

ROBERT V. KOHN

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Education

Harvard University, Mathematics, A.B. 1974
University of Warwick, Mathematics, M.Sc. 1975
Princeton University, Mathematics, Ph.D. 1979
New York University, Courant Institute, NSF Postdoc 1979-1981

Employment

Operations Analyst, Daniel H. Wagner Associates, Summer 1976
Research Staff, Exxon Research & Engineering, Summer 1979
Courant Institute faculty, 1981–present; Professor of Mathematics since 1988

Honors

SIAM Fellow, 2009; Plenary lecturer at SIAM APDE meeting (Boston, 2006), ICM (Madrid, 2006), ICIAM (Zurich, 2007), SIAM Materials Science meeting (Philadelphia, May 2008); Keith Medal (Royal Society of Edinburgh, 2007, shared with A. DeSimone, S. Müller, and F. Otto); Ralph E. Kleinman Prize (SIAM, 1999); Midwest Mechanics Lecturer (1993–4); Sloan Research Fellowship (1984–6); NSF Postdoctoral Fellowship (1979–81); NSF Graduate Fellowship (1976–78).

Research Interests

Mathematical aspects of materials science, including: cloaking, coarsening due to energy-driven motion, composite materials, effective moduli, epitaxial growth, interface motion laws, martensitic transformation, micromagnetics, photonics, pattern formation due to energy minimization, polycrystal plasticity, shape-memory materials, structural optimization, surface energy as a selection mechanism, thermally-activated switching.

Nonlinear partial differential equations and nonconvex variational problems, including: bounds and extremal microstructures for composites, electric current tomography, homogenization and Γ -convergence, image segmentation, motion by curvature, relaxation of nonconvex variational problems, self-similarity in solutions of nonlinear evolution equations, singularly perturbed variational problems.

Mathematical aspects of finance, including: hedging and pricing of derivatives, heterogeneity and its consequences for equilibrium and speculation, portfolio optimization.

Recent Services

CIMS ADMINISTRATION: Deputy Director, Courant Institute (1997–2000); Chair, Mathematics Department (1991–92).

FINANCIAL MATHEMATICS MASTERS PROGRAM: Faculty Committee most years since 1998 (Chair, 2003–2006 and Spring 2010); created or redesigned MS-level courses *Derivative Securities*, *Continuous Time Finance*, and *Partial Differential Equations for Finance*.

NSF: Member, Mathematical and Physical Sciences Advisory Committee (2004–2006), Astronomy Committee of Visitors (2005), Mathematics Committee of Visitors (2004); coauthor of NSF report *Intellectual Opportunities in the Mathematical Sciences* (2000); many proposal review panels.

IMA: Member, Board of Governors, 2004–2008 (Chair in 2006); Member, External Relations Committee (since 2009).

SIAM: Chair, SIAG on Mathematical Aspects of Materials Science (2008–10); Co-Chair, Organizing Committee for 6th SIAM Meeting on Mathematical Aspects of Materials Science (May 2010); Member, SIAM Council (1997–2002); Mathematics in Industry Project: Co-chair, Phase II (1997–1999) and Steering Committee member, Phase I (1995–1997); Chair, 1st Ad-Hoc Committee on Membership (1995–1996).

REVIEW PANELS: Member, Mathematics Department Review panels at Rutgers University (2004), University of Maryland (2002), and Indiana University (2000); Chair, ARO Mathematics Program Review Panel (2000).

PRIZE AND SPEAKER SELECTION COMMITTEES: Chair, ICIAM 2011 Materials Science Panel and ICM 2002 Applied Mathematics Panel; Member, selection committees for the 2009 John von Neumann Lecturer, the 2003 and 2001 Ralph E. Kleinman Prizes, and the 2003 Pioneer Prize.

EDITORIAL BOARDS: Communications on Pure and Applied Mathematics (since 2002); Interfaces and Free Boundaries (since 2002); Journal of Nonlinear Science (since 1991); Mathematical Modeling and Numerical Analysis (since 2005); Royal Society of Edinburgh, Proceedings A (since 1985); Structural and Multidisciplinary Optimization (since 1994).

