

# Jon A. Wilkening

1091 Evans Hall  
Department of Mathematics  
University of California, Berkeley  
Berkeley, CA 94720-3840

Tel. 510.643.7990  
Fax. 510.642.8204  
wilken@math.berkeley.edu

## EDUCATION

University of California, Berkeley Berkeley, 2002  
Ph. D. in Mathematics  
Advisor: Professor James Sethian  
Dissertation: *Mathematical Analysis and Numerical Simulation of Electromigration*

University of Arizona Tucson, 1996  
B.S. in Engineering Physics, Summa Cum Laude with Honors

## FELLOWSHIPS AND AWARDS

Frederick A. Howes Scholar in Computational Science 2003  
Department of Energy Computational Science Graduate Fellowship 1997–2001  
National Science Foundation Graduate Research Fellowship (declined, 1997)  
Flinn Foundation Scholarship 1992–1996

## POSITIONS

University of California, Berkeley, *Assistant Professor* 2005–present  
Courant Institute of Mathematical Sciences, *Courant Instructor, Research Postdoc* 2002–2005  
Lawrence Berkeley National Laboratory, *Research Assistant* 1997–2002  
Los Alamos National Laboratory, *Research Assistant* Summer, 1999  
University of California, Berkeley, *Graduate Student Instructor* 1996, 2001  
University of Arizona, *Teaching Assistant* 1996  
Arizona Research Laboratories, Surface Sciences Division, *Research Assistant* 1994

## RESEARCH INTERESTS

broadly:

**Numerical Analysis, Computational Physics, PDE, Scientific Computing**

specifically:

Fluid mechanics, shape optimization, lubrication theory, interaction with elastic or inertial bodies  
Periodic solutions of non-linear dispersive PDE, numerical methods for finding them, solitons  
Electromigration, grain boundary diffusion, surface diffusion, the role of stress in these problems  
Semigroup theory, functional analysis, well-posedness of diffusion problems  
Quasicontinuum method, ghost forces at interface between atomistic and coarse grained regions  
Least squares finite elements, singular basis functions, interface problems in elasticity  
Perturbation theory, stable numerical methods for corner singularities of ADN elliptic systems  
String method, thermally driven rare events, dislocation nucleation near a stressed crack tip  
Numerical linear algebra, multigrid, canonical forms of matrices, Jordan chains  
Generalized Gaussian quadrature rules, free space Poisson problems, micromagnetics

**PUBLICATIONS**

- Jon Wilkening, An infinite branching hierarchy of time-periodic solutions of the Benjamin-Ono equation, (submitted), arXiv:0811.4209.
- D. M. Ambrose and J. Wilkening, Global paths of time-periodic solutions of the Benjamin-Ono equation connecting pairs of traveling waves, *Comm. App. Math. and Comput. Sci.*, (accepted)
- Jon Wilkening and Jia Yu, A local construction of the Smith normal form of a matrix polynomial, *J. Symbolic Comput.*, (submitted), arXiv:0809.2978.
- Michael Westdickenberg and Jon Wilkening, Variational particle scheme for the porous medium equation and for the system of isentropic Euler equations, *ESAIM-Math. Model. Num.*, (submitted), arXiv:0807.3573.
- D. M. Ambrose and J. Wilkening, Time-periodic solutions of the Benjamin-Ono equation, *J. Nonlinear Sci.*, (accepted), arXiv:0804.3623.
- J. Wilkening, Practical error estimates for Reynolds' lubrication approximation and its higher order corrections, *SIAM J. Math. Anal.*, 41/2 (2009), pp. 588–630.
- J. Wilkening, Inf-sup estimates for the Stokes problem in a periodic channel, (submitted), arXiv:0706.4082.
- J. Wilkening, A. E. Hosoi, Shape optimization of a sheet swimming over a thin liquid layer, *J. Fluid Mech.*, 601 (2008), pp. 25–61.
- J. Wilkening, An algorithm for computing Jordan chains and inverting analytic matrix functions, *Lin. Alg. Appl.*, 427 (2007), pp. 6–25.
- J. Wilkening, L. Borucki, J. A. Sethian, Analysis of stress-driven grain boundary diffusion. Part I, *SIAM J. Appl. Math.* 64/6 (2004), pp. 1839–1863.
- J. Wilkening, L. Borucki, J. A. Sethian, Analysis of stress-driven grain boundary diffusion. Part II: degeneracy, *SIAM J. Appl. Math.* 64/6 (2004), pp. 1864–1886.
- J. A. Sethian, J. Wilkening, A numerical model of stress driven grain boundary diffusion, *J. Comput. Phys.*, 193/1 (2003), pp. 275–305.
- J. Wilkening, Mathematical Analysis and Numerical Simulation of Electromigration, PhD thesis, University of California, Berkeley, May 2002.

