Gregory R. Baker

Department of Mathematics
Ohio State University
Columbus, Ohio 43210
baker@math.ohio-state.edu

Education

Ph.D. Department of Applied Mathematics, California Institute of Technology,
Pasadena, California 1977.
Thesis Topic: Studies in Vortex Motion
Thesis Advisor: P.G. Saffman
M.S. Cum Laude, (Physics), 1973*
B.S. (Honors), (Physics), 1970*
B.S. (Applied Mathematics, Physics), 1969*

*University of Natal, Durban, Rep. South Africa.

Employment

8/1988 to date: Professor and Ohio Eminent Scholar in Scientific Computing,
Department of Mathematics, Ohio State University.
7/1986-7/1988: Research Mathematician, CRSL, Exxon Res. and Eng. Co., Annandale,
New Jersey.
7/1986-7/1988: Visiting Fellow, Dept. Mechanical and Aerospace Engineering,
Princeton   University.
9/1985-7/1986: Director of Applied Mathematics Program*
8/1981-7/1986: Associate Professor*
7/1980-7/1981: Assistant Professor**
10/1979-6/1980: Lecturer**
7/1977-8/1979: Instructor**
10/1976-6/1977: Research Fellow in Department of Applied Mathematics,
Calif. Inst. of Tech., CA.

*Department of Mathematics, University of Arizona.
**Massachusetts Institute of Technology.

Honors and Awards

1984   Presidential Young Investigator, National Science Foundation.
I am one of three selected in Mathematical Sciences in the first year of the program.

National Committee Membership.

2011 Member NSF Review Panel
2010 Member NSF Review Panel.
2008 Member NSF Review Panel.
2007 Member NSF Review Panel.
2006 Member NSF Review Panel.
2003 Member NSF Review Panel.

1999 Member NSF Review Panel.
1998 Member NSF Review Panel.
1997 Member NSF Review Panel.
1993 Member NSF Review Panel.
1993 Member DOE-Applied Mathematics Review Panel.
1990 NSF-PYI Workshop on Science and Math. Education.
1987 Army Basic Research Committee, 1987, National Research Council.
1985 Chairman of Organizing Committee for SIAM Summer Workship on "Simulations in Fluid Flow".

Ohio State Committees.
   Member Board of regents TAG Committee, 2008 – 2011.

University Committees
   Research Computing Committee, 2010-2011**.**
   Engineering Core Mathematics Committee, 2008 - 2010.
   Math department Chair Search Committee, 2006.
   Math 2000, a College Committee to review teaching in the Department of Mathematics; proposed the creation of the Math/Stat learning Center.
   President and Provost Advisory Committee, current.
   TREP Advisory Committee (Honda Endowment), College of Engineering, 1998.
   Member of University Senate, 1993-1996.
   Council on Academic Affairs, 1993-5.
   Chairperson, RCAC, 1992-3.
   Chairperson, Academic Computing Plan Implementation Task Force, 1992 - 4.
   Dean of the College of Engineering Search Committee, 1991 - 2.
   Human Resources Committee (P&T Cases), College of MPS, 1989 -91.

Research Grants.
   Co-Principal Investigator, NSF, Numerical Studies of Sea Surface Wave Height Statistics with application to Sea Level Sensing Using Satellite Altimetry. $550k, 2006 - 2010.
   Co-Principal Investigator, Keck Foundation, Computational Science Consortium, $30,000, 2002 - 2003.
   Co-Principal Investigator, NSF-ITR, Numerical Studies of the Nonlinear Interaction Between Turbulent Air Flow and Sea Surface Waves, with Application to Ocean Surface Wave Turbulence, $500K, 2001 - 2006.
   Co-Principal Investigator, NASA, Crystal Growth and Fluid Mechanics Problems in Directional Solidification (Continuation), $440K, 1996 - 2000.
   Co-Principal Investigator, NASA, Crystal Growth and Fluid Mechanics Problems in Directional Solidification, $210K, 1993 - 1996.
   Principal Investigator, NSF, Well-posed Numerical Calculations of Free-Surface Flows, $32.5K, 1993 - 1994.
   Principal Investigator, NSF, Physical Regularizations of the Motion of Vortex Sheets, $100K, 1990 - 92.