Thesis Students

Bruce D. Lowe, *A Variational Method for Parameter Identification*, 1986.

Peter Sternberg, *The Effect of a Singular Perturbation on Nonconvex Variational Problems*, 1986.

Robert Lipton, *An Optimal Lower Bound on the Energy Dissipation Rate for Homogenized Stokes Flow*, 1986.

Gaetano Tepedino, *Bounds on the Effective Energy Density of Two Nonlinear Composites*, 1988.

Lia Bronsard, *Reaction Diffusion Equations & Motion by Mean Curvature*, 1988.

Vincenzo Nesi, *Extremal Microgeometries for Polycrystalline Composites*, 1989.

Oscar Bruno, *The Effective Conductivity of an Infinitely Interchangeable Mixture*, 1989.

Nick Firoozye, *Optimal Translations and Relaxations of Some Multiwell Energies*, 1990.

Piotr Rybka, *Dynamical Modelling of Phase Transitions in Solids by Means of Viscoelasticity in Many Dimensions*, 1990.

Stathis Filippas, *Center Manifold Analysis for a Semilinear Parabolic Equation Arising in the Study of the Blowup of $u_t - \Delta u = u^p$* , 1990.

Pedro Girao, *Convergence of a Crystalline Algorithm for Motion by Mean Curvature*, 1993.

Jiangbo Lu, *Extremal Microstructures for Two Isotropic Phases with Distinct Stress-free Strains in Two Space Dimensions*, 1993.

Yury Grabovsky, *Bounds and Extremal Microstructures for Two-Component Composites: A Unified Treatment Based on the Translation Method*, 1994.

Weimin Jin, *Singular Perturbation and the Energy of Folds*, 1997.

Matthew Killough, *A Diffuse Interface Approach to the Development of Microstructure in Martensite*, 1998.

Cameron Connell, *Coarsening of step bunches in step flow growth: a reaction-diffusion model and its sharp interface limit*, 2000.

Antti Pihlaja, *Modeling Grain Boundary Structures Using Energy Minimization*, 2000.

Selim Esedoglu, *Analysis of the Perona-Malik Method for Image Segmentation*, 2000.

Pedro Judice, *Dynamic Asset Pricing via Conic Duality*, 2003.

Valeriy Slastikov, *Topics in Micromagnetics*, 2003.

Oana Papazoglu-Statescu, *Maximizing the Utility of Final-Time Wealth with Little Trading*, 2004.

Maria Reznikoff, *Rare Events in Finite and Infinite Dimensions*, 2004

Irakli Odisharia, *Simulation and Analysis of the Relaxation of a Crystalline Surface*, 2006

Haiping Shen, *Two PDE Problems from Electromagnetics*, 2007

Xi Chen, *Two Problems from Mathematical Finance*, 2009

Current: Hala Al Hajj Shehadeh, Peter Bella, Jens Jorgensen

Articles in Refereed Journals

1. *An example concerning approximate differentiation*, Indiana Univ. Math. J. 26, pp. 393–397, 1977.
2. *New integral estimates for deformations in terms of their nonlinear strains*, Arch. Rat. Mech. Anal. 78, pp. 131–172, 1982.
3. *Partial regularity of suitable weak solutions of the Navier–Stokes equations*, (with L. Caffarelli and L. Nirenberg), Comm. Pure Appl. Math. 35, pp. 771–831, 1982.
4. *Geometric effects in continuous media percolation*, (with P. Sheng), Phys. Rev. B, Vol. 26, pp. 1331–1335, 1982.

