 - 1/91.
- Institute for Theoretical Physics, University of California at Santa Barbara; 8/85 - 12/85.
- Thomas. J. Watson Industrial Intern Program, Thomas J. Watson IBM Research Center, Yorktown Heights, NY; 6/77 - 8/77.

Research Interests

- Numerical and asymptotic solutions of differential equations
- Scientific computing, numerical analysis
- Hydrodynamic stability, crystal growth, mathematical biology

Professional Activities

- 1991 - 2005, Associate editor, SIAM Journal on Applied Mathematics
- 1994 - 2002, Associate editor, Journal of Computational Physics
- 1998 - Present, Associate editor, Interfaces and Free Boundaries
- 2001 - Present, Associate editor, Journal of Crystal Growth
- Member of American Physical Society, Society for Industrial and Applied Mathematics, Sigma Xi.
- Reviewer for Air Force Office of Scientific Research, Army Research Office, International Science Foundation, National Aeronautics and Space Administration, National Science Foundation, The Petroleum Research Fund.
- Referee for ACM Transactions on Mathematical Software, Canadian Applied Mathematics Quarterly, Chemical Engineering Science, Department of Energy, European Journal of Applied Mathematics, Experimental Mathematics, IMA Journal of Applied Mathematics, International Journal of Heat and Mass Transfer, Journal of the American Ceramic Society, Journal of Crystal Growth, Journal of Computational Physics, Journal of Fluid Mechanics, Metallurgical Transactions, The Physical Review, The Physics of Fluids, Scripta Metallurgica et Materialia, SIAM Journal on Applied Mathematics.
- Served on review panels for DOE Office of Science (1993 and 1994), NASA Microgravity Research Program (1991, 1995), and NSF Division of Mathematical Sciences (1996, 1998, 2001, 2003, 2005, 2009).
- Served on organizing committees for IMA workshops (On the Evolution of Phase Boundaries, 9/90, and Microstructure and Thin Films, 1/96), SIAM conferences (Emerging Issues in Mathematics and Computation from the Materials Sciences, 4/94; Second SIAM Conference on Mathematical Aspects of Materials Science, 5/97; Third SIAM Conference on Mathematical Aspects of Materials Science, 5/00 [co-chair]), and Interfaces for the Twenty-First Century, 10/99.
- Organized conference sessions: Fluid Dynamics of Materials Processing, 1993 Joint April Meeting of the American Physical Society, Washington, DC.; Interfacial Instabilities during Solidification, SIAM 1990 Annual Meeting, Chicago, IL.

Research Collaboration/Supervision

Advisor for NRC Postdoctoral Research Associateship Program at NIST

- P. Aaron Lott, 8/08 - Present.
- David L. Cotrell, 9/03 - 8/05. Subsequently at Lawrence Livermore National Laboratory.
- Katharyn F. Gurski, 2/01 - 1/03. Subsequently in Department of Mathematics, George Washington University.

- Daniel M. Anderson, 1/95 - 12/96. Subsequently in Department of Mathematical Sciences, George Mason University.
- Richard J. Braun, 10/91 - 9/93. Subsequently in Department of Mathematical Sciences, University of Delaware.
- Bruce T. Murray, 10/88 - 9/90. Subsequently in Department of Mechanical Engineering, SUNY Binghamton.
- Lucien N. Brush, 1/87 - 12/89. Subsequently in Department of Materials Science and Engineering, University of Washington.

Service on Dissertation Committees

- Augustin Luna, Bioinformatics Graduate Program, Boston University, Ph. D. (expected). Advisor: D. Segré
- Gamse B. Tanoglu, Department of Mathematical Sciences, University of Delaware, Ph. D., 6/00. Advisor: R. Braun.
- Katharyn F. Gurski, Department of Mathematics, University of Maryland, Ph. D., 6/99. Advisor: R. Pego.
- Philip A. Sackinger, Department of Chemical Engineering, Massachusetts Institute of Technology, Ph. D., 1/89. Advisor: R. A. Brown.
- Lucien N. Brush, Department of Metallurgical Engineering and Materials Science, Carnegie Mellon University, Ph. D., 12/87. Advisor: R. F. Sekerka.

Advisor for NIST Summer Undergraduate Research Fellowship Program

- Michael Sharpnack, New York University undergraduate, 2009.

Advisor for Montgomery Blair High School magnet program

- Chris Hong, Westinghouse Science Talent Search semi-finalist, 1996. Subsequently Stanford University undergraduate.
- Susan Han, Presidential Scholars Award semi-finalist, 1997. Subsequently Yale University undergraduate.
- Elaine Kim, First Place, Montgomery County Science Fair, 1998. Subsequently Stanford University undergraduate.

Honors

- NIST Fellow, 2004 – present.
- Fellow of the American Physical Society, Division of Fluid Dynamics, 2001 – present.
- Gold Medal Award for Superior Federal Service, U.S. Department of Commerce, 1991.
- Arthur S. Flemming Award for federal service, Washington D.C. Junior Chamber of Commerce, 1989.
- Silver Medal Award for Superior Federal Service, U.S. Department of Commerce, 1984.
- NSF Mathematical Sciences Postdoctoral Research Fellow; 1979 - 1980.
- NSF Graduate Fellow; 1976 - 1979.

