Richard D. James
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Birth Date: November 8, 1952

Education

Sc.B. in Engineering from Brown University, 1974, concentration in Biomedical Engineering
Ph.D. in Mechanical Engineering from The Johns Hopkins University, 1979

Professional Appointments

2001 - 2011	Russell J. Penrose Professor, University of Minnesota
1998 -	Distinguished McKnight University Professor, University of Minnesota
1991 -	Professor, Department of Aerospace Engineering and Mechanics, University of Minnesota
1985 - 1991	Associate Professor, Department of Aerospace Engineering and Mechanics, University of Minnesota
1981 - 1985	Assistant Professor, Division of Engineering, Brown University
1979 - 1980	Research Fellow in Mechanics and Thermodynamics at the University of Minnesota

Visiting Positions

2006	John von Neumann Professorship, TU Munich (two months)
2002	Mary Shepard B. Upson Visiting Chair, College of Engineering, Cornell University (Fall semester)
1999	Rothschild Visiting Professor, Cambridge University (Fall term)
1993 - 1994	Member, Institute for Advanced Study, Princeton, Term I
1991 - 1992	Visiting Professor, International Centre for Mathematical Sciences, Edinburgh
1988	Visiting Scientist at the Mathematical Sciences Institute, Cornell University (3 months)
1985	Visiting Professor at Heriot-Watt University in connection with the symposium year on "Material Instabilities in Continuum Mechanics" (2 months)
1984	Research consultant at the Mathematics Research Center, University of Wisconsin (5 months)
1983	Senior Fellow at the Institute for Mathematics and its Applications, University of Minnesota (8 months)

Significant Committees (past 10 years)

2005 -	Scientific Advisory Board for the field of Mechanics, École Polytechnique
2003 -	Distinguished McKnight University Professorships Selection Committee
	Portfolio coordinator: nanotechnology, AHPCRC
2003 - 2004	Theodore von Karman Prize Committee, SIAM
	NIRT (Nanotechnology Research) Review Panel for the National Science Foundation
2002 - 2005	Board of Governors of the Institute for Mathematics and its Applications
2001	Future Directions in Solid Mechanics, NSF advisory committee
	Review Board of the Mathematics Division of the National Science Foundation

2000	NIRT (Nanotechnology Research) Review Panel for the National Science Foundation
	Mathematical Aspects of Materials Science - 2000, co-chair (with Jeff McFadden): SIAM meeting held in Spring, 2000
1998 - 2006	Scientific Advisory Board for the Max–Planck–Institut for Mathematics in the Sciences, Leipzig
1998 -	Materials Research Council, Interdisciplinary research committee with responsibility for evaluating new directions and assigning positions in materials science in the Institute of Technology
1997 - 2004	Advisory Board, Mesoscale Interface Mapping Project: NSF Center in the Department of Materials Science and Engineering, Carnegie Mellon University (Chair, 1997)
1995 - 1996	Scientific organizer, Mathematics in Materials Science, Institute of Mathematics and its Applications, University of Minnesota (with G. Milton, S. Whittington and J. Moloney)
1994 - 1998	Member (at large), U. S. National Committee on Theoretical and Applied Mechanics, National Research Council
1993 - 1996	Promotion and Tenure Committee, Institute of Technology (Chair, 1995-96)

Honors and Fellowships

2006 - 2007	Alexander von Humboldt Senior Research Award
2001 -	Russell J. Penrose Professor, University of Minnesota (endowed professorship with 10 year term carrying fund for research)
2000	"Best Poster of the Conference", EuroMech Congress (ref. [67], with R. Rizzoni)
1999	Rothschild Visiting Professor, Cambridge University
	Best paper award, ASME/SPIE Smart Materials, reference [57]
1998 -	Distinguished McKnight University Professor (full career professorship, five year fund for research support, supported by the McKnight Foundation of 3M)
1997	Fellow, American Academy of Mechanics
	Featured Review (in Mathematical Reviews) of Ref. [34]
1991	George Taylor Distinguished Research Award, Institute of Technology, University of Minnesota (One award given each year for research to a member of a department of pure science, engineering or mathematics at the University of Minnesota)
1976 - 1978	IBM Fellow at the Johns Hopkins University