5. *Principes variationnels duaux et théorème de l'énergie dans le modèle de plasticité de Hencky*, (with R. Temam), C.R. Acad. Sci. Paris 294, Ser. I, pp. 205–208, 1982.
6. *Hencky–Prandtl nets and constrained Michell trusses*, (with G. Strang), Comp. Meth. in Appl. Mech. & Eng. 36, pp 207–222, 1983.
7. *Explicit relaxation of a variational problem in optimal design*, (with G. Strang), Bull. Amer. Math. Soc. 9, pp. 211–214, 1983.
8. *Dual spaces of stresses and strains, with applications to Hencky plasticity*, (with R. Temam), Appl. Math. Opt. 10, pp. 1–36, 1983.
9. *Determining conductivity by boundary measurements*, (with M. Vogelius), Comm. Pure Appl. Math. 37, pp. 289–298, 1984.
10. *First order interpolation inequalities with weights*, (with L. Caffarelli and L. Nirenberg), Compositio Math. 53, pp. 259–275, 1984.
11. *A new model for thin plates with rapidly varying thickness*, (with M. Vogelius), Intl. J. Solids and Structures 20, pp. 333–350, 1984.
12. *A new model for thin plates with rapidly varying thickness II: A convergence proof*, (with M. Vogelius), Q. Appl. Math. 43, pp. 1–22, 1985.
13. *Asymptotically Self-Similar Blow-Up of Semilinear Heat Equations*, (with Y. Giga), Comm. Pure Appl. Math. 38, pp. 297–319, 1985.
14. *Optimal design and relaxation of variational problems*, (with G. Strang), Comm. Pure Appl. Math. 39, pp. 113–137, 139–182, and 353–377, 1986.
15. *A new model for thin plates with rapidly varying thickness III: Comparison of different scalings*, (with M. Vogelius), Q. Appl. Math. 44, pp. 35–48, 1986.
16. *Determining conductivity by boundary measurements II: Interior results*, (with M. Vogelius), Comm. Pure Appl. Math. 38, pp. 643–667, 1986.
17. *Optimal design in elasticity and plasticity*, (with G. Strang), Intl. J. Num. Meth. Eng. 22, pp. 183–188, 1986.
18. *Numerical study of a relaxed variational problem from optimal design*, (with J. Goodman and L. Reyna), Comp. Meth. Appl. Mech. Eng. 57, pp. 107–127, 1986.
19. *Characterizing blowup using similarity variables*, (with Y. Giga), Indiana Univ. Math. J. 36, pp. 1–40, 1987.
20. *Reinforcement by a thin layer with oscillating thickness*, (with G. Buttazzo), Appl. Math. Optim. 16, pp. 247–261, 1987.
21. *Relaxation of a variational method for impedance computed tomography*, (with M. Vogelius), Comm. Pure Appl. Math. 40, pp. 745–777, 1987.

22. *A variational method for parameter identification*, (with B.D. Lowe), RAIRO–MMAN 22, pp. 119–158, 1988.
23. *Optimal bounds for the effective energy of a mixture of two isotropic, incompressible, elastic materials*, (with R. Lipton), Arch. Rational. Mech. Anal. 102, pp. 331–350, 1988.
24. *A rescaling algorithm for the numerical calculation of blowing-up solutions*, (with M. Berger), Comm. Pure Appl. Math. 41, pp. 841–863, 1988.
25. *Variational bounds on the effective moduli of anisotropic composites*, (with G. Milton), J. Mech. Phys. Solids 36, pp. 597–629, 1988.
26. *Local minimizers and singular perturbations*, (with P. Sternberg), Proc. Roy. Soc. Edinburgh 111 A, pp. 69–84, 1989.
27. *Nondegeneracy of blowup for semilinear heat equations*, (with Y. Giga), Comm. Pure Appl. Math., 42, pp. 845–884, 1989.
28. *Numerical implementation of a variational method for electrical impedance tomography*, (with A. McKenney), Inverse Problems, 6, pp. 389–414, 1990.
29. *On the slowness of phase boundary motion in one space dimension*, (with L. Bronsard), Comm. Pure Appl. Math., 43, pp. 983–997, 1990.
30. *Variational constraints for electrical impedance tomography*, (with J. Berryman), Phys. Rev. Lett. 65, pp. 325–328, 1990.
31. *Motion by mean curvature as the singular limit of Ginsburg–Landau dynamics*, (with L. Bronsard), J. Diff. Eqns. 90, pp. 211–237, 1991.
32. *The initial-value problem for measure-valued solutions of a canonical 2×2 system with linearly degenerate fields*, (with Weinan E), Comm. Pure Appl. Math. 44, pp. 981–1000, 1991.
33. *The relaxation of a double-well energy*, Continuum Mechanics and Thermodynamics 3, pp. 193–236, 1991.
34. *Refined asymptotics for the blowup of $u_t - \Delta u = u^p$* , (with S. Filippas), Comm. Pure Appl. Math. 45, pp. 821–869, 1992.
35. *Branching of twins near an sustenite-twinned-martensite interface*, (with S. Muller), Phil. Mag. 66A, pp. 697–715, 1992.
36. *Relaxation and regularization of nonconvex variational problems*, (with S. Muller), Rend. Sem. Mat. Fis. Univ. Milano 62, pp. 89–113, 1992.
37. *Optimal bounds on the effective behavior of a mixture of two well-ordered elastic materials*, (with G. Allaire), Quart. Appl. Math. 51, pp. 643–674, 1993.