Co-Principal Investigator, NSF, Viscous Regularization of Vortex Sheets, $20K, 1989 - 90.
Presidential Young Investigator, Topics in Vortex Dynamics, $0.5M, 1984 - 9.
Co-Principal Investigator, AFSOR, Transition to Complicated Behavior in Infinite Dimensional, Dynamical Systems, $1.7M , 1986 - 9.
Principal Invetigator, NSF, Stratified Contour Dynamics, $34.5K, 1983 - 5.
Co-Principal Investigator, DOD, Equipment Grant, $135K, 1984 - 5.
Co-Principal Investigator, SRC, Efficient Methods for Simulating MOS-Integrated Circuits, $94K, 1984 - 5.

Publications (Refereed)

G. R. Baker, S. J. Barker, K. K. Bofah and P. G. Saffman, Laser Anemometer Measurements of Trailing Vortices in Water, *J. Fluid Mech*. (1974) 65, p. 325.

G. R. Baker, P. G. Saffman and J. S. Sheffield, Structure of a Linear Array of Hollow Vortices of Finite Cross-Section, *J. Fluid Mech*. (1976), 74, p. 469.

G. R. Baker, The "Cloud-in-Cell" Technique Applied to the Roll Up of Vortex Sheets, *J. Comp. Phys*. (1979), 31, p.76.

P. G. Saffman and G. R. Baker, Vortex Interactions, *Annual Review of Fluid Mech.* (1979), 11, p. 95.

G. R. Baker, Energetics of a Linear Array of Hollow Vortices of Finite Cross-Section, *J. Fluid Mech.* (1980), 99, p.97.

G. R. Baker, A Test of the Method of Fink and Soh for Following Vortex Sheet Motion, *J. Fluid Mech*. (1980), 100, p. 209.

G. R. Baker, D. I. Meiron and S. A. Orszag, Vortex Simulations of the Rayleigh-Taylor Instability, *Phys. Fluids* (1980), 23, p. 1485.

G. R. Baker and M. I. Israeli, Spin-up from rest of Immiscible Fluids, *Studies in Appl. Math*. (1981), 65, p. 249.

D. I. Meiron, G. R. Baker and S. A. Orszag, Analytic Structure of Vortex Sheet Dynamics. I: Kelvin-Helmholtz Instability, *J. Fluid Mech*. (1982), 114, p. 283.

G. R. Baker and S. Mardeusz, The Steady Viscous Flow of Two Differentially Rotating Immiscible Fluids, *Studies in Appl. Math*. (1982), 67, p. 63.

G. R. Baker, D. I. Meiron and S. A. Orszag, Generalized Vortex Methods for Free Surface Flow Problems, *J. Fluid Mech*. (1982), 123, p. 477.

C. P. Verdon, R. L. McCrory, R. L. Morse, G. R. Baker, D. I. Meiron and S.A. Orsazg, Nonlinear Effects of Multi-Frequency Hydrodynamic Instabilities on Ablating Accelerating Thin Shells, *Phys. Fluids* (1982), 25, p.1653.

G. R. Baker, D. I. Meiron and S. A. Orszag, Boundary Integral Methods for Axisymmetric and Three-Dimensional Rayleigh-Taylor Instability Problems, *Physica D* (1984), 12, p. 19.

G. R. Baker and M. J. Shelley, Boundary Integral Techniques for Multi-Connected Domains, *J. Comp. Phys*. (1986), 64, p. 112.

G. R. Baker, R. L. McCrory, C. P. Verdon and S. A. Orszag, Rayleigh-Taylor Instability of Fluid Layers, *J. Fluid Mech*. (1987), 178, p. 161.