Editorial Positions

2002 -	Contributing Editor, *Mechanics of Advanced Materials and Structures*
2001 -	Editorial Advisory Board, *SIAM Journal on Multiscale Analysis, Modeling and Simulation*
1999 -	Chief Editor, with J. M. Ball, *Archive for Rational Mechanics and Analysis*
1998 -	Editorial Board, *Interfaces and Free Boundaries*
1997 -	Editorial Advisor, *Journal of the Mechanics and Physics of Solids*
1996 -	Editorial Board, *Journal of Elasticity*
1991 - 1998	Editorial Board, *Archive for Rational Mechanics and Analysis*
1989 - 1993	Editorial Board, *Journal of Intelligent Materials and Structures*, (begun January 1989, relaunched, January 1993)
1988 - 2005	Editorial Board, *Continuum Mechanics and Thermodynamics*,

Professional Organizations

Membership in professional societies of engineering, mathematics, physics and biology as necessary to reduce registration fees at conferences.

Publications

1. R. D. James, Co-existent phases in the one dimensional static theory of elastic bars, *Archive for Rational Mechanics and Analysis* **72** (1979), pp. 99-140.
2. R. D. James, The propagation of phase boundaries in elastic bars, *Archive for Rational Mechanics and Analysis* **73** (1980), pp. 125-158.
3. R. D. James, The elastica and the problem of pure pending for a non-convex stored energy function, with R.L. Fosdick, *Journal of Elasticity* **11** (1981), pp. 165-186.
4. R. D. James, The equilibrium and post-buckling behavior of an elastic curve governed by a non-convex energy, *Journal of Elasticity* **11** (1981), pp. 239-269.
5. R. D. James, Finite deformation by mechanical twinning, *Archive for Rational Mechanics and Analysis* **77** (1981), pp. 143-176.
6. R. D. James, A relation between the jump in temperature across a propagation phase boundary and the stability of solid phases, *Journal of Elasticity* **13** (1983), p. 357-378.
7. R. D. James, Theory for the cold-drawing of polymers, in Orienting Polymers, (ed. J.L. Ericksen), *Springer Lecture Notes in Mathematics* **1063**, p. 143-161 (1983).
8. R. D. James, The arrangement of coherent phases in a loaded body, in "Proceedings of the Conference on Phase Transformations and Material Instabilities in Solids" (eds. M. Gurtin and J. Nohel), Academic Press, 1983.
9. R. D. James, Stress-free joints and polycrystals, *Archive for Rational Mechanics and Analysis* **86** (1984), p. 13, and "The J.L. Ericksen Anniversary Volume," Springer-Verlag, 1985.
10. R. D. James, On the stability of phases, *International Journal of Engineering Science* **22** (1984), p. 1193.
11. R. D. James, Phase transformations and non-elliptic free energy functions, in "New Perspectives in Thermodynamics" (eds. J. Serrin and G. Sell), Springer-Verlag, 1986.
12. R. D. James, Displacive phase transformations in solids, *Journal of the Mechanics and Physics of Solids* **34**, (1986), pp. 359-394.
13. R. D. James, Motions which preserve ellipsoidal holes, *Journal of Elasticity* **17**, (1987), pp. 265-269.
14. J. M. Ball and R. D. James, Fine phase mixtures as minimizers of energy, *Archive for Rational Mechanics and Analysis* **100** (1987), pp. 13-52.
15. R. D. James, The stability and metastability of quartz, in "Metastability and Incompletely Posed Problems," IMA Volume 3 (eds. S. Antman, J.L. Ericksen, D. Kinderlehrer, and I. Müller) Springer-Verlag (1987), pp. 147-176.
16. R. D. James, Minimizing sequences and the microstructure of crystals, in "Proceedings of the Society of Metals Conference on Phase Transformations," Cambridge University Press, 1989.
17. R. D. James, Microstructure and weak convergence, in "Material Instabilities in Continuum Mechanics and Related Mathematical Problems" (ed. J.M. Ball), Oxford University Press, 1987, pp. 175-196.
18. R. D. James, Basic principles for the improvement of shape-memory and related materials, in "Proceedings of the Workshop on Smart Materials, Structures and Mathematical Issues," Plenum Press, (1989).
19. R. D. James and D. Kinderlehrer, Theory of diffusionless phase transformations, Proceedings of "Equations à Derivées Partielles et Modeles Continues de Transitions de Phases", *Lecture Notes in Physics* **344**, p. 51-84 (1990).
20. R. D. James, Relation between microscopic and macroscopic properties of crystals undergoing phase transformation, *Transactions of the 7th Army Conference on Applied Mathematics and Computing*, (ed. F. Dressel), (1989), pp 305-317.
21. R. D. James, R. Lipton and A. Lutoborski, Laminar elastic composites with crystallographic symmetry, *SIAM Journal of Applied Mathematics* **50** (1990), pp. 683-702

