

## Curriculum Vitae

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### Education

- Ph.D. (Mathematics), New York University, New York, NY, 1979.
- M.S. (Mathematics), 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: NIST Fellow, 5/04 – present; 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

- 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

- Hydrodynamic stability, crystal growth
- Numerical analysis, scientific computing
- Numerical solution of partial differential equations

## Professional Activities

- 1991 - Present, 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.
- 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.

## Advisor for NRC Postdoctoral Research Associateship Program

- David L. Cotrell, 9/03 - present.
- Katharyn F. Gurski, 2/01 - 1/03. Currently Department of Mathematics, George Washington University.
- Daniel M. Anderson, 1/95 - 12/96. Currently Department of Mathematical Sciences, George Mason University.
- Richard J. Braun, 10/91 - 9/93. Currently Department of Mathematical Sciences, University of Delaware.
- Bruce T. Murray, 10/88 - 9/90. Currently Department of Mechanical Engineering, SUNY Binghamton.
- Lucien N. Brush, 1/87 - 12/89. Currently Department of Materials Science and Engineering, University of Washington.

## Honors

- NIST Fellow, 2004.
- APS Fellow, Division of Fluid Dynamics, 2001.
- 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 (Rice University): Arthur B. Cohn Scholar (1972), Mary Parker Gieseke Scholar (1973), James and Alice Graham Baker Scholar (1974); 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, M.E. Gurtin and **G.B. McFadden**, eds., (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 Articles

1. S.R. Coriell, **G.B. McFadden**, and R.F. Sekerka, Selection mechanisms for multiple similarity solutions for solidification and freezing, *Journal of Crystal Growth* 200 (1999) 276-286.
2. H.P. Grimm, S.H. Davis, and G.B. McFadden, Steps, kinetic anisotropy, and long-wavelength instabilities in directional solidification, *Physical Review E* 59 (1999) 5629-5640.
3. J.W. Cahn, S.C. Han, and **G.B. McFadden**, Anisotropy of Interfaces in an Ordered HCP Binary Alloy, *Journal of Statistical Physics* 95 (1999) 1337-1360.
4. D.M. Anderson, **G.B. McFadden**, and A.A. Wheeler, A phase-field model of solidification with convection, *Physica D* 135 (2000) 175-194.
5. **G.B. McFadden**, S.R. Coriell, and R.F. Sekerka, Analytic solution for a non-axisymmetric isothermal dendrite, *Journal of Crystal Growth* 208 (2000) 726-745.
6. W.J. Boettinger, S.R. Coriell, C.E. Campbell, and **G.B. McFadden**, On the properties of  $\alpha/\alpha + \beta$  diffusion couples, *Acta Materialia* 48 (2000) 481-492.

7. **G.B. McFadden**, S.R. Coriell, and R.F. Sekerka, Shape parameter for a non-axisymmetric isothermal dendrite, *Acta Materialia* 48 (2000) 3177–3181.
8. **G.B. McFadden**, A.A. Wheeler, and D.M. Anderson, Thin interface asymptotics for an energy/entropy approach to phase-field models with unequal conductivities, *Physica D* 144 (2000) 154–168.
9. Y. Dabo, H. Nguyen Thi, S.R. Coriell, **G.B. McFadden**, Q. Li, and B. Billia, On the origin of microsegregation in Peltier interface demarcation, *Journal of Crystal Growth* 216 (2000) 483-494.
10. S.R. Coriell, **G.B. McFadden**, B. Billia, H. Nguyen Thi, and Y. Dabo, Electrical pulsing during directional solidification: Analysis of transients by Laplace transform, *Journal of Crystal Growth* 216 (2000) 495-500.
11. B.T. Murray, S.R. Coriell, A.A. Chernov, and **G.B. McFadden**, The effect of oscillatory shear flow on step bunching, *Journal of Crystal Growth* 218 (2000) 434–446.
12. S.R. Coriell, **G.B. McFadden**, W.F. Mitchell, B.T. Murray, J.B. Andrews, and Y. Arikawa, Effect of flow due to density change on eutectic growth, *Journal of Crystal Growth* 224 (2001) 145-154.
13. S. Van Vaerenbergh, S.R. Coriell, and **G.B. McFadden**, Morphological Stability of a binary alloy: thermodiffusion and temperature-dependent diffusivity, *Journal of Crystal Growth*, 223 (2001) 565–573.
14. 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.
15. D.M. Anderson, **G.B. McFadden**, and A.A. Wheeler, A phase-field model with convection: sharp-interface asymptotics, *Physica D* 151 (2001) 305-331.
16. R.F. Sekerka, S.R. Coriell, and **G.B. McFadden**, Separation of scales for growth of an alloy needle crystal, *Metallurgical and Materials Transactions* 32A (2001) 2669-2670.
17. S.R. Coriell and **G.B. McFadden**, Applications of morphological stability theory, *Journal of Crystal Growth* 237-239 (2002) 8–13.
18. **G.B. McFadden** and A.A. Wheeler, On the Gibbs adsorption equation for diffuse interface models, *Proceedings of the Royal Society (London) A* 458 (2002) 1129–1149.
19. G.B. Tanoğlu, R.J. Braun, J.W. Cahn, and **G.B. McFadden**, A1–L1<sub>0</sub> phase boundaries and anisotropy via multiple-order-parameter theory for an FCC alloy, *Interfaces and Free Boundaries* 5 (2003) 275-299.
20. **G.B. McFadden**, S.R. Coriell, T.P. Moffat, D. Josell, D. Wheeler, W. Schwarzacher, J. Mallett, A mechanism for brightening: Linear stability analysis of the curvature enhanced coverage model, *Journal of the Electrochemical Society* 150 (2003) C591–C599.
21. K.F. Gurski and **G.B. McFadden**, The effect of surface tension anisotropy on the Rayleigh instability, *Proceedings of the Royal Society (London) A* 459 (2003) 2575–2598.
22. J.E. Guyer, W.J. Boettinger, J.A. Warren, and **G.B. McFadden**, Phase-field modeling of electrochemistry: Equilibrium, *Physical Review B* 69 (2004) 021603.
23. J.E. Guyer, W.J. Boettinger, J.A. Warren, and **G.B. McFadden**, Phase-field modeling of electrochemistry: Kinetics, *Physical Review B* 69 (2004) 021604.

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## Recent Talks

1. A phase-field model of the rapid solidification of a binary alloy,” Nonlinear PDE and Applications to Materials, Institute for Mathematics and its Applications, the University of Minnesota, April 30, 1999.
2. Diffuse interface models of order-disorder transitions in a binary alloy, Interfaces for the 21st Century, Monterey, California, August 18, 1999.
3. Analytic solution for a non-axisymmetry isothermal dendrite, S. R. Coriell Symposium on Alloy Solidification and Crystal Growth, 1999 ASM International Materials Solutions, Cincinnati, Ohio, November 1, 1999.
4. A phase-field/fluid motion model of solidification: Investigation of flow effects during Directional Solidification and dendritic growth, NASA Materials Science Conference, Huntsville, Alabama. June 7, 2000,
5. Phase-field models of solidification, 2001 John H. Barrett Memorial Lectures, University of Tennessee, Knoxville, Tennessee, May 10, 2001.
6. Taylor-Couette instabilities with a crystal-melt interface, G.I. Taylor Medalist Symposium in Honor of Stephen H. Davis, 2001 Mechanics and Materials Summer Conference, San Diego, CA, June 28, 2001.
7. Phase-field models, Gordon Research Conference on Gravitational Effects in Physico-Chemical Systems: Interfacial Effects, New London, NH, July 9, 2001.
8. Modeling of flow during coupled monotectic growth, 40th AIAA Aerospace Sciences Meeting and Exhibit, Reno, Nevada, January 15, 2002.
9. Analytic solution for non-axisymmetric isothermal dendrites, SIAM 50th Anniversary and 2002 Annual Meeting, Philadelphia, PA, July 9, 2002.
10. The effect of surface tension anisotropy on the Rayleigh instability in materials systems, SIAM 50th Anniversary and 2002 Annual Meeting, Philadelphia, PA, July 10, 2002.
11. The effect of surface tension anisotropy on the Rayleigh instability, Workshop on the Evolution and Self-Assembly of Quantum Dots, Northwestern University, August 27, 2002.
12. Analysis of hydrodynamic and interfacial instabilities during cooperative monotectic growth, 41th AIAA Aerospace Sciences Meeting and Exhibit, Reno, Nevada, January 8, 2003.
13. Phase-field modeling of electrodeposition, Moving Boundary Problems in Physics, Mathematics, and Materials Science, Carnegie Mellon University, April 12, 2003.
14. Interfacial boundary conditions and phase-field models of solidification, Nonequilibrium Interface Dynamics: Theory and Simulation from Atomistic to Continuum Scales, Center for Scientific Computation and Mathematical Modeling, University of Maryland, College Park, MD, October 20, 2003.