**STUDENTS**

Bradley Froehle, (Ph. D. student)	2009–present
Erica Isaacson, (Ph. D. student)	2008–present
Trevor Potter, (Ph. D. student)	2008–present
Jia Yu, (Ph. D. student)	2006–present
Xixi Wang (Ph. D. student in biology, master's student in math via exam)	Fall, 2008
Ahmed H. El-Shaer, (Ph. D. student in Mechanical Engineering, Master's student in math)	Fall, 2007
<i>On the Synthesis of Suboptimal Control Using Galerkin Approximations.</i>	
Christian Linder, (Ph. D. student in Civil Engineering, Master's student in math)	Fall, 2006
<i>Application of differential topology for the derivation of compatibility conservation laws in mechanics</i>	
Xueyao (Vicky) Liu, (Undergraduate)	Fall, 2008
honor's thesis: <i>Cytoplasmic polyadenylation switching mechanism</i>	
Yajing Tan, (Undergraduate)	2006–2008
honor's thesis: <i>Modeling the Magnetostatic Interaction Matrix</i>	
Cassandra Bluemel, (Undergraduate)	Fall, 2005
honor's thesis: <i>Discontinuous Galerkin Methods for the 1-D Spherical Neutron Transport Equation</i>	

**INVITED TALKS**

- Computation of time-periodic solutions of nonlinear PDE*  
 SIAM Annual Meeting Denver, CO, 7/8/2009  
 Northwestern Applied Math Colloquium Evanston, IL, 6/1/2009  
 UC Davis Math Colloquium Davis, CA, 4/13/2009
- Time-periodic solutions of the Benjamin-Ono equation*  
 CU Boulder Nonlinear Waves Seminar Boulder, CO, 1/27/2009  
 Indiana University PDE/Applied Math Seminar Bloomington, 10/27/2008  
 AMR08 (DOE Applied Mathematics Principal Investigators Meeting) Argonne, IL, 10/15/2008  
 UC Berkeley Applied Math Seminar Berkeley, 9/12/2008  
 Georgia Tech Applied Math Seminar Atlanta, 3/24/2008
- Lubrication theory in nearly singular geometries: when should one stop optimizing a reduced model?*  
 IMA Program on Geometrical Singularities and Singular Geometries Minneapolis, 7/24/2008
- Rigorous Error Estimates for Reynolds' Lubrication Approximation*  
 American Physical Society Division of Fluid Dynamics 59th Annual Meeting Tampa, 11/2006
- Shape Optimization of Swimming Sheets*  
 SAMSI interface problems workshop North Carolina, 11/15/2007  
 Cal Day Berkeley, 4/21/2007  
 UC Berkeley Scientific Computing Seminar Berkeley, 4/11/2007  
 Georgia Tech Applied Math Seminar Atlanta, 4/5/2007  
 SIAM Conference on Computational Science and Engineering Costa Mesa, 2/21/2007  
 U.C. Davis Applied Math Seminar Davis, 5/26/2006  
 Dartmouth Math Colloquium Hannover, 5/11/2006  
 Courant Institute Applied Math Lab Seminar (NYU) New York, 3/30/2006  
 U.C. Merced Math Colloquium Merced, 3/20/2006  
 Cornell CAM Colloquium Ithaca, 2/24/2006  
 CPAM lunchtime seminar Berkeley, 2/2/2006  
 American Physical Society Division of Fluid Dynamics 58th Annual Meeting Chicago, 11/2005
- Mathematics of Microchip Failure*  
 SAC Capital Advisors, LLC New York, 9/2004
- Constructing Stable Asymptotics for Corner Singularities of Elliptic Systems*  
 Fourth World Congress of Nonlinear Analysts Orlando, 7/2004  
 CIMS Analysis Seminar (NYU) New York, 4/2004
- Grain Boundary Diffusion due to Stress and Electromigration*  
 Maryland, Brown, Columbia 4/2005  
 UCLA, Berkeley, Arizona, Cornell, GATech, MIT 3/2005  
 NYU, Rutgers, CU Boulder, Simon Fraser, Minnesota 2/2005  
 UC Berkeley Math Colloquium Berkeley, 10/2004  
 CSGF Conference (Howes Scholar Talk) Washington D.C., 7/2004  
 SIAM Conference on Mathematical Aspects of Materials Science Los Angeles, 5/2004  
 Cornell CAM Colloquium Ithaca, 2/2004  
 Fields Institute, Workshop on Patterns in Physics Toronto, 11/2003  
 Rutgers Mathematical Physics Seminar New Brunswick, 10/2003  
 5th International Congress on Industrial and Applied Mathematics Sydney, AUS, 7/2003  
 IBM T. J. Watson Research Center Yorktown, NY, 5/2003
- Void Growth, Level Sets, and Multigrid*  
 Center for Nonlinear Studies, LANL Los Alamos, 7/1999

**TEACHING**

U. C. Berkeley	2005–present
Fall 2009: Math 204, <i>Theory of Ordinary Differential Equations</i> .	
Spring 2009: Math 118, <i>Fourier analysis, wavelets and signal processing</i> .	
Fall 2008: Math 1B, <i>Calculus</i> .	
Spring 2008: Math 1A, <i>Calculus</i> .	
Fall 2007: Math 228A, <i>Numerical Solution of Differential Equations</i> .	
Spring 2007: Math 228B, <i>Numerical Solution of Differential Equations</i> .	
Fall 2006: Math 228A, <i>Numerical Solution of Differential Equations</i> .	
Fall 2006: Math 204A, <i>Theory of Ordinary Differential Equations</i> .	
Spring 2006: Math 224B, <i>Mathematical Methods for the Physical Sciences</i> .	
Fall 2005: Math 275, <i>Topics in Applied Mathematics</i> .	
New York University	2003–2004
Spring 2004: Math 63, <i>Business Calculus</i> (24 students)	
Fall 2003: Math 63, <i>Business Calculus</i> (102 students)	

**PROFESSIONAL ACTIVITIES**

Minisymposium Organizer	
<i>Nonlinear waves</i> , SIAM Annual Meeting, Denver 7/2009	
<i>Asymptotic Analysis and Numerical Modeling</i> , SIAM CSE Conference, Costa Mesa 2/2007	
Organizer of the Applied Math Seminar at Berkeley (with A. Chorin)	2005–present
Organizer of the Applied Math Lab Seminar at Courant (with N. Vandenbergh)	2003–2004
Reviewer for various journals and grant proposals	2002–present
<i>Acta Applicanda Mathematicae</i> , <i>Electronic Transactions on Numerical Analysis</i> ,	
<i>International Journal for Numerical Methods in Fluids</i> , <i>Journal of Computational Physics</i> ,	
<i>Journal of Fluid Mechanics</i> , <i>Journal of the Mechanics and Physics of Solids</i> ,	
<i>Journal of Nonlinear Science</i> , <i>Journal of the Royal Society Interface</i> , <i>Nonlinearity</i> ,	
<i>Physica A</i> , <i>Physical Review Letters</i> , <i>Proceedings of the National Academy of Sciences</i> ,	
NSF Panelist (2009), U. S. Civilian Research and Development Foundation (2004)	
Member, Society for Industrial and Applied Mathematics	2002–present
Member, American Physical Society	2005–present

**RECENT COLLABORATORS**

Chris H. Rycroft (LBL), Marcus Roper (Miller Fellow), Michael Westdickenberg (GA Tech), David M. Ambrose (Drexel), Anette Hosoi (MIT), Geoff Sanders (Boulder), Tom Manteuffel (Boulder), Tarek Zohdi (Berkeley), A. Chorin (Berkeley), A. Packard (Berkeley), GI Barenblatt (UCB), Todd Murphey (Northwestern), Kevin Lin (Arizona), Robert V. Kohn (NYU), Eric Vanden-Eijnden (NYU), Ellad Tadmor (Minnesota), Michael Shelley (NYU), Leslie Greengard (NYU), James Sethian (Berkeley), Len Borucki (Motorola)

**PERSONAL**

Competitive swimming (100/200/500 free, 50/100 fly)  
 Intramural and pick-up basketball (power forward, center)  
 Classical piano