38. *Explicit optimal bounds on the elastic energy of a two-phase composite in two space dimensions*, (with G. Allaire), Quart. Appl. Math. 51, pp. 675–699, 1993.
39. *Optimal design for minimum weight and compliance in plane stress*, (with G. Allaire), European J. Mech. A/Solids 12, pp. 839–878, 1993.
40. *Surface energy and microstructure in coherent phase transitions*, (with S. Muller), Comm. Pure Appl. Math. 47, pp. 405–435, 1994.
41. *Optimal lower bounds on the elastic energy of a composite made from two non-well-ordered isotropic materials*, (with G. Allaire), Quart. Appl. Math. 52, pp. 311–333, 1994.
42. *Restrictions on microstructure*, (with K. Bhattacharya, N. Firoozye, and R.D. James), Proc. Roy. Soc. Edinburgh 124A, pp. 843–878, 1994.
43. *Convergence of a crystalline algorithm for the heat equation in one dimension and for the motion of a graph by weighted curvature*, (with P. Girao), Numer. Math. 67, pp. 41–70, 1994.
44. *Microstructures minimizing the energy of a two phase elastic composite in two space dimensions. I: the confocal ellipse construction*, (with Y. Grabovsky), J. Mech. Phys. Solids 43, pp. 933–947, 1995.
45. *Microstructures minimizing the energy of a two phase elastic composite in two space dimensions. II: the Vigdergauz microstructure*, (with Y. Grabovsky), J. Mech. Phys. Solids 43, pp. 949–972, 1995.
46. *Anisotropy of the Vigdergauz microstructure*, (with Y. Grabovsky), ASME J. Appl. Mechanics 62, pp. 1063–1065, 1995.
47. *Symmetry, texture, and the recoverable strain of shape memory polycrystals*, (with K. Bhattacharya), Acta Materialia 44, pp. 529–542, 1996.
48. *Elastic energy minimization and the recoverable strains of polycrystalline shape-memory materials*, (with K. Bhattacharya), Arch. Rat. Mech. Anal. 139, pp. 99–180, 1997.
49. *Bounds on the micromagnetic energy of a uniaxial ferromagnet*, (with R. Choksi), Comm. Pure Appl. Math. 51, pp. 259–289, 1998.
50. *Some model problems of polycrystal plasticity with deficient basic crystals*, (with T. Little), SIAM J. Appl. Math. 59, pp. 172–197, 1998.
51. *Duality relations for non-ohmic composites, with applications to behavior near percolation*, (with O. Levy), J. Stat. Phys. 90, pp. 159–189, 1998.
52. *Domain branching in uniaxial ferromagnets: a scaling law for the minimum energy*, (with R. Choksi and F. Otto), Comm. Math. Phys. 201, pp. 61–79, 1999.