M. J. Shelley and G. R. Baker, Order Preserving Approximations to Succesive Derivatives of Periodic Functions by Iterated Splines, *SIAM J. Num. Anal*. (1988), 25, p. 1442.

G. R. Baker and D. W. Moore, The Rise and Distortion of a Two-Dimensional Gas Bubble in an Inviscid Liquid, *Phys. Fluids* (1989), A1, p. 1451.

G. R. Baker and M. J. Shelley, On the Connection between Thin Vortex Layers and Vortex Sheets, *J. Fluid Mech*. (1990), 215, p. 161.

G. R. Baker, D. J. Meiron and S. A. Orszag, Generalized Vortex Methods for Free Surface Flow Problems II: Radiating Waves, *J. Sci. Computing* (1990), 4, p. 237.

G.R. Baker, A Study of the Numerical Stability of the Method of Contour Dynamics, *Phil. Trans. R. Soc. Lond*. (1990), A333, p. 391.

G.R. Baker, R.E. Caflisch, and M. Siegel, Singularity formation during Rayleigh-Taylor instability, *J. Fluid Mech*. (1993), 252, p.51.

J. Ely and G.R. Baker, High precision calculations of vortex sheet motion, *J. Comput. Phys*. (1994), 111, p.275.

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

G.R. Baker, X. Li, and A. Morlet, Analytic Structure of Two 1D-Transport Equations with Non Local Fluxes, *Physica D*} (1996), 91, p.349.

G. Baker and A. Nachbin, Stable methods for vortex sheet motion in the presence of surface tension, *SIAM J. Sci. Comp*. (1998), 19, p. 1737-1766.

G. Baker and Q. Nie, The asymptotic motion of an accelerating, thick layer of inviscid liquid, *Phys. Fluids* (1998), 10, p.101-112.

G. Baker and Q. Nie, Application of adaptive quadrature to axi-symmetric vortex sheet motion, *J. Comp. Phys*. (1998), 143, p.49-69.

S.J. Cowley, G.R. Baker, and S. Tanveer, On the formation of a Moore singularity, *J. Fluid Mech*. (1999), 378, p.233-267.

K.M. Berger, G.R. Baker and J.T. Johnson, A comparison of nonlinear water wave models, *Intern. J. Comput. Fluid Dyn*. (2003), 17, pp. 219-224.

A.R. Hayslip, J.T. Johnson, and G.R. Baker, Further numerical studies of backscattering from time evolving non-linear sea surfaces, *IEEE Trans. Geosc. Rem. Sens*. (2003), 41, pp. 2287-2293.

G.R. Baker and J.T.Beale, Vortex blob methods applied to interfacial motion, *J. Comput. Phys*. (2004), 196, p.233-258.

G.R. Baker and L. Pham, A comparison of blob methods for vortex sheet roll-up, *J. Fluid Mech*. (2006), 547, pp. 297 – 316.

J. Wang and G. Baker, A numerical algorithm for viscous incompressible interfacial flows, *J. Comput. Phys*. (2009), 228, pp. 5470 – 5489.

G.Baker and C. Xie, Singularities in the complex physical plane for deep water waves, to appear in *J. Fluid Mech*. (2011).

J. Czocher and G. Baker, Contextual learning in math education for engineers, *Innovations 2011: World Innovations in Engineering Education and Research*, ed. W. Aung, et al., iNEER, Potomac, MD, USA, pp. 309 - 325.

Book Chapters:
G.Baker, BIT for free surface flows, Chapter 8 in *Boundary Element Methods in Engineering and Sciences*, (eds. M. Aliabadi, P. Wen), Computational and Experimental Methods in Structures – Vol. 4, Imperial College Press (2011).

Conference Proceedings:
P. Krumm, M. Hellberg and G. Baker, in *Proceedings of the 3rd Intern. Conf. on Quiescent Plasmas*}, Elsinore, (Danish Atomic Energy Comm.) (1971), p. 9.