- Undergraduate awards: Arthur B. Cohn Scholar (1972), Mary Parker Gieseke Scholar (1973), James and Alice Graham Baker Scholar (1974); elected to the Rice University Chapters of the honor societies of Phi Beta Kappa (1974) and Sigma Pi Sigma (1975).

Publications

Books Edited

1. *On the Evolution of Phase Boundaries*, The IMA Series in Mathematics and Its Applications, Vol. 43, eds. M.E. Gurtin and **G.B. McFadden**, (Springer-Verlag, New York, 1992).
2. *Interfaces for the 21st Century: New Research Directions in Fluid Mechanics and Materials Science*, eds. Marc K. Smith, Michael J. Miksis, **G.B. McFadden**, G. Paul Neitzel, David R. Canright, (Imperial College Press, London, 2002).

Book Chapters

1. S.R. Coriell, **G.B. McFadden**, and R.F. Sekerka, Cellular growth during directional solidification, *Annual Review of Materials Science* 15, 1985, pp. 119-145.
2. M.E. Glicksman, S.R. Coriell, and **G.B. McFadden**, Interaction of flows with the crystal-melt interface, *Annual Review of Fluid Mechanics* 18, 1986, pp. 307-335.
3. S.R. Coriell and **G.B. McFadden**, Morphological Stability, in *Handbook of Crystal Growth*, Vol. 1B, ed. D. T. J. Hurle, (Elsevier, Amsterdam, 1993), pp. 785-857.
4. D. M. Anderson, **G.B. McFadden**, and A.A. Wheeler, Diffuse-interface methods in fluid mechanics, *Annual Review of Fluid Mechanics* 30 (1998) 139–165.
5. **G.B. McFadden**, Phase-field models of solidification, in *Contemporary Mathematics*, Vol. 306, “Recent Advances in Numerical Methods for Partial Differential Equations and Applications,” ed. X. Feng and T.P. Schulze, (American Mathematical Society, Providence, RI, 2002), pp. 107–145.

Recent Publications

1. D.L. Cotrell, **G.B. McFadden**, and B.J. Alder, Instability in pipe flow, *Proceedings of the National Academy of Sciences* 105 (2008) 428–430.
2. C.S. Pande, K.P. Cooper, **G.B. McFadden**, Grain size distribution in two dimensions in the long time limit, *Acta Materialia* 56 (2008) 5304–5311.
3. **G.B. McFadden** and S.R. Coriell, Onset of oscillatory convection in two liquid layers with phase change, *Physics of Fluids* 21 (2009) 034101-1 – 034101-8.
4. P.E. King-Smith, B.A. Fink, J.J. Nichols, K.K. Nichols, R.J. Braun, and **G.B. McFadden**, The Contribution of Lipid Layer Movement to Tear Film Thinning and Breakup, *Investigative Ophthalmology & Visual Science* 50 (2009) 2747-2756.
5. Y. Mishin, W.J. Boettinger, J.A. Warren, **G.B. McFadden**, Thermodynamics of grain boundary premelting in alloys. I. Phase-field modeling, *Acta Materialia* 57 (2009) 3771–3785.
6. P. R. Garabedian and **G.B. McFadden**, Design of the DEMO fusion reactor following ITER, *Journal of Research of the National Institute of Standards and Technology* 114 (2009) 229–236.

Selected Publications (ranked by citation)