22. R. D. James and D. Kinderlehrer, Frustration in ferromagnetic materials, *Continuum Mechanics and Thermodynamics* **2** (1990), pp. 215-239. Similar research with an application to magnetostriction reported in, An example of Frustration in a Ferromagnetic Material, *Proc. NATO Advanced Workshop on Defects, Singularities and Patterns in Nematic Liquid Crystals*, Orsay, 1991.
23. R. D. James, Microstructure of shape-memory and magnetostrictive materials, *Applied Mechanics Review* **43** (supplement), 1990. Similar research also reported in "Proceedings of the U.S./Japan Workshop on Smart/Intelligent Materials and Systems" (eds. I. Ahmad, A. Crowson,C. A. Rogers and M. Aizawa), Technomic Press, 1990.
24. J. M. Ball and R. D. James, A characterization of plane strain, *Proc. Royal Soc.* **432A** (1991), pp. 93-99.
25. R. D. James and S. Spector, The formation of filamentary voids in solids, *Journal of the Mechanics and Physics of Solids* **39** (1991), pp. 783-813.
26. R. D. James and S. Spector, Remarks on $W^{1,p}$-quasiconvexity, interpenetration of matter and function spaces for elasticity, *Ann. Inst. H. Poincaré* **9** (1992), pp. 1-18.
27. J.M. Ball, P.J. Holmes, R. D. James, R.L. Pego and P.J. Swart, On the dynamics of fine structure, *Journal of Nonlinear Science* **1** (1991), pp. 17-70.
28. J.M. Ball and R. D. James, Proposed experimental tests of a theory of fine microstructure and the two-well problem, *Phil. Trans. Royal Soc. London* **A338** (1992), pp. 389-450.
29. R. D. James, Deformation of shape-memory materials, *Proc. of the Materials Research Society Symposium on Shape-Memory Materials*, 1992.
30. R. D. James and D. Kinderlehrer, Frustration and microstructure: an example in magnetostriction, "Progress in partial differential equations: calculus of variations, applications" (eds. C. Bandle, J. Benelmans, M. Chipot, M. Grüter, J. St. Jean Paulin). *Pitman Research Notes in Mathematics* **267**, Longmans, 1992.
31. J. M. Ball and R. D. James, Theory for the microstructure of martensite and applications, with J. M. Ball, *Proc. of the International Conference on Martensitic Transformations, ICOMAT-92*, Monterey Institute for Advanced Studies, 1993, pp. 65-76.
32. R. D. James and D. Kinderlehrer, A theory of magnetostriction with applications to $Tb_xDy_{1-x}Fe_2$, *Phil. Mag.* **B 68** (1993), pp. 237-274.
33. R. D. James and Stefan Müller, Internal variables and fine-scale oscillations in micromagnetics, *Continuum Mechanics and Thermodynamics* **6** (1994), pp. 291-336.
34. K. Bhattacharya, N. Firoozye, R. D. James and R. Kohn, Restrictions on microstructure, *Proc. Royal Soc. Edinburgh* **A124** (1994), pp. 843-878.
35. R. D. James and D. Kinderlehrer, Mathematical approaches to the study of smart materials, in "Proc. SPIE Conference on Smart Materials," Volume 1919 (ed. H. T. Banks), 1993.
36. X. Liu and R. D. James, Stability of fiber networks under biaxial stretching, *Trans. ASME Journal of Applied Mechanics* **62** (1995), pp. 398-406.
37. C. Chu and R. D. James, Biaxial loading experiments on Cu-Al-Ni single crystals, ASME-AMD Vol. 181, *Experiments in Smart Materials and Structures* (ed. K.-S. Kim), 1993, pp. 61-69.
38. K. Bhattacharya, R. D. James and P. J. Swart, A nonlinear dynamic model for twin relaxation with applications to Au 47.5at.%Cd and other shape-memory materials, *Proc. TMS symposium on "Twinning in Advanced Materials"* (eds. M. Yoo and M. Wuttig), 1993.
39. R. D. James and D. Kinderlehrer, Laminate structures in martensite, *Proc. Workshop on Composite Media and Homogenization*, SISSA, Trieste, 1994.
40. R. D. James and D. Kinderlehrer, Theory of magnetostriction with applications to Terfenol-D, *J. Appl. Physics* **76** (1994), pp. 7012-7014.
41. R. Abeyaratne, C. Chu and R. D. James, Kinetics and hysteresis in martensitic single crystals, ASME-AMD Vol. 189, *Mechanics of Phase Transformations and Shape Memory*

