

BIOGRAPHICAL SKETCH
JOHN S. LOWENGRUB

Department of Mathematics
University of California at Irvine
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Irvine, CA 92617

Born May 10, 1964, Middletown, Connecticut.

EDUCATION

Sept 1985–Oct 1988	Ph.D. in Applied Mathematics Courant Institute of Mathematical Sciences Thesis topic: Convergence of the Vortex Method for Vortex Sheets Advisor: Professor Russel Caffisch
Sept 1981–May 1985	B.A. Mathematics Cornell University cum laude 1985

APPOINTMENTS

1/07–Present	Professor Department of Chemical Engineering and Materials Science University of California, Irvine
1/07–Present	Professor Department of Biomedical Engineering University of California, Irvine
7/04–Present	Chair Department of Mathematics, University of California, Irvine
9/03–6/04	Vice Chair for Graduate Studies Department of Mathematics, University of California, Irvine
Jan 2003–Present	Professor Department of Mathematics, University of California, Irvine
Sept 2000–Dec 2003	Graduate Faculty Dept Chemical Engineering & Materials Science University of Minnesota
July 1999–Dec 2003	Professor School of Mathematics University of Minnesota
July 1999–June 2001	Professor Department of Mathematics University of North Carolina
Dec 1998–Dec 2003	Graduate Faculty Dept Aerospace Engineering & Mechanics University of Minnesota

July 1995–June 1999	Associate Professor School of Mathematics University of Minnesota
July 1992– June 1995	Assistant Professor School of Mathematics University of Minnesota
Sept 1991–June 1992	Member School of Mathematics Institute for Advanced Study
June 1990–June 1993	NSF Postdoctoral Fellow Stanford Advisor: Professor Joseph Keller Minnesota Advisor: Professor Mitchell Luskin
July 1989–Sept 1992	Szego Assistant Professor Department of Mathematics Stanford University
Sept 1988–June 1989	Visiting Member Courant Institute of Mathematical Sciences New York University

HONORS AND GRANTS

June 2008	Chancellor’s award for Excellence in Fostering Undergraduate Research UC Irvine
April 2008	Distinguished Mid-Career Faculty Award for Research UC Irvine
June 2006 - May 2009	NSF Grant in the Division of Materials Research New epitaxial nanostructures in the limited adatom mobility regime (co-PI, with Professor Robert Hull, U. Va.(PI))
August 2005 - July 2008	NSF Grant in the Division of Materials Research NSF-EC Cooperative Activity in Computational materials research: Bridging the atomistic to the continuum– Multiscale investigation of self-assembling magnetic dots during epitaxial growth (co-PI, with Professors M. Asta (co-PI), P.W. Voorhees (co-PI) and K. Thornton (PI))
Jul 1994–June 2009	NSF Grants in the Division of Mathematical Sciences Current Grant: Computational problems for interfaces with bending stiffness in strongly anisotropic thin films and inhomogeneous biomembranes
Jul 2006–June 2007	University of California, Irvine Research Experience for Undergraduates Agent-based models of tumor growth (awarded for Aaron Abajian). Also awarded Henry Samueli Engineering School Undergraduate Fellowship.

June 2006-Sept 2006	University of California, Irvine Research Experience for Undergraduates Turing instability for irregular domains (awarded for Katiya Pavlova)
Jul 2004-June 2005	University of California, Irvine Research Experience for Undergraduates Nonlinear 3D modeling of tumor growth (awarded for Genevieve Brown)
Jan 2002-July 2003	University of Minnesota Research Experience for Undergraduates The development of a three dimensional adaptive tetrahedral mesh (awarded for Tony Anderson)
July 2001-June 2002	Minnesota Supercomputer Institute Research Scholarship Numerical Simulation of Microstructured Materials (awarded for Dr. Vittorio Cristini)
Jan 1998-Dec 2004	DOE Grants in the Basic Energy Sciences Division Fundamental Studies of Topological Transitions in Liquid/Liquid Flows (PI, with Professor E.K. Longmire (co-PI)).
May 2000	Plenary Invited Address 3rd SIAM Conference on Math. Methods in Materials Science
Nov 1998	Francois Frenkiel Award American Physical Society, Fluid Dynamics Division
Sept 1996-2001	NSF Group Infrastructure Grant Infrastructural Needs for Preparing Students for the Industrial and Business Workforce (co-PI, with Professors B.Cockburn (co-PI), A. Friedman (co-PI), and F. Santosa (PI))
Sept 1995-1997	Sloan Foundation Fellowship
July 1994-1996	McKnight Foundation Professorship University of Minnesota
June 1990-1993	NSF Postdoctoral Fellowship

PUBLICATIONS

1. *The Convergence of the Vortex Method for Vortex Sheets*, with R.C. Caflisch, SIAM J. Num. Anal., **26**, pp. 1060-1080, 1989.
2. *The Convergence of the Vortex Method for Vortex Sheets*, **Mathematical Aspects of Vortex Dynamics**, ed. R.C. Caflisch, SIAM, pp. 120-127, 1989.
3. *The Convergence of the Point Vortex Method for the 2-D Euler Equations*, with J. Goodman and T.Y. Hou, Comm. Pure Appl. Math, **XLIII**, pp. 415-430, 1990.
4. *The Convergence of the Point Vortex Method for the 3-D Euler Equations*, with T.Y. Hou, Comm. Pure Appl. Math, **XLIII**, pp. 965-981, 1990.
5. *Smooth Grid Methods for the Vorticity Formulation of the Euler Equations*, with M.J. Shelley, in **Vortex Dynamics and Methods**, ed. C. Anderson and C. Greengard,