53. *Some examples of nonlinear homogenization involving nearly degenerate energies*, (with K. Bhattacharya and S. Kozlov), Proc. Roy. Soc. London 455A, pp. 567–583, 1999.
54. *Partial regularity for optimal design problems involving both bulk and surface energies*, (with F.H. Lin), Chinese Annals of Math. 20, pp. 137–158, 1999.
55. *A geometric model for coarsening during spiral-mode growth of thin films*, (with T. Schulze), Physica D 132, pp. 520–542, 1999.
56. *Singular perturbation and the energy of folds*, (with W. Jin), J. Nonlin. Sci. 10, pp. 355–390, 2000.
57. *Geometrically nonlinear shape-memory polycrystals made from a two-variant material*, (with B. Niethammer), Math. Modeling and Numer. Anal. 34, pp. 377–398, 2000.
58. *A compactness result in the gradient theory of phase transitions*, (with A. DeSimone, S. Muller, and F. Otto), Proc. Royal Soc. Edinburgh 131A, pp. 833–844, 2001.
59. *Two-dimensional modeling of soft ferromagnetic films*, (with A. DeSimone, S. Muller, F. Otto, and R. Schafer), Proc. Roy. Soc. London 457A, pp. 2983–2991, 2001.
60. *Bending martensite needles in $Ni_{64}Al_{35}$ investigated by two-dimensional elasticity and high-resolution transmission electron microscopy*, (with Ph. Boullay and D. Schryvers), Phys. Rev. B 64, paper 144105, 2001.
61. *A new approach to the continuum modeling of epitaxial growth: slope selection, coarsening, and the role of the uphill current*, (with T. Lo), Physica D 161, pp. 237–257, 2002.
62. *Upper bounds on coarsening rates*, (with F. Otto), Comm. Math. Phys. 229, pp. 375–395, 2002.
63. *A reduced theory for thin-film micromagnetics*, (with A. DeSimone, S. Muller, and F. Otto), Comm. Pure Appl. Math. 55, pp. 1408–1460, 2002.
64. *Microstructures and interfaces in Ni-Al martensite: comparing HRTEM observations with continuum theories*, (with D. Schryvers, P. Boullay, P.L. Potapov, and J.M. Ball), Int. J. Solids & Structures 39, pp. 3543–3554, 2002.
65. *Repulsive interaction of Neel walls, and the internal length scale of the cross-tie wall*, (with A. Desimone, S. Muller, and F. Otto), Multiscale Modeling & Simulation 1, pp. 57–104, 2003.
66. *Representation and self-similarity of shapes*, (with D. Geiger and T.-L. Liu), IEEE Trans. Pattern Anal. and Mach. Intell. 25, pp. 86–99, 2003.
67. *Some three-dimensional problems related to dielectric breakdown and polycrystal plasticity*, (with A. Garroni), Proc. Roy. Soc. London 459A, pp. 2613–2625, 2003.