Alloys (ed. L. C. Brinson and B. Moran), 1994, pp. 85-98.
42. R. V. Kohn, R. D. James and T. W. Shield, Modeling the branched needle microstructures at the edge of a martensite laminate, *J. de Physique III, Colloque* **C8**, Vol. 5 (1995), pp. 253-259.
43. J. M. Ball, C. Chu and R. D. James, Hysteresis during stress-induced variant rearrangement, *J. de Physique III, Colloque* **C8**, Vol. 5 (1995), pp. 245-251.
44. C. Chu and R. D. James, Analysis of microstructures in Cu-14.0%Al-3.9%Ni by energy minimization, *J. de Physique III, Colloque* **C8**, Vol. 5 (1995), pp. 143-149.
45. J. M. Ball and R. D. James, Local minimizers and phase transformations, *Zeitschrift für Angewandte Mathematik und Mechanik* **76** (Suppl. 2), 1996, pp. 389-392.
46. R. Abeyaratne, C. Chu and R. D. James, Kinetics of materials with wiggly energies: theory and application to the evolution of twinning microstructures in a Cu-Al-Ni shape memory alloy, *Phil. Mag.* **A73** (1996), pp. 457-497.
47. R. D. James, Hysteresis in phase transformations, Mathematical Research Vol. 87, Proc. ICIAM-95 (eds. K. Kirchgässner, O. Mahrenholtz and R. Mennicken), Akademie Verlag, 1996, pp. 135-154.
48. K. Bhattacharya, R. D. James and P. J. Swart, Relaxation in shape-memory alloys, Part I: Mechanical model, *Acta Materialia* **45** (1997), pp. 4547-4560, and Part II: Thermomechanical model and proposed experiments, ibid., pp. 4561-4568.
49. R. D. James, Wiggly energies, in Contemporary Research in the Mechanics and Mathematics of Materials (ed. R. C. Batra and M. F. Beatty), pp. 275-286, CIME: Barcelona, 1996.
50. G. Gioia and R. D. James, Micromagnetics of very thin films, *Proc. Royal Soc. London* **453** (1997), pp. 213-223.
51. R. D. James and D. Kinderlehrer, Magnetoelastic interactions, *Zeitschrift für Angewandte Mathematik und Mechanik* **76** (Suppl. 2), 1996, pp. 401-404.
52. J. Li and R. D. James, Prediction of microstructure in monoclinic $LaNbO_4$ by energy minimization, *Acta Materialia* **45** (1997), pp. 4271-4281.
53. K. Bhattacharya and R. D. James, A theory of shape-memory thin films with applications, in "Materials for Smart Systems II" (ed. E.P. George, R. Gotthardt, K. Otsuka, S. Trolier-McKinstry, M. Wun-Fogle), MRS Symposium Proceedings Series, Volume **459**, Materials Research Society, Pittsburgh, 1997, pp. 311-316.
54. R. D. James and M. Wuttig, Alternative smart materials, Proceedings SPIE Symposium on "Mathematics and Control in Smart Structures" (ed. V. V. Varadan and J. Chandra), Vol. 2715 (1996), pp. 420-426.
55. R. D. James, D. Kinderlehrer and L. Ma, Modeling magnetostrictive microstructure under loading, in Mathematics of Microstructure Evolution (eds. L.-Q Chen, B. Fultz, J. W. Cahn, J. Manning, J. Morral and J. Simmonds), TMS/SIAM, to appear.
56. A. DeSimone and R. D. James, A theory of magnetostriction oriented toward applications, *Journal of Applied Physics* **81** (1997), pp. 5706–5708.
57. R. D. James and Manfred Wuttig, Magnetostriction of martensite, *Phil. Mag. A* **77** (1998), pp. 1273–1299.
58. J. Schmidt, R. Tickle, G. D. Skidmore, C. Merton, R. D. James and E. Dan Dahlberg, Microscopic stress-induced magnetization changes in a fracture (111) surface of Terfenol-D observed with magnetic force microscopy, *J. Magnetism and Magnetic Materials* **190** (1998), pp. 97–107.
59. K. Bhattacharya and R. D. James, A theory of thin films of martensitic materials with applications to microactuators, *J. Mechanics and Physics of Solids*, **47** (1999), pp. 531–576.
60. R. Tickle, R. D. James, T. Shield, M. Wuttig and V. V. Kokorin, Ferromagnetic shape memory in the NiMnGa system, *IEEE Trans. Magnetics* **35** (1999), pp. 4301–4310.

61. R. D. James, New materials from theory: trends in the development of active materials, Research Trends in Solid Mechanics (ed. G. J. Dvorak for USNC/TAM), Elsevier; reprinted in *Int. J. Solids Struct.* **37** (2000), pp. 239–250.
62. R. D. James, R. Tickle and Manfred Wuttig, Large field-induced strains in ferromagnetic shape memory materials, *Materials Science and Engineering* **A273–295** (1999), pp. 320–325.
63. K. Bhattacharya, A. Desimone, K. F. Hane, R. D. James and C. J. Palmstrøm, Tents and tunnels on martensitic films, *Materials Science and Engineering A*, **A273–295** (1999), pp. 685–689.
64. R. Tickle and R. D. James, Magnetic and magnetomechanical properties of Ni_2MnGa *J. Magnetism and Magnetic Materials*, **195** (1999), pp. 627–638.
65. J. W. Dong, L. C. Chen, R. D. James, S. McKernan and C. J. Palmstrøm, MBE growth of ferromagnetic single crystal (001) Ni_2MnGa on (001) GaAs, *Appl. Phys. Lett.* **75** (1999), pp 1443–1445. .
66. Richard D. James and Kevin F. Hane, Martensitic transformations and shape memory materials, *Acta mater.*, **48** (2000), pp. 197–222.
67. R. D. James and G. Friesecke, A scheme for the passage from atomic to continuum theory for thin films, nanotubes and nanorods, *J. Mech. Phys. Solids* **48** (2000), pp. 1519–1540.
68. R. D. James and R. Rizzoni, Pressurized shape memory thin films, *J. Elasticity* **59** (2000), pp. 399–436.
69. Manfred Wuttig, Luohong Liu, Koichi Tsuchiya and Richard D. James, The occurrence of ferromagnetic shape memory alloys, *J. Applied Physics* **87** (2000), pp. 4707–4711.
70. Qi Pan and R. D. James, Micromagnetic study of Ni_2MnGa under applied field, *J. Applied Physics* **87** (2000), pp. 4702–4706.
71. Monique Dauge, Gero Friesecke, Richard James, Korn inequalities for thin films, preprint.
72. J. W. Dong, J. Lu, J. Q. Xie, L. C. Chen, R. D. James, S. McKernan, C. J. Palmstrøm, MBE growth of ferromagnetic single crystal Heusler alloys on (001) $Ga_{1-x}In_xAs$, *Physica E* **10** (2001), pp. 428–432
73. Antonio DeSimone and Richard D. James, A constrained theory of magnetoelasticity, *J. Mechanics and Physics of Solids*, **50** (2002), pp. 283–320.
74. Gero Friesecke, Richard D. James and Stefan Müller, Rigorous derivation of nonlinear plate theory and geometric rigidity, *C. R. Acad. Sci. Paris* **334** (2002), 173–178.
75. Gero Friesecke, Richard D. James and Stefan Müller, A theorem on geometric rigidity and the derivation of nonlinear plate theory from three dimensional elasticity, *Comm. Pure and Appl. Math.* **LV**, 1461–1506.
76. R. D. James, Configurational forces in magnetism with application to the dynamics of a small-scale ferromagnetic shape memory cantilever, *Continuum Mech. Thermody.* **14** (2002), pp. 55–86.
77. R. D. James and R. Rizzoni, Piecewise rigid body mechanics, *J. Nonlinear Sci.* **13** (2003), 165–114.
78. Gero Friesecke, Richard D. James, Maria Giovanna Mora, Stefan Müller, Derivation of nonlinear bending theory for shells from three dimensional nonlinear elasticity by Γ-convergence, *C. R. Acad. Sci. Paris*, to appear 2001.
79. J. M. Ball and R. D. James, The scientific life and influence of Clifford Ambrose Truesdell III, *Arch. Rational Mech. Anal.* **161** (2002), pp. 1–26.
80. Gero Friesecke, Richard D. James, Stefan Müller, The Föppl-von Kármán plate theory as a low energy Gamma limit of nonlinear elasticity, *C. R. Acad. Sci. Paris*, accepted, to appear 2002.
81. Q. Pan, J. W. Dong, C. J. Palmstrøm, J. Cui and R. D. James, Magnetic domain observations of free standing single crystal patterned Ni_2MnGa films, *J. Appl. Physics* **91** (2002), pp. 7812–7814.

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83. J. Cui, R.D. James, and T. Shield, Phase transformation and magnetic anisotropy of an iron-palladium ferromagnetic shape memory alloy, *Acta Materialia* **52** (2003), pp. 35-47.
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85. M. G. A. Tijssens and R. D. James, Towards an improved continuum theory for phase transformations using atomistic calculations, in *Computational Fluid and Solid Mechanics* (ed. K. J. Bathe), Elsevier (2003), pp. 687–689.
86. J. Cui, T. W. Shield and R. D. James, Ferromagnetic shape memory effects in an iron-palladium ferromagnetic shape-memory alloy, *Acta Materialia* **52** (2004), pp. 35–47.
87. J.W. Dong, J. Q. Xie, J. Lu, C. Adelmann, C. J. Palmstrøm, J. Cui, Q. Pan, T. W. Shield, R. D. James S. McKernan, Shape memory and ferromagnetic shape memory effects in single-crystal Ni_2MnGa thin films, *J. Appl. Physics* **91** (2004), pp. 2593–2600.
88. R. D. James and Z. Zhang, A way to search for multiferroic materials with 'unlikely' combinations of physical properties, in Magnetism and Structure in Functional Materials (ed., Lluis Mañosa, Antoni Planes, Avadh Saxena), Springer Series in Materials Science, vol. 79, Springer-Verlag (2005).
89. K. Bhattacharya and R. D. James, The material is the machine, Science **307** (2005), pp. 53–54.
90. L. Liu, R. D. James, and P. H. Leo, Magnetostrictive composites in the dilute limit, *J. Mechanics and Physics of Solids* **54** (2006), pp. 951–974.
91. Wayne Falk and R. D. James, The tail sheath of bacteriophage T4 as a microactuator, submitted to *Integrated Ferroelectrics*.
92. T. C. Shih, J. Q. Xie, J. W. Dong, X. Y. Dong, S. Srivastava, C. Adelmann, S. McKernan, R. D. James, and C. J. Palmstrøm, Epitaxial growth and characterization of single crystal ferromagnetic shape memory Co_2NiGa films, submitted to *Integrated Ferroelectrics*.
93. Wayne Falk and R. D. James, An elasticity theory for self-assembled protein lattices with application to the martensitic transformation in bacteriophage T4 tail sheath, Phys. Rev. E**73**, 011917 (2006).
94. R. D. James, Objective structures, Max-Planck Institute for Mathematics in the Sciences preprint number 91/2005.
95. J. Cui, Y. S. Chu, O. Famodu, Y. Furuya, J. Hattrick-Simpers, R. D. James, A. Ludwig, S. Thienhaus, M. Wuttig, Z. Zhang and I. Takeuchi, Combinatorial search of thermoelastic shape memory alloys with extremely small hysteresis width. Nature Materials, online publication, 5 March 2006, doi: 10.1038/nmat1593.
96. Gero Friesecke, Richard D. James, Stefan Müller, A hierarchy of plate models derived from nonlinear elasticity by Γ-convergence, *it Arch. Rational Mech. Anal.* **180** (2006), pp. 183–236.
97. Zhiyong Zhang and R. D. James, Method of producing low hysteresis TiNiX alloys, *Shape Memory and Superelastic Technologies*, submitted.

Preprints

Metastability of martensite, with J. M. Ball and C. Chu.

Books

Editor of "Microstructure and Phase Transition," *IMA Volumes in Mathematics and its Applications* #54, (with J. Ericksen, D. Kinderlehrer and M. Luskin)

Editor of "Mathematics of Multiscale Materials," *IMA Volumes in Mathematics and its Applications* #99, (with Kenneth M. Golden, Geoffrey R. Grimmett, Graeme W. Milton

and Pabitra N. Sen)

Invited Lectures at Universities, Institutes and Laboratories (c = colloquium)

Institute for Advanced Study (1993)
Ames Laboratory (Magnetics group, 1993)
University of Arizona (Department of Mathematics and Department of Applied Mechanics and Engineering Science, 1997c)
Army Research Laboratory (Materials Directorate, 2005)
University of Bath (Department of Mathematical Sciences, 1988c, 1992c, 1999c)
TU Berlin (Berlin-Leipzig seminar on analysis and probability theory, 2006)
University of Bonn (Instutute für Angewandte Mathematik, 1992)
Brown University (Solid Mechanics Seminar, 1980, 1988; PDE seminar 1999)
California Institute of Technology (Applied Sciences, 1984c, 1989c, 1994c, 1995c; Mechanical Engineering, 2002)
Carnegie Mellon University (Department of Mathematics, 1991c, 1996c, 1997c)
University of Chicago (Computational and Applied Mathematics, 2003)
Cornell University (Department of Theoretical and Applied Mechanics, 1981c, 2002c; Department of Chemical Engineering, 1984c, ; Mathematical Sciences Inst., 1988 x2)
Courant Institute (1984, 1988, 1991, 1993, 1998)
University of East Anglia (Department of Applied Mathematics, 1992c)
University of Edinburgh (Department of Applied Mathematics, 1992c)
Università di Ferrara (School of Engineering, 2004)
Florida State University (Computational Science & Engineering and the National Magnetic Field Laboratory, 1999)
The Foxboro Co. (Corporate Research, 1983)
University of Freiburg (Department of Mathematics, 1994c)
General Motors Research (2003)
Georgia Institute of Technology (2006)
Harvard University (Applied Mechanics and Condensed Matter Physics, 1999)
Heriot-Watt University (Department of Mathematics, 1991)
The Johns Hopkins University (Department of Mechanical Engineering, 1994, 1997c)
University of Illinois (Department of Theoretical and Applied Mechanics, 1993c, 2000c)
Lord Corporation (Corporate Research, 1998)
Massachusetts Institute of Technology (Department of Mechanical Engineering, 1988, 1993c, 1995c; Mechanics Seminar, 2005)
Maryland Institute of Materials Scientists (1989)
Max–Planck–Institut, Mathematics in the Sciences, Leipzig (1997, 1998)
University of Maryland (Department of Mathematics, 1995c)
University of Michigan (Department of Aerospace Engineering, 1987c)
Michigan State University (Department of Materials Science and Mechanics, 1987c, 1997c)
University of Minnesota (Aerospace Engineering and Mechanics, 1978c, 1980c, 1985c x2, 1997c, 2005c; Civil and Mineral Engineering, 1986c; Geology and Geophysics, 1987c; School of Mathematics, 1989, 1991, 1998, 2001c; Chemical Engineering and Materials Science, 1999c, 2005c, 2006 (MRS student chapter); Mechanical Engineering, 2000c; Electrical Engineering (Magnetics Seminar, 2003, 2006))
TU Munich (Department of Mathematics, 2006c)
NASA Langley (ICASE, nanotechnology series, 2001)
National Institute of Standards and Technology (Polymers Division, 1978; Applied Mathematics, 1994)
University of Nebraska (Department of Engineering Mechanics and Center for the Analysis of Materials, 1995c, 2005c)
Northwestern University (Department of Civil Engineering, 1985; Department of Materials

Science and Engineering, 1989)
University of Nottingham (Department of Theoretical Mechanics, 1999)
Oxford University (Mathematics Institute, 1997, 1999c, 2005; Department of Materials, 1999; Applied Analysis Seminar, 2005; kick-off lecture for solid mechanics project, 2006)
Université de Paris-Nord (Laboratoire des Propriétés Méchaniques et Thermodynamiques des Matériaux, 1995)
University of Pennsylvania (Mechanical Engineering and Applied Mechanics, 2000)
Princeton University (Applied and Computational Mathematics Program, 1989c, