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## 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: NIST Fellow, 3/04 – present; Leader, Mathematical Modeling Group, 10/99 – 9/10; 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

- Courant Institute of Mathematical Sciences, New York University, 2006 – Present.
- Laboratory of Molecular Pharmacology, National Cancer Institute, NIH, 2005 – 2016.
- 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 - 2015, Associate editor, Interfaces and Free Boundaries
- 2001 - 2010, Associate editor, Journal of Crystal Growth

- Member of American Physical Society, Society for Industrial and Applied Mathematics
- 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

### Postdoctoral Advisor

- Michael Cromer (NRC Postdoc), 2/13 - 7/14.
- Sean Colbert-Kelly (NRC Postdoc), 1/13 - 2/15.
- Asha Nurse (NIST ARRA Postdoc), 2/11 - 2/13.
- P. Aaron Lott (NRC Postdoc), 8/08 - 8/10.
- Sohyoung Kim (NIH National Cancer Institute), 5/05 - 4/10.
- David L. Cotrell (NRC Postdoc), 9/03 - 8/05.
- Katharyn F. Gurski (NRC Postdoc), 2/01 - 1/03.
- Daniel M. Anderson (NRC Postdoc), 1/95 - 12/96.
- Richard J. Braun (NRC Postdoc), 10/91 - 9/93.
- Bruce T. Murray (NRC Postdoc), 10/88 - 9/90.
- Lucien N. Brush (NRC Postdoc), 1/87 - 12/89.

### Service on Dissertation Committees

- Augustin Luna, Bioinformatics Graduate Program, Boston University, Ph. D. 7/13. Advisor: D. Segré
- Gamse B. Tanoğlu, 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.
- Johnathan Orthwein, Columbia University undergraduate, 2012.

#### 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

- Fellow of the Washington Academy of Sciences, 2012 – present.
- Fellow of the Society for Industrial and Applied Mathematics, 2012 – present.
- Washington Academy of Sciences Award for work of Merit and Distinction in Mathematics and Computer Science, 2012.
- 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).
3. *Journal of Fluid Mechanics*, Vol. 647 (Dedicated to Professor S.H. Davis on his 70th birthday), guest editors **G.B. McFadden** and P.H. Steen, (Cambridge University Press, Cambridge, 2010).

### Book Chapters

1. R.F. Sekerka, S.R. Coriell, and **G.B. McFadden**, Morphological Stability, *Handbook of Crystal Growth*, Vol. I, Second Edition, ed. T. Nishinaga (Elsevier, Amsterdam, 2015) pp. 595–630.
2. 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.
3. 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.
4. 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.
5. 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.
6. **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. W.J. Boettinger, M.E. Williams, K.-W. Moon, **G.B. McFadden**, P.N. Patrone, J.H. Perepezco, Interdiffusion in the Ne-Re System: Evaluation of Uncertainties, *Journal of Phase Equilibria and Diffusion* 38 (2017) 750763. DOI: 10.1007/s11669-017-0562-7
2. Sean Colbert-Kelly, **Geoffrey B. McFadden**, Daniel Phillips, and Jie Shen, Numerical Analysis and Simulation for a Generalized Planar Ginzburg-Landau Equation in a Circular Geometry, *Communications in Mathematical Sciences* 15 (2017) 329-357. DOI: 10.4310/CMS.2017.v15.n2.a3
3. R.F. Sekerka, **G.B. McFadden**, and W.J. Boettinger, Analytical Derivation of the Sauer-Freife Flux Equation for Multicomponent Multiphase Diffusion Couples with Variable Partial Molar Volumes *Journal of Phase Equilibria and Diffusion* 37 (2016) 640-650. DOI: 10.1007/s11669-016-0500-0