1. A.A. Wheeler, W.J. Boettinger, and **G.B. McFadden**, A phase-field model for isothermal phase transitions in binary alloys, *Phys. Rev. A* 45 (1992) 7424-7439.
2. D. M. Anderson, **G.B. McFadden**, and A.A. Wheeler, Diffuse-interface methods in fluid mechanics, *Annual Review of Fluid Mechanics* 30 (1998) 139–165.
3. S-L. Wang, R.F. Sekerka, A.A. Wheeler, B.T. Murray, S.R. Coriell, R.J. Braun, and **G.B. McFadden**, Thermodynamically-consistent phase-field models for solidification, *Physica D* 69 (1993) 189-200.
4. **G.B. McFadden**, A.A. Wheeler, R.J. Braun, S.R. Coriell, and R.F. Sekerka, Phase-field models for anisotropic interfaces, *Phys. Rev. E* 48 (1993) 2016-2024.
5. A.A. Wheeler, W.J. Boettinger, and **G.B. McFadden**, A phase-field model of solute trapping during solidification, *Phys. Rev. E* 47 (1993) 1893-1909.
6. M.E. Glicksman, S.R. Coriell, and **G.B. McFadden**, Interaction of flows with the crystal-melt interface, *Ann. Rev. Fluid Mech.* 18, 1986, pp. 307-335.
7. A.A. Wheeler, **G.B. McFadden**, and W.J. Boettinger, Phase-Field model of a eutectic alloy, *Proceedings of the Royal Society of London, Series A.*, 452 (1996) 495–525.
8. S.R. Coriell, **G.B. McFadden**, and R.F. Sekerka, Cellular growth during directional solidification, *Ann. Rev. Mater. Sci.* 15, 1985, pp. 119-145.
9. P.W. Voorhees, **G.B. McFadden**, and W.C. Johnson, On the morphological development of second phase particles in elastically-stressed solids, *Acta Metall.* 40 (1992) 2979-2992.
10. D. L. VanderHart and **G.B. McFadden**, Some perspectives on the interpretation of NMR proton spin diffusion data in terms of polymer morphologies, *Solid State Nuclear Magnetic Resonance* 7 (1996) 45–66.
11. N.A. Ahmad, A.A. Wheeler, W.J. Boettinger, and **G.B. McFadden**, Solute trapping and solute drag in a phase-field model of rapid solidification, *Physical Review E* 58 (1998) 3436–3450.
12. Anne Greenbaum, Leslie Greengard, and **G.B. McFadden**, Laplace’s equation and the Dirichlet-Neumann map in multiply connected domains, *J. Comput. Phys.* 105 (1993) 267-278.
13. P.W. Voorhees, **G.B. McFadden**, R.F. Boisvert, and D.I. Meiron, Numerical simulation of morphological development during Ostwald ripening, *Acta Met.* 36 (1988) pp. 207-222.
14. D.M. Anderson, **G.B. McFadden**, and A.A. Wheeler, A phase-field model of solidification with convection, *Physica D* 135 (2000) 175-194.
15. S.R. Coriell, **G.B. McFadden**, R.F. Boisvert, and R.F. Sekerka, Effect of a forced Couette flow on coupled convective and morphological instabilities during unidirectional solidification, *Journal of Crystal Growth* 69, 1984, pp. 15-22.
16. **G.B. McFadden**, R.G. Rehm, S.R. Coriell, W. Chuck, and K.A. Morrish, Thermosolutal convection during directional solidification, *Metall. Trans.* 15A, 1984, pp. 2125-2137.
17. P.W. Voorhees, S.R. Coriell, **G.B. McFadden**, and R.F. Sekerka, Effect of anisotropic crystal-melt surface tension on grain boundary groove morphology, *Journal of Crystal Growth* 67, 1984, pp. 425-440.

18. **G.B. McFadden** and S.R. Coriell, Nonplanar interface morphologies during unidirectional solidification of a binary alloy, *Physica* 12D, 1984, pp. 253-261.
19. J.J. Eggleston, **G.B. McFadden**, and P.W. Voorhees, A phase-field model for highly anisotropic interfacial energy, *Physica D* 150 (2001) 91-103.
20. R.F. Sekerka, S.R. Coriell, and **G.B. McFadden**, Stagnant film model of the effect of natural convection on the dendrite operating state, *Journal of Crystal Growth* 154 (1995) 370-376.
21. R.J. Braun, J.W. Cahn, **G.B. McFadden**, and A.A. Wheeler, Anisotropy of interfaces in an ordered alloy: a multiple-order parameter model, *Philosophical Transactions of the Royal Society of London, Series A* 355 (1997) 1787-1833.
22. S.R. Coriell, B.T. Murray, A. A. Chernov, and **G.B. McFadden**, Step bunching on a vicinal face growing in a flowing solution, *Journal of Crystal Growth* 169 (1996) 773-785.
23. S.R. Coriell, A. A. Chernov, B.T. Murray, and **G.B. McFadden**, Step bunching: generalized kinetics, *Journal of Crystal Growth* 183 (1998) 669-682.
24. **G.B. McFadden** and S.R. Coriell, The effect of fluid flow due to the crystal-melt density change on the growth of a parabolic isothermal dendrite, *Journal of Crystal Growth* 74, 1986, pp. 507-512.
25. W.J. Boettinger, A.A. Wheeler, B.T. Murray, and **G.B. McFadden**, Prediction of solute trapping at high solidification rates using a diffuse interface phase-field theory of alloy solidification, *Materials Science and Engineering* A178 (1994) 217-223.
26. **G.B. McFadden**, R.F. Boisvert, and S.R. Coriell, Nonplanar interface morphologies during directional solidification. II. Three-dimensional computations, *Journal of Crystal Growth* 84 (1987) pp. 371-388.
27. R.J. Braun, B.T. Murray, W.J. Boettinger, and **G.B. McFadden**, Lubrication theory for reactive spreading of a thin drop, *Physics of Fluids* 7 (1995) 1797-1810.
28. R.J. Braun, **G.B. McFadden**, and S.R. Coriell, Morphological instability in phase-field models of solidification, *Phys. Rev. E* 49 (1994) 4336-4352.
29. B.V. Saunders, B.T. Murray, **G.B. McFadden**, S.R. Coriell, and A.A. Wheeler, The effect of gravity modulation on thermosolutal convection in an infinite layer of fluid, *Phys. Fluids A* 4 (1992) 1176-1189.