68. *Upper bounds on the coarsening rate for an epitaxial growth model*, (with X. Yan), *Comm. Pure Appl. Math.* 56, pp. 1549–1564, 2003.
69. *Energy minimization and flux domain structure in the intermediate state of a type-I superconductor*, (with R. Choksi and F. Otto), *J. Nonlin. Sci.* 14, pp. 119–171, 2004.
70. *Coarsening rates for models of multicomponent phase separation*, (with X. Yan), *Interfaces and Free Boundaries* 6, pp. 135–149, 2004.
71. *Another thin-film limit of micromagnetics*, (with V. Slastikov), *Arch. Rational Mech. Anal.* 178, pp. 227–245, 2005.
72. *Effective dynamics for ferromagnetic thin films: a rigorous justification*, (with V. Slastikov), *Proc. Roy. Soc. London* 460A, pp. 1–12, 2004.
73. *A deterministic-control-based approach to motion by curvature*, (with S. Serfaty), *Comm. Pure Appl. Math* 59, pp. 344–407, 2005.
74. *On the equivalence of the static and dynamic asset allocation problems*, (with O. Papazoglu-Statescu), *Quantitative Finance* 6, pp. 173–183, 2006.
75. *Magnetic elements at finite temperature and large deviation theory*, (with M. Reznikoff and E. Vanden-Eijnden), *J. Nonlinear Science* 15, pp. 223–253, 2005.
76. *Action minimization and sharp interface limits for the stochastic Allen-Cahn equation*, (with M. Reznikoff, F. Otto, and E. Vanden-Eijnden), *Comm. Pure Appl. Math.* 60, pp. 393–438, 2007.
77. *The sharp interface limit of the action functional for Allen Cahn in one space dimension*, (with M. Reznikoff and Y. Tonegawa), *Calc. Var. PDE* 25, pp. 503–534, 2006.
78. *Geometrically constrained walls*, (with V. Slastikov), *Calc. of Var. and PDE*, 28, pp. 33–57, 2006
79. *Continuum theory of interacting steps on crystal surfaces in 2+1 dimensions*, (with D. Margetis), *Multiscale Modeling and Simulation* 5, pp. 729–758, 2006.
80. *Ground state energy scaling laws during the onset and destruction of the intermediate state in a type-I superconductor*, (with R. Choksi, S. Conti, and F. Otto), *Comm. Pure Appl. Math.* 61, pp. 595–626, 2008.
81. *Magnetism and the homogenization of micro-resonators*, (with S. Shipman), *Multiscale Modeling and Simulation* 7, pp. 62–92, 2008.
82. *Cloaking via change of variables in electric impedance tomography*, (with H. Shen, M. Vogelius, and M. Weinstein), *Inverse Problems* 24, 015016 (21pp), 2008.
83. *Optimization of structural topology in the high-porosity regime*, (with B. Bourdin), *J. Mech. Phys. Solids* 56, pp. 1043–1064, 2008.

84. *Optimization of scattering resonances*, (with P. Heider, D. Berebichez, and M. Weinstein), Structural and Multidisciplinary Optimization 36, pp. 443–456, 2008.
85. *Asset price bubbles from heterogeneous beliefs about mean reversion rates*, (with X. Chen), Finance and Stochastics, in press.
86. *Numerical analysis of a steepest-descent PDE model for surface relaxation below the roughening temperature*, (with H. Versieux), submitted to SIAM J. Numer. Anal.
87. *The string method as a dynamical system*, (with M. Cameron and E. Vanden-Eijnden), submitted to J. Nonlin. Science.
88. *A deterministic-control-based approach to fully nonlinear parabolic and elliptic equations*, (with S. Serfaty), submitted to Comm. Pure Appl. Math.
89. *Cloaking via change of variables for the Helmholtz equation*, (with D. Onofrei, M. Vogelius, and M. Weinstein), submitted to Comm. Pure Appl. Math.

Book Chapters and Conference Proceeding Articles

1. *Rigidity and nonlinear elasticity*, in Nonlinear Partial Differential Equations in Engineering and Applied Sciences, A.J. Kalinowski and J.S. Papadakis eds., Marcel Dekker, 1980.
2. *Existence of optimal geometries for a model problem of antiplane shear*, in Optimization of Distributed Parameter Structures II, E. Haug and J. Cea eds., Sijthoff and Noordhoff, 1981.
3. *Optimal design for torsional rigidity*, (with G. Strang), in Proceedings of Conference on Mixed and Hybrid Finite Elements, Atlanta, 1981, S.N. Atluri, R.H. Gallagher and Zienkiewicz eds., J. Wiley & Sons, 1982.
4. *Optimal design of cylinders in shear*, (with G. Strang), in The Mathematics of Finite Elements and Applications, J.R. Whiteman, ed., Academic Press, 1982.
5. *Structural design optimization, homogenization and relaxation of variational problems*, (with G. Strang), in Macroscopic Properties of Disordered Media, R. Burridge, S. Childress and G. Papanicolaou eds., Springer Lecture Notes in Physics 154, 1982.
6. *Partial regularity and the Navier–Stokes equations*, in Nonlinear Partial Differential Equations, Proc. of US–Japan Seminar, Tokyo, 1982, H. Fujita, P.D. Lax and G. Strang eds., North–Holland Math. Studies 81, 1984.
7. *Identification of an unknown conductivity by means of measurements at the boundary*, (with M. Vogelius), in Inverse Problems, D.W. McLaughlin ed., SIAM–AMS Proc. No. 14, Amer. Math. Soc., Providence, 1984.
8. *The method of partial regularity as applied to the Navier–Stokes equations*, in Lectures on PDE, S.S. Chern, ed., Math. Sci. Res. Inst. Publ. 2, Springer–Verlag, 1984.