- Lectures in Applied Mathematics, **28**, AMS, pp. 423-432, 1991.
6. *The Convergence of an Exact Desingularization and Local Regridding for Vortex Methods*, with T.Y. Hou and M.J. Shelley, in **Vortex Dynamics and Methods**, ed. C. Anderson and C. Greengard, Lectures in Applied Mathematics, v. 28, AMS, pp. 341-362, 1991.
 7. *The Convergence of a Point Vortex Method for Vortex Sheets*, with T.Y. Hou and R. Krasny, *SIAM J. Num. Anal.*, **28**, pp. 308-320, 1991.
 8. *On the Well-Posedness of Two Fluid Interfacial Flows with Surface Tension*, with J.T. Beale and T.Y. Hou, in **Singularities in Fluids, Plasmas and Optics**, ed. R. Caflisch and G. Papanicolaou, NATO ASI Series, Kluwer Publishers, pp. 11-38, 1992.
 9. *Asymptotic and Numerical Results for Blowing-up Solutions to Semi-Linear Heat Equations*, with J.B. Keller, in **Singularities in Fluids, Plasmas and Optics**, ed. R.C. Caflisch and G. Papanicolaou, NATO ASI Series, Kluwer Publishers, pp. 111-130, 1992.
 10. *The Convergence of an Exact Desingularization for Vortex Methods*, with T.Y. Hou and M.J. Shelley, *SIAM J. Sci. Comp.*, **14**, pp. 1-18, 1993.
 11. *High Order and Efficient Methods for the Vorticity Formulation of the Euler Equations*, with M.J. Shelley and B. Merriman, *SIAM J. Sci. Comp.*, **14**, pp. 1107-1142, 1993.
 12. *Growth Rates for the Linearized Motion of Fluid Interfaces away from Equilibrium*, with J.T. Beale and T.Y. Hou, *Comm. Pure Appl. Math.*, **XLVI**, pp. 1269-1301, 1993.
 13. *Removing the Stiffness from Interfacial Flows with Surface Tension*, with T.Y. Hou and M.J. Shelley, *J. Comp. Phys.*, **114**, No. 2, pp. 312-338, 1994.
 14. *Spatial and Temporal Stability Issues for Interfacial Flows with Surface Tension*, with J.T. Beale, T.Y. Hou and M.J. Shelley, *J. Math. and Comp. Modelling*, **20**, No. 10/11, pp. 1-27, 1994.
 15. *Numerical Calculations of Precipitate Shape Evolution in Elastic Media*, with H.-J. Jou and P. Leo, to appear in **Proceedings of an International Conference on Solid-Solid Phase Transformations**, ed. W.C. Johnson, J.M. Howe, D.E. Laughlin, W.A. Soffa, The Minerals, Metals and Materials Society, Warrendale, PA, pp. 635-640, 1994.
 16. *Convergence of Boundary Integral Methods for Water Waves*, with J.T. Beale and T.Y. Hou, *SIAM J. Num. Anal.*, **33**, 1797, 1996.
 17. *The long time motion of vortex sheets with surface tension*, with T.Y. Hou and M.S. Shelley, *Phys. Fluids*, **9**, pp. 1933-1954, 1997.
 18. *Microstructural Evolution in Inhomogeneous Elastic Media*, with H.J.-Jou and P.H. Leo, *J. Comp. Phys.*, **131**, pp. 109-148, 1997.
 19. *Stability of Boundary Integral Methods for Water Waves*, with J.T. Beale and T.Y. Hou, *AMS/IP Stud. Adv. Math*, **3** (Nonlinear Evolutionary Partial Differential Equations, Beijing 1993), pp. 107-127, 1997.
 20. *A Diffuse Interface Model for Microstructural Evolution in Elastically Stressed Solids*, with P.H. Leo and H.-J. Jou, *Acta Materialia*, **46**, pp. 2113-2130, 1998.
 21. *Quasi-incompressible Cahn-Hilliard Fluids and Topological Transitions*, with L. Truski-novsky, *Proc. Roy. Soc. London A* **454**, pp. 2617-2654, 1998.
 22. *Almost Optimal Convergence of the Point Vortex Method for Vortex Sheets using Numerical Filtering*, with R.C. Caflisch and T.Y. Hou, *Math. Comp.*, **68**, pp. 1465-1496, 1999.

