

CURRICULUM VITAE: JON 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
<http://math.berkeley.edu/~wilken>

EDUCATION

University of California, Berkeley Ph. D. in Mathematics Advisor: Professor James Sethian Dissertation: <i>Mathematical Analysis and Numerical Simulation of Electromigration</i>	Berkeley, 2002
University of Arizona B.S. in Engineering Physics, Summa Cum Laude with Honors	Tucson, 1996

FELLOWSHIPS AND AWARDS

National Science Foundation Faculty Early Career Development Award (CAREER)	2010-2015
Frederick A. Howes Scholar in Computational Science	2003
Department of Energy Computational Science Graduate Fellowship	1997–2001
National Science Foundation Graduate Research Fellowship	(declined in favor of CSGF, 1997)
Flinn Foundation Scholarship	1992–1996

APPOINTMENTS

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

RESEARCH INTERESTS

Broadly:

Numerical Analysis, Computational Physics, Partial Differential Equations, High Performance Computing

Specifically:

Water waves, vortex sheets, mode-locked lasers, solitons, periodic and quasi-periodic solutions
Boundary value problems, adjoint methods, shape optimization, PDE-constrained optimization
Dirichlet to Neumann operators in solid and fluid mechanics, semigroup theory, grain-boundary diffusion
Numerical optimization, optimal transportation, high order time-stepping, spectral deferred correction
Least squares finite elements, singular basis functions, interface problems in elasticity
Perturbation methods, lubrication theory, stable representations of corner singularities
Numerical linear algebra, multigrid, canonical forms of matrices, Jordan chains
Generalized Gaussian quadrature rules, free space Poisson problems, micromagnetics

PUBLICATIONS

- Jon Wilkening, Breakdown of self-similarity at the crests of large amplitude standing water waves, *Phys. Rev. Lett.*, 107, 184501, 2011.
- M. O. Williams, E. Shlizerman, J. Wilkening and J. N. Kutz, The low dimensionality of time-periodic standing waves in water of finite and infinite depth, *SIAM J. Appl. Dyn. Syst.*, 2011 (submitted).
- M. O. Williams, J. Wilkening, E. Shlizerman and J. N. Kutz, Continuation of periodic solutions in the waveguide array mode-locked laser, *Physica D*, 240/22 (2011), pp. 1791–1804.
- D. M. Ambrose and J. Wilkening, Dependence of time-periodic vortex sheets with surface tension on mean vortex sheet strength, 2011 (submitted to *Phys. Fluids*).
- L. C. Lee, S. J. S. Morris and J. Wilkening, Stress concentrations, diffusionaly-accommodated grain boundary sliding and the viscoelasticity of polycrystals, *Proc. Royal Soc. A*, 467 (2011), pp. 1624–1644.
- D. M. Ambrose and J. Wilkening, Computation of symmetric, time-periodic solutions of the vortex sheet with surface tension, *Proc. Natl. Acad. Sci.*, 107/8 (2010), pp. 3361–3366.
- David M. Ambrose and Jon Wilkening, Computing time-periodic solutions of nonlinear systems of partial differential equations, *Hyperbolic Problems: Theory, Numerics, and Applications*, Proceedings of the 13th International Conference on Hyperbolic Problems, held in Beijing, China, June 15–19, 2010.
- L. C. Lee, S. J. S. Morris, J. Wilkening and T. I. Zohdi, Effects of stress concentrations on the attenuation by diffusionaly assisted grain boundary sliding, *Proceedings of 16th US National Congress of Theoretical and Applied Mechanics*, 2010, State College, PA.
- J. Wilkening, An infinite branching hierarchy of time-periodic solutions of the Benjamin-Ono equation, 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. Appl. Math. Comput. Sci.*, 4/1 (2009), pp. 177–215.
- Jon Wilkening and Jia Yu, A local construction of the Smith normal form of a matrix polynomial, *J. Symbolic Comput.*, 46 (2011), pp. 1–22.
- 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.*, 44 (2010), pp. 133–166.
- D. M. Ambrose and J. Wilkening, Computation of time-periodic solutions of the Benjamin-Ono equation, *J. Nonlinear Sci.*, 20/3 (2010), pp. 277–308.
- 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, 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, *Math 228A,B Lecture Notes. Numerical Solution of Differential Equations*, (2007, 2011).
http://math.berkeley.edu/~wilken/228A.F07/wilkening_228A_notes.pdf
http://math.berkeley.edu/~wilken/228B.S07/wilkening_228B_notes.pdf
http://math.berkeley.edu/~wilken/wilkening_228B_additional_lectures.pdf
- J. Wilkening, An algorithm for computing Jordan chains and inverting analytic matrix functions, *Lin. Alg. Appl.*, 427 (2007), pp. 6–25.