9. *Thin plates with rapidly varying thickness, and their relation to structural optimization*, (with M. Vogelius), in Homogenization and Effective Moduli and Media, J. Ericksen et al. eds., Springer-Verlag, 1986.
10. *On bounding the effective conductivity of anisotropic composites*, (with G. Milton), in Homogenization and Effective Moduli of Materials and Media, J. Ericksen et al., eds., Springer-Verlag, 1986.
11. *Fibered structures in optimal design*, (with G. Strang), in Theory of Ordinary and Partial Differential Equations, B.D. Sleeman and R.J. Jarvis eds., Longman, 1986.
12. *The effective viscosity of a mixture of two Stokes fluids*, (with R. Lipton), in Advances in Multiphase Flow and Related Problems, G. Papanicolaou ed., SIAM, pp. 123–135, 1986.
13. *The constrained least gradient problem*, (with G. Strang), in Nonclassical Continuum Mechanics, R. Knops and A. Lacey eds., Cambridge Univ. Press, pp. 226–243, 1987.
14. *Optimal design of a two-way conductor*, (with G. Strang), in Topics in Nonsmooth Mechanics, J. Moreau et al. eds., Birkhauser, pp. 143–155, 1988.
15. *Recent progress in the mathematical modelling of composite materials*, in Composite Material Response: Constitutive Relations and Damage Mechanisms, G. Sih et al. eds., Elsevier, pp. 155–176, 1988.
16. *Removability of blowup points for semilinear heat equations*, (with Y. Giga), in Differential Equations, C. Dafermos et al. eds., M. Dekker, pp. 257–264, 1989.
17. *Composite materials and structural optimization*, in Smart Materials, Structures, and Mathematical Issues, C. Rogers ed., Technomic, pp.179–182, 1989.
18. *The relationship between linear and nonlinear variational models of coherent phase transitions*, in Proc. Seventh Army Conference Appl. Math. & Computing, West Point, June 1989, ARO Report 90–1, 1990.
19. *Composite materials and structural optimization*, in U.S.-Japan Workshop on Smart-Intelligent Materials and Systems, I. Ahmad et al. eds., Technomic, pp. 272–286, 1990.
20. *Extremal microstructures for composite materials*, (with G. Milton), in S. C. Chou ed., Synergism of Mechanics, Mathematics, and Materials, U.S. Army Symposium on Solid Mechanics, 1991.
21. *Numerical structural optimization via a relaxed formulation*, (with G. Allaire), in M. Delfour ed., Shape Optimization and Free Boundaries, Kluwer, pp. 173–210, 1992.
22. *Surface energy and microstructure*, (with S. Muller), in Shape Memory Materials and Phenomena – Fundamental Aspects and Applications, C. T. Liu et al. eds., Materials Research Society Proceedings Vol. 246, 1992.

23. *Geometric parameters and the relaxation of multiwell energies*, (with N. Firoozye), in *Microstructure and Phase Transitions*, D. Kinderlehrer et al. eds., Springer-Verlag, 1993.
24. *Topology optimization and optimal shape design using homogenization*, (with G. Allaire), in *Topology Design of Structures*, M. Bendsoe and C. Mota Soares, eds., Kluwer, pp. 207–218, 1993.
25. *Surface energy and the length scale of twinning in martensite*, (with S. Muller), in *Proceedings of ICOMAT-92*, J. Perkins and C. Wayman eds., Monterey Institute of Advanced Studies, pp. 77-82, 1993.
26. *The relaxed approach to structural optimization*, in *Mathematics of Smart Materials*, H.T. Banks ed., SPIE, pp. 325-327, 1993.
27. *Effective behavior of polycrystals that undergo martensitic phase transformation*, (with K. Bhattacharya), in *Mathematics of Smart Materials*, H.T. Banks ed., SPIE, pp. 207-213, 1993.
28. *The behavior of polycrystalline shape memory materials*, (with K. Bhattacharya), in *proceedings of the symposium “Mechanics of Phase Transformations and Shape Memory Alloys,”* held at ASME WAM '94, 11/94 in Chicago, IL.
29. *Recoverable strains in shape-memory polycrystals*, (with K. Bhattacharya), in *Proc. ICOMAT-95*, J. de Physique IV – Colloque C8, pp. 261–266, 1995.
30. *Modeling of branched needle microstructures at the edge of a martensite laminate*, (with R. James and T. Shield), in *Proc. ICOMAT-95*, J. de Physique IV – Colloque C8, pp. 253–259, 1995.
31. *The crystalline algorithm for computing motion by curvature*, (with P. Girao), in *Variational Methods for Discontinuous Structures*, R. Serapioni and F. Tomarelli eds., Birkhauser, pp. 7–18, 1996.
32. *Small surface energy, coarse-graining, and selection of microstructure*, (with F. Otto), *Physica D* 107, pp. 272–289, 1997.
33. *Analogies between bone adaptation and homogenization-based methods for structural optimization*, *Forma* 12 301–303, 1997.
34. *The Taylor estimate of recoverable strains in shape-memory polycrystals*, (with K. Bhattacharya and Y.-C. Shu), in *proceedings of the IUTAM Symp. on Transformation Problems in Composite and Active Materials* (Y.A. Bahei-El-Din and G.J. Dvorak, eds.), Kluwer, 1998.
35. *Representation and self-similarity of shapes*, (with T-L Liu and D. Geiger), in *Proc. Int'l. Conf. Computer Vision*, Bombay, pp. 1129–1138, 1998.

36. *Magnetic microstructures – a paradigm of multiscale problems*, (with A. DeSimone, S. Müller, and F. Otto), in ICIAM 99: Proceedings of the Fourth International Congress on Industrial and Applied Mathematics, J.M. Ball and J.C.R. Hunt eds., Oxford University Press, pp. 175–190, 2000.
37. *Modeling MOCVD growth of YBCO thin films*, (with T. Lo), in Growth, Evolution and Properties of Surfaces, Thin Films and Self-Organized Structures, S.C. Moss ed., MRS Symposia Proceedings 648, 2001.
38. *Continuum Limit of a Step Flow Model of Epitaxial Growth*, (with T. Lo and N.K. Yip), in Materials Research Society Symp. Proc. vol 696, pp. T1.7.1-T1.7.7, 2002.
39. *Recent analytical developments in micromagnetics*, (with A. DeSimone, F. Otto, and S. Mueller), in The Science of Hysteresis II: Physical Modeling, Micromagnetics, and Magnetization Dynamics, G. Bertotti and I. Mayergoyz eds., pp. 269–381, Elsevier 2006
40. *Energy-driven pattern formation*, in Proceedings of the International Congress of Mathematicians, Madrid, August 22-30, 2006, ed. M. Sanz-Solé et al., Euro Math Society, vol 1, pp 359-384, 2007
41. *Second-order PDE's and deterministic games*, (with S. Serfaty), in 6th Int'l Congr. on Industr. and Appl. Math. – Zurich, Switzerland, 16-20 July 2007 – Invited Lectures, R. Jeltsch and G. Wanner eds, Euro Math Society, pp 239–249, 2009

Books Edited

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