23. *Topological Transitions in Liquid/Liquid Interfaces*, with J. Goodman, H. Lee, E. Longmire, M.J. Shelley and L. Truskinovsky, Chapman & Hall/CRC Res. Notes Math, **409** (Free Boundary Problems: Theory and Applications, Crete 1997), pp. 221-236, 1999.
24. *Microstructural Evolution in Orthotropic Elastic Media*, with P.H. Leo and Q. Nie, J. Comp. Phys., **157**, pp. 44-88, 2000.
25. *A Comparison of Experiments and Simulations on Pinch-Off in Round Jets*, with E.K. Longmire and D.L. Gefroh, in **Proceedings of the 1999 ASME/JSME Meeting**, San Francisco.
26. *Measurement and modeling of latent heat release during freezing in a small container*, with R. V. Devireddy, J.C. Bischof, P.H. Leo, ASME IMECE HTD-368/BED-47 (2000), 23-31.
27. *Boundary Integral Methods for Multicomponent Fluids and Multicomponent Materials*, with T.Y. Hou and M.J. Shelley, J. Comp. Phys. **169** (2001), 302-362.
28. *Focusing of an elongated hole in porous medium flow*, with S.B. Angenent, D.G. Aronson and S.I. Betelu, Physica D **151** (2001), 228-252.
29. *Modeling multiphase flows using a novel 3D adaptive remeshing algorithm*, with R. Hooper V. Cristini, S. Shakya, C. W. Macosko and J. J. Derby, In **Computational Methods in Multiphase Flow**, Eds.: C.A. Brebbia and H. Power, Series: Advances in Fluid Mechanics, Vol. 29, Wessex Institute of Technology Press, UK, 2001.
30. *On an Elastically Induced Splitting Instability*, with P.H. Leo and Q. Nie, Acta Mater. **49** (2001), 2761-2772.
31. *Modelling Pinchoff and Reconnection in a Hele-Shaw Cell Part I: The Models and their Calibration*, with H. Lee and J. Goodman, Phys. Fluids **14** (2002), 492-513.
32. *Modelling Pinchoff and Reconnection in a Hele-Shaw Cell Part II: Analysis and Simulation in the Nonlinear Regime*, with H. Lee and J. Goodman, Phys. Fluids **14** (2002), 514-545.
33. *Measurement and numerical analysis of freezing in solutions enclosed in a small container*, R. Devireddy, P. Leo and J. Bischof, Int. J. Heat Mass Transfer **45** (2002), 1915-1931.
34. *Three dimensional crystal growth. I. Linear analysis and self-similar evolution*, with V. Cristini, J. Crystal Growth, **240** (2002) 267.
35. *Nonlinear simulation of tumor growth*, with V. Cristini and Q. Nie, J. Math. Biol. **46** (2003) 191.
36. *Microstructure evolution in three-dimensional inhomogeneous elastic media*, with X. Li, Q. Nie, P.H. Leo and V. Cristini, Met. Mater. Trans. A **34A** (2003) 1421.
37. *Conservative multigrid methods for Cahn-Hilliard fluids*, with J.-S. Kim, K. Kang, J. Comp. Phys. **193** (2004) 511-543.
38. *Three dimensional crystal growth II. Nonlinear simulation and control of the Mullins-Sekerka instability*, with V. Cristini, J. Crystal Growth **266** (2004) 552.
39. *Conservative multigrid methods for ternary Cahn-Hilliard systems*, with J.-S. Kim and K. Kang, Comm. Math. Sci. **2** (2004) 53.
40. *Nonlinear theory of self-similar growth and melting*, with S. Li, P.H. Leo and V. Cristini, J. Crystal Growth **267** (2004) 703.
41. *A surfactant conserving volume-of-fluid method for interfacial flows with insoluble surfactant*, with A. James, J. Comp. Phys. **201** (2004) 685-722.