PUBLICATIONS (CONTINUED)

- 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.

PH. D. STUDENTS

- | | |
|--|--------------|
| Daneil Greengard | 2011–present |
| Bradley Froehle | 2009–present |
| Erica Isaacson | 2008–present |
| Trevor Potter | 2008–present |
| Jia Yu | 2006–2010 |
| Ph. D. thesis: <i>A local construction of the Smith Normal form of a matrix polynomial, and time-periodic gravity-driven water waves.</i> (first job after graduation: Bloomberg L.P., New York) | |

MASTER’S STUDENTS

- | | |
|--|--------------|
| Liang Yu (Ph. D. student in physics, master’s student in math) | 2010–present |
| Wael Hassan (Ph. D. student in Structural and Earthquake Engineering, master’s student in math) | Fall, 2010 |
| master’s thesis: <i>Error analysis of numerical solutions of ordinary differential equations for linear and nonlinear seismic analysis of single degree of freedom concrete structures</i> | |
| Curt Hansen (Ph. D. student in statistics, master’s student in math, via exam) | Spring, 2010 |
| 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 |
| master’s thesis: <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 |
| master’s thesis: <i>Application of differential topology for the derivation of compatibility conservation laws in mechanics</i> | |

UNDERGRADUATE STUDENTS

- | | |
|--|--------------|
| Monica Jinwoo Kang | 2010–present |
| Xueyao (Vicky) Liu | Fall, 2008 |
| honor’s thesis: <i>Cytoplasmic polyadenylation switching mechanism</i> | |
| Yajing Tan | 2006–2008 |
| honor’s thesis: <i>Modeling the Magnetostatic Interaction Matrix</i> | |
| Cassandra Bluemel | Fall, 2005 |
| honor’s thesis: <i>Discontinuous Galerkin Methods for the 1-D Spherical Neutron Transport Equation</i> | |

INVITED TALKS*Breakdown of self-similarity at the crests of large amplitude standing water waves*

SIAM Conference on Nonlinear Waves and Coherent Structures	Seattle, 6/2012
British Applied Mathematics Colloquium, University College	London, 3/2012
UC Santa Cruz Math Colloquium	Santa Cruz, 11/2011
University of Arizona Applied Math Colloquium	Tucson, 10/2011
DOE Applied Mathematics Program Meeting	Washington DC, 10/2011

Bifurcation and resonance in standing water waves

AMS Western Sectional Meeting (session on nearly integrable systems)	Honolulu, 3/2012
SIAM Conference on Analysis of Partial Differential Equations	San Diego, 11/2011
ICIAM 2011 (session on boundary integral methods)	Vancouver, 7/2011
Waves in Fluids III, IMPA, Brazil	Rio de Janeiro, 6/2011

Computation of time-periodic water waves

IMACS Conference on Nonlinear Waves	Athens, GA 4/2011
AMS Western Sectional Meeting (session on nonlinear phenomena)	Los Angeles, 10/2010
SIAM Conference on Nonlinear Waves and Coherent Structures	Philadelphia, 8/2010

Computation of two-dimensional standing water waves

American Physical Society Division of Fluid Dynamics 63rd Annual Meeting	Long Beach, 11/2010
--	---------------------

Computation of three-dimensional standing water waves

American Physical Society Division of Fluid Dynamics 63rd Annual Meeting	Long Beach, 11/2010
--	---------------------

Computation of time-periodic solutions of fluid interface problems

University of Illinois, Chicago, Math and its Applications Seminar	Chicago, 9/2010
University of Waterloo Applied Math Colloquium	Canada, 7/2010
Mechanical Engineering Fluid Mechanics Seminar	Berkeley, 4/2010
SIAM Conference on Parallel Processing	Seattle, 2/2010
University of Washington Applied Math Seminar	Seattle, 2/2010
Courant Institute Applied Math Seminar	New York, 2/2010
Harvard Widely Applied Math Seminar	Boston, 2/2010
University of Michigan Applied Math Colloquium	Ann Arbor, 12/2009
Lawrence Berkeley Lab Site Visit	Berkeley, 8/2009