4. Y. Mishin, **G.B. McFadden**, R.F. Sekerka, W.J. Boettinger, Sharp interface model of creep deformation in crystalline solids *Physical Review B* 92 (2015) 064113. DOI: 10.1103/PhysRevB.92.064113
5. A.K. Nurse, S. Colbert-Kelly, S.R. Coriell, and **G.B. McFadden**, Equilibrium and stability of axisymmetric drops on a conical substrate under gravity *Physics of Fluids* 27 (2015) 084101.
6. A. Luna, **G.B. McFadden**, M.I. Aladjem, K.W. Kohn, Predicted Role of NAD Utilization in the Control of Circadian Rhythms during DNA Damage Response *PLoS Computational Biology* 11 (2015), e1004144. DOI: 10.1371/journal.pcbi.1004144
7. A. K. Nurse, S.R. Coriell, and **G.B. McFadden**, On the stability of rotating drops, *Journal of Research of the National Institute of Standards and Technology* 120 (2015) 74-101. DOI: 10.6028/jres.120.007.
8. A. Reiman, N.M. Ferraro, A. Turnbull, J.K. Park, A. Cerfon, T.E. Evans, M.J. Lanctot, E.A. Lazarus, Y. Liu, **G.B. McFadden**, D. Monticello, Y. Suzuki, Tokamak Plasma High Field Side Response to an  $n = 3$  Magnetic Perturbation: A Comparison of 3D Equilibrium Solutions from Seven Different Codes, *Nuclear Fusion* 55 (2015) 063026. DOI: 10.1088/0029-5515/55/6/063026
9. Asha K. Nurse, **G.B. McFadden**, and S.R. Coriell, Bubble motion and size variation during thermal migration with phase change, *Physics of Fluids* 25 (2013) 013302.
10. R.F. Sekerka, W.J. Boettinger, and **G.B. McFadden**, Surface morphologies due to grooves at moving grain boundaries having stress-driven fluxes, *Acta Materialia* 61 (2013) 7216–7226.
11. W. Villanueva, W.J. Boettinger, **G.B. McFadden**, and J.A. Warren, A diffuse-interface model of reactive wetting with intermetallic formation, *Acta Materialia* 60 (2012) 3799–3914.
12. R.J. Braun, R. Usha, **G.B. McFadden**, T.A. Driscoll, L.P. Cook, and P.E. King-Smith, Thin film dynamics on a prolate spheroid with application to the cornea, *Journal of Engineering Mathematics* 73 (2012) 121–138.
13. **G.B. McFadden**, S.R. Coriell, and P.A. Lott, Onset of morphological instability in two binary liquid layers, *Physics of Fluids* 23 (2011) 044102-1–044102-8.
14. D.M. Anderson, **G.B. McFadden**, S.R. Coriell, and B.T. Murray, Convective instabilities during the solidification of an ideal ternary alloy in a mushy layer, *Journal of Fluid Mechanics* 647 (2010) 309–333.
15. **G.B. McFadden**, S.R. Coriell, and P.A. Lott, Onset of convection in two layers of a binary liquid, *Journal of Fluid Mechanics* 647 (2010) 105–124.
16. S. Kim, M.I. Aladjem, **G.B. McFadden**, and K.W. Kohn, Predicted functions of MdmX in fine-tuning the response of p53 to DNA damage, *PLoS Computational Biology* 6 (2010) e1000665.
17. P.R. Garabedian and **G.B. McFadden**, The DEMO quasisymmetric stellarator, *Energies* 3 (2010) 277–284.
18. D.M. Anderson, **G.B. McFadden**, S.R. Coriell, and B.T. Murray, Convective instabilities during the solidification of an ideal ternary alloy in a mushy layer, *Journal of Fluid Mechanics* 647 (2010) 309–333.
19. C.S. Pande and **G.B. McFadden**, Self-similar grain size distribution in three dimensions: A stochastic treatment, *Acta Materialia* 58 (2010) 1037–1044.

20. W.J. Boettinger and **G.B. McFadden**, Bending of a bimetallic beam due to the Kirkendall effect, *Journal of Phase Equilibria and Diffusion* 31 (2010) 6–14.

### Selected Publications (in order of times cited)

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. 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.
3. **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.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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.
9. 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.
10. 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.
11. D.M. Anderson, **G.B. McFadden**, and A.A. Wheeler, A phase-field model of solidification with convection, *Physica D* 135 (2000) 175-194.
12. 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.
13. **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.
14. 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.
15. **G.B. McFadden** and S.R. Coriell, Nonplanar interface morphologies during unidirectional solidification of a binary alloy, *Physica* 12D, 1984, pp. 253-261.
16. 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.

17. 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.
18. 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.
19. 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.
20. 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.
21. **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.
22. 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 A* 178 (1994) 217-223.
23. **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.
24. 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.