42. *Two- and three dimensional equilibrium morphology of a misfitting particle and the Gibbs-Thomson effect* , with X. Li, K. Thornton, Q. Nie and P.W Voorhees, *Acta Metall.* **52** (2004) 5829-5843.
43. *Efficient phase-field simulation of quantum dot formation in a strained heteroepitaxial film*, with S.M. Wise, J.S. Kim and W.C. Johnson, *J. Superlattices and Microstructures* **36** (2004) 293-304.
44. *Experiments and computations on drop impact at a liquid/liquid interface, with Z. Mohamed Kassim, E.K. Longmire, J.-S. Kim, X. Zheng* , Proc. 5th Int. Conf. Multiphase Flow, paper no. 122 (2004) in press.
45. *Phase-field modeling of step dynamics*, with Z. Hu, S.M. Wise, J.S. Kim and A. Voigt, *MRS Proceedings* **859E** (JJ8.6), J. Evans, C. Orme, M. Asta and Z. Zhang eds., 2004.
46. *Evolving interfaces via gradients of geometry dependent interior Poisson problems: Application to tumor growth*, with P. Macklin, *J. Comp. Phys.* **203** (2005) 191-220.
47. *Nonlinear stability analysis of self-similar crystal growth: Control of the Mullins-Sekerka Instability*, with S. Li, P.H. Leo and V. Cristini, *J. Crystal Growth* **277** (2005) 578-592.
48. *Modeling coarsening dynamics using interface tracking methods*, invited review, *Handbook of Materials Modeling*, vol 1., S. Yip ed., Kluwer Acad. Press (2005) in press.
49. *Interfaces and multicomponent fluids*, with J.-S. Kim, *Encyclopedia of Math. Phys.*, J.-P. Francoise, G. Naber and T.-S. Tsun eds., Elsevier (2005), invited review, to appear.
50. *Adaptive unstructured volume remeshing algorithms II: Application to two- and three- dimensional level-set simulations of multiphase flows*, with X. Zheng, A. Anderson and V. Cristini, *J. Comp. Phys.*, **208** (2005) 626-650.
51. *Phase field modeling and simulation of three phase flows*, with J.-S. Kim, *Int. Free Bound.* **7** (2005) 435-466.
52. *Nonlinear morphological control of growing crystals*, with S.W. Li and P.H. Leo, *Physica D* **208** (2005) 209-219.
53. *Quantum dot formation on a strain-patterned epitaxial thin film*, with S.M. Wise, J.S. Kim, K. Thornton, P.W. Voorhees and W.C. Johnson, *Appl. Phys. Lett.* **87** (2005) 133102.
54. *A level-set method for interfacial flows with surfactant*, with J.J. Xu, Z.L. Li and H.-K. Zhao, *J. Comp. Phys.* **212** (2006) 590-616.
55. *Phase reconstruction by the weighted least action principle*, with C.M. Lee J. Rubinstein and X.M. Zheng, *J. Optics A- Pure Appl. Optics* **8** (2006) 279-289.
56. *An improved geometry-aware curvature discretization for level set methods: Application to tumor growth*, with P. Macklin, *J. Comp. Phys.* **215** (2006) 392-401.
57. *Analysis of cell growth in three-dimensional scaffolds*, with J.C.Y. Dunn, W.Y. Chan, V. Cristini, J.S. Kim, S. Singh, B.M. Wu, *Tissue Eng.* **12** (2006) 705-716.
58. *Numerical evidence of nonuniqueness in the evolution of vortex sheets*, with M.C. Lopes, H.J.N. Lopes and Y. Zheng, *ESAIM-Math. Model. Numer. Anal.* **40** (2006) 225-237.
59. *An adaptive coupled level-set/volume of fluid interface tracking method for unstructured triangular grids*, with X. Yang, A. James, X. Zheng and V. Cristini, *J. Comp. Phys.* **217** (2006) 364-394.
60. *Non-monotone temperature boundary conditions in dendritic growth*, with M.E. Glicksman and S. Li, *Proc. Modelling of Casting, Welding and Adv. Solid Processes XI*, ed. C.A. Gandin, M. Bellet, (2006) 512-528.

61. *A deterministic mechanism for dendritic solidification kinetics*, with M.E. Glicksman and S. Li, JOM **59** (2007) 27-34.
62. *Nonlinear three-dimensional simulation of solid tumor growth*, with X. Li, V. Cristini and Q. Nie, Discrete Contin. Dyn. System B **7** (2007) 581-604.
63. *Nonlinear simulation of the effect of the microenvironment on tumor growth*, with P. Macklin, J. Theor. Biol. **245** (2007) 677-704.
64. *A rescaling scheme with application to the long time simulation of viscous fingering in a Hele-Shaw cell*, with S. Li and P.H. Leo, J. Comp. Phys. **225** (2007) 554-567.
65. *Surface phase separation and flow in a simple model of multicomponent drops and vesicles*, with J.-J. Xu and A. Voigt, Fluid Dyn. Mater. Proc., **3** (2007) 1-19.
66. *Computer simulation of glioma growth and morphology*, with H.B. Frieboes, S. Wise, X. Zheng, P. Macklin, E. Bearer, V. Cristini, NeuroImage **37** (2007) S59-S70.
67. *Morphological stability analysis of the epitaxial growth of a circular island: Application to nanoscale shape control*, with Z. Hu and S. Li, Physica D **233** (2007) 151-166.
68. *Solving the regularized, strongly anisotropic Cahn-Hilliard equation by an adaptive nonlinear multigrid method*, with S.M. Wise and J.-S. Kim, J. Comp. Phys. **226** (2007) 414-446.
69. *A linear stability analysis for step meandering instabilities including the effects of elastic interactions and ES Barriers*, with D.-H. Yeon, P.-R. Cha, A. Voigt and K. Thornton, Phys. Rev. E **76** (2007) 011601.
70. *A deterministic mechanism for side-branching in dendritic growth*, with S. Li, X. Li and M. Glicksman, Fluid Dyn. Mater. Proc. **2** (2007) 1-8.
71. *Nonlinear modeling and simulation of tumor growth*, with V. Cristini, H.B. Frieboes, X. Li, P. Macklin, S. Sanga, S.M. Wise and X. Zheng, in Modeling and Simulation in Science, Engineering and Technology, ed. N. Bellomo, M. Chaplain and E. DeAngelis, Birkhauser, Boston, in press.
72. *A ghost-cell/level-set method for nonlinear moving boundary problems*, with P. Macklin, J. Sci. Comput., in press.
73. *A new method for simulating strongly anisotropic Cahn-Hilliard equations*, with S. Torabi, S. Wise, A. Ratz and A. Voigt, Proc. Mater. Sci. Tech. 2007, in press.
74. *Three-dimensional multispecies nonlinear tumor growth- I. Model and numerical method*, with S.M. Wise, H.B. Frieboes and V. Cristini, J. Theor. Biol., in press.
75. *Nonlinear simulations of solid tumor growth using a mixture model: Invasion and branching*, with V. Cristini, X. Li and S.M. Wise, J. Math. Biol., in press.
76. *Multiscale modeling and nonlinear simulation of vascular tumour growth*, with P. Macklin, S. McDougall, A.R.A. Anderson, M.A.J. Chaplain and V. Cristini, J. Math. Biol., in press.

STUDENTS

1. **H.-J. Jou** (Aerospace and Mechanics, UMN, Aero. Advisor: P.H. Leo, PhD 1995) Thesis topic: *Microstructure evolution in inhomogeneous elastic media*. Current position: Senior materials design engineer, QuesTek Innovations LLC.
2. **Doug Clancey** (Mathematics, UMN, M.S. 1996)
3. **Yilen Qiu** (Mathematics, UMN, M.S. 1996)

4. **Matthew Gast** (Aerospace and Mechanics, UMN, B.S. 1999, joint with Aero. Advisor: E.K. Longmire, sponsored URI research project in 1999) Honors thesis: *A Research Study of Pinch-off and Reconnection in Liquid/Liquid Hele-Shaw Flows*.
5. **Jacob Hageman** (Aerospace and Mechanics, UMN, joint with Aero. Advisor: E.K. Longmire, M.S. 1999) Thesis: *Pinch-Off and Reconnection of an Unstably Stratified Fluid Layer*.
6. **Nicolas Vera** (Mathematics, UMN, M.S. 1999) Thesis: *A diffuse interface model for microstructure evolution in anisotropic homogeneous media*.
7. **Russell Hooper** (Chemical Engineering and Materials Science, UMN (Chem. Eng. Advisors: C. Macosko and J. Derby) Ph.D. 2001) Thesis topic: *Drop dynamics in polymer processing flows*. Current position: Sandia National Laboratory, N.M.
8. **Trygve Kristiansen** (Norges Teknisk-Naturvitenskapelige Universitet (NTNU, Norwegian University of Science and Technology), Norway; M.A. 2002). Thesis topic: *Theory and simulation of a shape-preserving drop/crystal motion*. Current position: Marintek (Norway).
9. **Jun-Seok Kim** (Mathematics, UMN, Ph.D. 2002) Thesis topic: *Theory and simulation of multi-component fluid flows*. Current position: Dept. Math., University of Dongguk, Korea.
10. **Grady Cantrell** (Burnsville High School class of 2003, Burnsville, Minn.) Research experience for high school students, sponsored by the Minnesota Academy of Sciences (summer 2001). Topic: *Analysis of a mathematical model for tumor growth*.
11. **Tony Anderson** (Dept. Chem. Eng. Mat. Sci, UMN, B.S. 2004). Honors thesis advisor (joint with V. Cristini). Topic: *The development of an adaptive, unstructured 3-d tetrahedral mesh*. Current: Ph.D. student in Appl. Math., Northwestern University.
12. **Frank Gonzalez** (Mathematics, UCI, M.S. 2005). Research topic: Models of angiogenesis in tissue scaffolds.
13. **Xiaoming Zheng** (Mathematics, UCI, Ph.D., June 2005), (joint with V. Cristini), Thesis topic: *Adaptive 2D and 3D simulations of interfacial flows*. Current: Dept. Math., U. Michigan.
14. **Shuwang Li** (Aerospace and Mechanics, UMN, joint with Aero. Advisor: P.H. Leo, Ph.D. 2005), Thesis topic: *Morphological control of crystal growth*. Current: Visiting Asst. Prof., Dept. Math, UCI.
15. **Genevieve Brown** (Mathematics, UCI, B.S. 2006). Undergraduate researcher. Topic: Modeling 3D tumor growth. Current: Ph.D. student in appl. math., Northwestern University.
16. **Anders Lagoni** (Mathematics, Visiting Student 2005-06. Undergraduate researcher. Topic: Multigrid methods and applications to diffusion equations. Current: M.S. student in Mathematics in Denmark.
17. **Katiya Pavlova** (Mathematics, UCI, B.S. 2006. Joint with E. Titi). Undergraduate researcher. Topic: Leray- α regularization for discontinuous solutions of the inviscid Burger's equation. Current: Ph.D. student in Applied Math, Caltech.
18. **Paul Macklin** (Mathematics, UCI, Ph.D. 2007), Thesis topic: *Modeling and simulation of solid tumor growth*. Current position: University of Texas Health Science Center (Houston).
19. **Xiangrong Li** (Mathematics, UCI, Ph.D. 2007), Thesis topic: *Analysis and simulation of solid tumor growth*. Current position: Postdoctoral researcher UC Irvine (starting Jan 2008).
20. **Aaron Abajian** (Mathematics and Computer Sci. Eng., UCI, B.S. expected 2008), Research topic: *Agent-based tumor modelling and simulation*.

21. **Sam Lee** (Biomedical Engineering, UCI, B.S. expected 2008), Research topic: *Three-dimensional modeling of solid tumor growth*
22. **Zhengzheng Hu** (Mathematics, UCI, Ph.D. expected 2008). Thesis topic: Adaptive phase-field modeling of epitaxial growth: Quantum dot formation and stability of step motion.
23. **Jinsun Kim** (Mathematics, UCI, Ph.D. expected 2009). Thesis topic: Modeling and simulation of biomembranes.
24. **Chris Ograin** (Mathematics, UCI, Ph.D. expected 2009). Thesis topic: Modeling, analysis and simulation of strongly anisotropic thin films.
25. **Geoff Cox** (Mathematics, UCI, Ph.D. expected 2009). Thesis topic: Modeling, analysis and simulation of interactions among pattern formation and domain growth.
26. **Solmaz Torabi** (Mater. Sci. Eng., UCI, Ph.D. expected 2009). Thesis topic: Strongly anisotropic Cahn-Hilliard type equations.
27. **Nzola De Magalhaes** (Biomed. Eng., UCI, Ph.D. expected 2009. joint with V. Cristini). Thesis topic: Theoretical and experimental models of angiogenesis.
28. **Shabnam Moobed** (Mathematics, UCI, Ph.D. expected 2009. Thesis topic: Multiscale models of solid tumor growth: From the cell-level to the continuum.
29. **Kara Pham** (Mathematics, UCI, Ph.D. expected 2010). Agent-based modeling of solid tumor growth.
30. **Laura Ciardiello** (Mathematics, U. Torino, M.S. expected 2008) Multiscale modeling of chemotaxis: From the cell-level to the continuum.
31. **Min Wu** (Mathematics, UCI, Ph.D. expected 2011). Modeling of vascular tumor growth.

POSTDOCTORAL STUDENTS AND MENTORING

1. **Thomas Little** (Mathematics, UMN, 1996; P. Leo joint advisor). Topic: *Theory and simulation of the ledge mechanism in metallic alloys*.
2. **Hyeonggi Lee** (Mathematics, UMN, 1996-2000). Topic: *Diffuse interface models for multiple component fluid flows*.
3. **Qing Nie** (Institute for Math and its Applications, UMN, 1996-1997; served as faculty mentor). Topic: *Simulations of diffusional phase transformations in anisotropic, inhomogeneous elastic media*. Current position: Professor of Mathematics, U.C. Irvine.
4. **Matthew Killough** (School of Math, UMN, 1998-2000; served as faculty mentor). Topic: *Phase transitions in elastically stressed media* Current position: Assistant Professor of Mathematics, Bowdoin College.
5. **Vittorio Cristini** (Mathematics and Chemical Engineering, UMN, (C. Macosko joint advisor), 2000-2002); Topic: *Computational science of microstructure: fluids, materials, biology*. Current: Assoc. Prof., School of Health Information Sciences, U. Texas.
6. **Hua Zhou** (Chemical Engineering, UMN, (C. Macosko joint advisor), 2001-2003), Topic: *Theory and simulations of interfacial fluid flows with surfactants in 3-D*.
7. **Galyna Vasko** (Dept. Oral Sciences-Biomaterials, UMN, (A. Versluis, W. Douglas and V. Cristini joint advisors), Oct 2001-2002); Topic: *Experiments and adaptive simulations of crack propagation in teeth and arteries*.
7. **Lan Pham** (Depts. of Mathematics and Bioengineering, UCI (V. Cristini joint advisor), Oct 2002-2003); Topic: *3D growth of solid tumors and crystals*.

8. **Jun-Seok Kim** (Dept. of Mathematics, UCI and UMN, Oct 2002-2006); Topic: *Numerical simulation of microstructured materials* . Current: Asst. Prof., Dept. Math, University of Dongguk.
9. **Steve Wise** (Depts. of Mathematics and Bioengineering, UCI, (V. Cristini joint advisor), March 2003-Present); Topic: *Analysis and numerical simulation of tumor growth and microstructured materials* . Current: Asst. Prof., Dept. Math., University of Tennessee.
10. **Jianjun Xu** (Dept. Math., UCI), 2005-2007. Topic: *Interfacial flows with surfactants*. Current: Math. Finance Program, USC.
11. **Shuwang Li** (Visiting Asst. Prof., Dept. Math., UCI), 2005-present. Topic: *Prediction and control of micro- and nano- scale materials*.
12. **Yao-Li Chuang** (Dept. Math., UCI), 2007-2008. Topic: *Upscaling of discrete, agent-based tumor models*. Current: Postdoctoral researcher, U. Texas Health Science Center, Houston.
13. **Fang Jin** (Dept. Math., UCI), 2007-present. Topic: *Three-dimensional tumor modeling and modeling of multicomponent, elastic membranes*.
14. **Peng Zhou** (Dept. Math., UCI), 2007-present. Topic: *Modeling and simulation of microstructures in materials science and biology* .
15. **Alex Sadovsky** (Dept. Math., UCI), 2008-present. Topic: *Modeling and simulation of soft tissue mechanics* .

RESEARCH INTERESTS

Applied analysis and numerical analysis of free boundary problems: Multicomponent fluid flows; fluid flows with deformable elastic boundaries; phase transformations in liquids, solids and biological tissues; tumor modeling; tissue engineering.

REFERENCES

R.C. Caflisch (UCLA); Mark Chaplain (U. Dundee, Scotland); T.Y. Hou (Caltech); J. Keller (Stanford); G.B. McFadden (NIST); M.J. Shelley (Courant). Others available upon request.

SERVICE

1. Developed graduate and undergraduate curricula in numerical analysis. Directed numerous seminar series. Served on examination committees in the Depts of Aerospace Engineering & Mechanics, Chemical Engineering & Materials Science, Geology, Mathematics and Mechanical Engineering.
2. Associate Editor for the journal Communications in the Mathematical Sciences (2000-2003).
3. Referee for J. Comp. Phys., J. Fluid Mech., Phys. Fluids, SIAM J. Num. Anal. and SIAM J. Appl. Math. Panelist reviewer for NSF and NASA.
4. Organized a mini-symposium (4 sessions) on computational methods in materials science for the 3rd SIAM conference on math. methods in materials science (May 2000, with Bo Li).
5. Organizing committee member for the biennial Snowbird Dynamical Systems meeting (2002).

6. Taught summer course for COSMOS (California State Summer School for Mathematics and Science) on Mathematical and Computer Modeling for Biology (for high school students). July-August 2004; July-August 2005.
7. Organized a focus session on fluid interfaces at the Int. Conference on Free Boundary Problems, Coimbra Portugal, 2005.
8. Organizing committee member (with F. Wan, Q. Nie and V. Cristini) for a minisymposium on the Biomechanics of Tissues at the 15th US National Congress of Theoretical and Applied Mechanics, Boulder 2006.
9. Organizing committee member for a 3-month long workshop at IPAM. Cells and materials: At the interface between mathematics, biology and engineering. Mar 13-June 16, 2006.
10. U.C. Santa Barbara IGERT Advisory board member (2006).
11. Reviewer for Auburn University Mathematics Department (2007).
12. Guest editor, Fluid Dynamics and Materials Processing, v3 no. 1 (2007).
13. Co-organizer (with Q. Nie) of the 1st UCI Symposium on Mathematical Systems Biology. :Spatial Dynamics of Growth and Signaling (Feb 28/29 2008).
14. Taught summer course for COSMOS (California State Summer School for Mathematics and Science) on Mathematical Materials Science and Engineering (for high school students). July-August 2007.
15. Faculty advisor for Aaron Abajian for UCI UTeach program. This program is designed to offer undergraduate students, (junior/senior) with the guidance of a faculty advisor, the opportunity to design, develop and facilitate a lower division seminar (Mathematical Biology in our case).

INVITED LECTURES

- 1988 Workshop on Singularities in Nonlinear Partial Differential Equations at the University of Arizona; S.I.A.M. Workshop on Mathematical Vortex Dynamics at Leesburg, VA.
- 1989 Stanford University; University of California at Berkeley; University of California at Los Angeles; University of Rome I (La Sapienza).
- 1990 California Institute of Technology (Applied Mathematics Dept.); S.I.A.M. Workshop on Vortex Dynamics and Methods at Seattle, WA; S.I.A.M. National Meeting at Chicago, IL; University of Rome I.
- 1991 Institute for Advanced Study; Princeton University; Rutgers University; State University of New York at Buffalo.
- 1992 Brown University (Applied Mathematics Dept.); Georgia Institute of Technology; New Jersey Institute of Technology; Northwestern University; NATO Meeting on Singularities in Fluids, Plasmas and Optics at Heraklion, Crete (Greece); University of California at Irvine; University of Chicago; University of Minnesota (School of Mathematics); University of Utah.
- 1993 California Institute of Technology (Applied Mathematics Dept.); New York University (Courant Institute); University of California at Los Angeles; University of Minnesota (Army High Performance Computing Research Center); University of Rome II (Tor Vergata).

- 1994 American Mathematical Society Conference at Stillwater, OK; University of Chicago; University of Minnesota (Dept. of Aerospace and Mechanics colloquium, Dept. of Chemical Engineering).
- 1995 University of Chicago; University of Minnesota (School of Math colloquium); Institute for Pure and Applied Math (IMPA), Rio de Janeiro, Brasil; University of Campinas, Campinas, Brasil (series of lectures on interfaces in fluids and materials at Summer Program in Partial Differential Equations); Sixth International Symposium on Computational Fluid Dynamics at Lake Tahoe, Nevada.
- 1996 Institute for Mathematics and its Applications (plenary lecture in workshop on “Interfaces and Thin Films”); University of Chicago; U. Minnesota (Numerical Analysis Seminar).
- 1997 U. Minnesota (Dept. Aero. and Mech. colloquium); U. Maryland (Dept. Math colloquium), Brigham Young University (PDE seminar); U. Utah (applied math seminar); U.C. Irvine (Applied Math Seminar); International Congress on Free Boundary Problems (Crete); SIAM national meeting (Palo Alto).
- 1998 Computational Science Initiative Panel on Nonlinear Complex Phenomena (organized by DOE); U. Minnesota (Dept. Chemical Engineering); U. Chicago (Applied Math Colloquium); 13th US National Congress of Applied Mechanics; Georgia Tech (Applied Math Seminar).
- 1999 University of North Carolina (Applied Math Seminar and Colloquium); Johns Hopkins University (Mechanical Engineering Seminar, February); Caltech (Applied Math Seminar, April); Midwest PDE Seminar (I.M.A., U. Minnesota); Seventeenth Symposium on Energy Engineering Sciences (Argon National Lab, May); Eindhoven University of Technology in the Netherlands (Chemical Engineering Seminar).
- 2000 North Carolina State University (Applied Math Seminar); 3rd SIAM meeting on Mathematical Aspects of Materials Science (Plenary speaker).
- 2001 University of Minnesota (Institute for Math and its Applications); Illinois Institute of Technology (Math Colloquium); University of California Irvine (Math Colloquium); Medtronic Corporation; Ford Motor Company; University of Minnesota (Dept. Pharmacology); American Physical Society Division of fluid dynamics annual meeting (San Diego).
- 2002 AMS Meeting (San Diego); U.C. Irvine (Math colloquium); U.C. Davis (Math Colloquium), University of Minnesota (Math); University of Minnesota (Chem. Eng. Mat. Sci.).
- 2003 TMS Meeting (San Diego); CIMMS workshop on multiscale techniques for dynamic interfaces (Caltech); I.P.A.M. workshop on tissue engineering (U.C.L.A.); U.C. Santa Barbara (Dept. Chem. Eng. colloquium); CSCAMM workshop on nonequilibrium interface dynamics (U. Maryland); 15th Amer. Conf. on Crystal Growth and Epitaxy (Keystone, CO); U.C. Irvine (Math); U.C.L.A. (Craniofacial research center colloquium; Dental school); American Physical Society Division of fluid dynamics annual meeting (East Rutherford).
- 2004 U.C.I. (Math); USC (Math colloquium, March); International Conference on Theoretical and Applied Mechanics (ICTAM 21, August, Warsaw– given by M. Glicksman); UCLA (Level-set seminar series); 4th SIAM Conference on Mater. Sci. (Los Angeles); Third Ann. Workshop on the Evolution and Self-Assembly of Quantum Dots (Northwestern U.); AIMS 5th Int. Conf. on Dynamical Systems and Differential Equations (Pomona); New York University (Math); New Jersey Institute of Technology (Math); Mater. Res. Soc. Ann. Meeting (Boston).
- 2005 Kent State University (Liquid Crystal Institute); San Diego State (Math); Workshop on Cancer Modeling (U. Michigan); University of Minnesota (Math Biology); Third MIT

- Conference on Computational Fluid and Solid Mechanics (Boston, declined); 16th Am. Conf. on Crystal Growth and Epitaxy (Montana); Eur. Conf. on Mathematical and Theoretical biology (Dresden, declined); AIMS Conf. on Modeling Cancer Progression and Immunotherapy (Palo Alto, declined).
- 2006 Workshop on mathematical models and problems in tumor growth and angiogenesis (principal speaker (3 lectures), NCTS, Taiwan); University of Bonn (Math); IPAM Workshop on Cells and Materials (3 introductory talks, 1 specialized talk); 15th US National Congress of Theoretical and Applied Mechanics (Colorado, 2 talks); Society of Math. Biology Annual Meeting (Raleigh); Cancer modeling workshop (Dundee, Scotland); Miniworkshop on anisotropic motion laws (Oberwolfach, Germany); Purdue U. (Thematic Seminar Series, Center Comp. App. Math., October); U.C. Berkeley (Math, November); Stanford U. (Math, November);
- 2007 Multiphase Flows and multi-material interface problems (Inst. Math. Sci., U. Singapore, Jan 2007, keynote speaker); SIAM Conf. Comp. Sci. Eng. (Los Angeles, February); Thematic Seminar Series Disting. Speaker Series in Appl. Comp. Math. (Simon Fraser U./Centre for Sci. Comp., PIMS, March); Colloquium (University of Maryland); Colloquium (UCLA); Math. Modeling and analysis of cancer invasion of tissue (Dundee, March, plenary talk); U.S. National Congress on Computational Mechanics (USNCCM IX, Berkeley) declined; 6th Int. Cong. on Industrial and Applied Math (talks in 3 different minisymposia); 3rd Int. Conf. on Theoretical and Numerical Fluid Mechanics (Vancouver, plenary talk); Society of Mathematical Biology Annual Meeting (San Jose); Random Media Opening Workshop (SAMSI); Workshop on Ion Channels and Membranes (Radon Institute for Comp. Appl. Math (RICAM) Linz, Austria, Oct 2007); Applied mathematics seminar (Caltech, Oct 2007);
- 2008 Workshop on epitaxial growth and thin films (Banff research station, Feb. 2008, declined); Singularities in Mechanics (month-long invitation to Inst. Henri Poincare, Paris. Winter/Spring 2008, declined); Colloquium (Tulane, April 2008); SAMSI Random Media Closing Workshop (May 2008); Month-long invited visitor to Paris, France for School on Singularity problems (Winter 2008, declined); SIAM Conference on Mathematical Aspects of Materials Science (Philadelphia, May 2008); Frontiers in Applied and Computational Mathematics (NJIT, May 2008); AIMS Int. Conf. Dyn. Systems, Diff. Equations and Applications (Texas, May 2008); Workshop on Ferroelectric Phenomena in Soft Matter Systems (Am. Inst. Math., May 2008); Workshop on multiscale modeling of soft matter/complex fluid (Beijing, May 2008, declined); European Conf. on Math. and Theor. Biology (Edinburgh, June 2008); Society for Math. Biology Annual Meeting (July 2008); Workshop on Geometric Singularities and Singular Geometries (IMA, July 2008).
- 2009 Workshop on new directions in computational partial differential equations (Warwick, Jan 2009); Algoritmy 2009: Conference on Scientific Computing (Slovakia, March 2009)