G. R. Baker and M. I. Israeli, Deformations of a Drop Caused by Variable Surface Tension, in *Proc. of the 7th Intern. Conf. on Num. Methods in Fluid Mechanics* (1981).

G. R. Baker, D. I. Meiron and S. A. Orszag, Applications of a Generalised Vortex Method to Nonlinear Free Surface Flows, in the *Proc. of the Conf. on Num. Ship Hydrodynamics*, Paris, (1981).

G. R. Baker, Generalised Vortex Methods for Free Surface Flows, in *Waves on Fluid Interfaces}*, MRC, Wisconsin, (1983).

G. R. Baker, Generalised Vortex Methods for Stratified, Layered Flows, in *Proc. of the 11th IMACS World Congress*, Oslo, (1986).

G. R. Baker, Two-Frequency Rayleigh-Taylor and Richtmyer-Meshkov instabilities, in *Proc. IMA Workshop on Computational Fluid Dynamics and Reacting Gas Flows*, Univ. Minnesota, (1986).

M. J. Shelley and G. R. Baker, The relation between thin vortex layers and vortex sheets, in *Mathematical Aspects of Vortex Dynamics}*, (ed. R. Caflisch), SIAM, (1989).

G. R. Baker, Singularities in the complex physical plane, in *Proc. 3rd Intern. Conf. on Hyperbolic Systems*, Uppsala, (1990).

G.R. Baker and S. Tanveer, Well-posed numerical calculations for free-surface flows, in Singularities in Fluids, Plasmas and Optics}, (ed. R. Caflisch), NATO ASI Series, (1993), p.1.

Gregory Baker, Michael Siegel, and Saleh Tanveer, Singularities and Interfacial Patterns in Hele-Shaw flows, in Proc. *5th. Intern. Conf. Hyperbolic Systems*, Stonybrook, USA.

G.R. Baker, On the origin of singularities in vortex sheet motion, AIAA paper 95-2235, presented at the *26th. AIAA Fluid Dynamics Conference}*, San Diego, California, 1995.

K. Essenhigh, T. Aldemir, and G. Baker, Stability Analysis of a Perfectly Stirred Reactor, in *Proc. International Symposium of the American Flame Research Committee}*, Monterey, California, 1995.

G.R. Baker, The asymptotic motion of a tall column of liquid in a tube, in *Proc. 22nd Symp. Numer. Math.*, SANUM, Cape Town, (1998).

J.T. Johnson, G.R. Baker, J.V. Toporkov, and G.S. Brown, Numerical studies of backscattering from time evolving non-linear sea surfaces: comparison of hydrodynamic models, in *IEEE Geosciences and Remote Sensing Symposium* (2000)

A. Hayslip, J.T. Johnson and G.R. Baker, in *Proc. Intern. Geosci. and Remote Sensing Symp.}* 2002

G. Baker, Accelerating fluid layers, in *7th Intern. Conf. Boundary Integral Techniques*, Paris, France, (2006).

G. Baker and N. Golubeva, Improved accuracy for points near a surface in BIT, in *Advances in Boundary Element Techniquess VIII*, Naples, Italy, (2007).

G. Baker and N. Golubeva, BEM for thin vortex layers, in *Advances in Boundary Element Techniques IX,* Seville, Spain (2008).

G. Baker and J.S. Im, BEM for shallow water, in *Advances in Boundary Element Techniques X,* Athens, Greece (2009).

G. Baker, Viscous effects on water waves, in *Proc. Workshop on Deterministic Measurements and Simulations of Ocean Waves*, Delft, Netherlands (2009).

C. Xie and G. Baker, Singularities in the complex physical plane for deep water waves, in *Recent Advances in Applied Mathematics*, Harvard (2010).

G. Baker and H. Zhang, Blob regularization of boundary integrals, in *Advances in Boundary Element Techniques XI,* Berlin, Germany (2010), p. 32.

J. Czocher and G. Baker, Contextual Learning in Math Education for Engineers, in *Proc. Intern. Conf. Eng. Educ. Res.*, Gliwice, Poland (2010).