Time-periodic solutions of the vortex sheet with surface tension

American Physical Society Division of Fluid Dynamics 62nd Annual Meeting	Minneapolis, 11/2009
AMS Eastern Sectional Meeting (session on nonlinear waves)	College Park, PA, 10/2009

Topics in Solid and Fluid Mechanics

Mechanical Engineering Colloquium	Berkeley, 9/2009
-----------------------------------	------------------

Computation of time-periodic solutions of nonlinear PDE

Drexel University Applied Math/PDE Seminar	Philadelphia, PA, 10/2009
Carnegie Mellon University Applied Math Seminar	Pittsburgh, 9/2009
UC Santa Cruz Applied Math Seminar	Santa Cruz, 10/2009
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

INVITED TALKS (CONTINUED)

- 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*
 Columbia University Applied Math Colloquium New York, 4/2005
 Brown University Applied Math Seminar Providence, 4/2005
 University of Maryland Applied Math Seminar College Park, 4/2005
 MIT Applied Math Seminar Boston, 3/2005
 UCLA Applied Math Seminar Los Angeles, 3/2005
 UC Berkeley Applied Math Seminar Berkeley, 3/2005
 University of Arizona Applied Math Seminar Tucson, 3/2005
 Cornell University CAM Colloquium Ithaca, 3/2005
 Georgia Tech Applied Math Seminar Atlanta, 3/2005
 University of Minnesota Minneapolis, 2/2005
 Simon Fraser Applied Math Seminar Canada, 2/2005
 CU Boulder Applied Math Colloquium Boulder, 2/2005
 Rutgers Applied Math Seminar New Brunswick, 2/2005
 Courant Institute Applied Math Seminar New York, 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 2012: Math 204, <i>Theory of Ordinary Differential Equations</i> .	
Summer 2011: Math 128A, <i>Numerical Analysis</i> .	
Spring 2011: Math 118, <i>Fourier Analysis, Wavelets and Signal Processing</i> .	
Spring 2011: Math 228B, <i>Numerical Solution of Differential Equations</i> .	
Spring 2010: Math 16B, <i>Calculus and Analytic Geometry</i> .	
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>	
Fall 2003: Math 63, <i>Business Calculus</i>	

PROFESSIONAL ACTIVITIES

Seminar and Minisymposium Organizer	
<i>Mathematical Models of Water Waves</i> , SIAM Conference on Nonlinear Waves, Philadelphia	8/2010
<i>Nonlinear waves</i> , SIAM Annual Meeting, Denver	7/2009
Session chair, IMA Workshop on Singularities and Singular Geometries	7/2008
<i>Asymptotic Analysis and Numerical Modeling</i> , SIAM CSE Conference, Costa Mesa	2/2007
<i>UC Berkeley Applied Math Seminar</i> (with A. Chorin)	2005–present
<i>Courant Institute Applied Math Lab Seminar</i> (with N. Vandenbergh)	2003–2004
University Coordinator at UC Berkeley	2009–present
<i>Department of Energy Computational Science Graduate Student Fellowship</i>	
Reviewer for various journals and agencies	2002–present
Acta Applicanda Mathematicae, Applied and Computational Harmonic Analysis, Communications in Mathematical Sciences, Electronic Transactions on Numerical Analysis, International Journal for Numerical Methods in Fluids, Journal of Computational Physics, Journal of Fluid Mechanics, Journal of the Mechanics and Physics of Solids, Journal of Nonlinear Science, Journal of the Royal Society Interface, Nonlinearity, Physica A, Physical Review Letters, Proceedings of the National Academy of Sciences, SIAM Journal on Applied Mathematics, DOE SciDac (2010), NSF Panelist (2009), U. S. Civilian Research and Development Foundation (2004)	
Membership in professional societies	
Society for Industrial and Applied Mathematics	2002–present
American Physical Society	2005–present
Released/maintain code: <i>gmpfrxx</i> . (one of the official C++ interfaces for MPFR)	2007–present
unique feature: allows mixing of double precision, MPFR and GMP types in algebraic expressions	
MPFR is a package for arbitrary precision arithmetic with correct rounding.	
GMP is a package for arbitrary size integer and rational number arithmetic.	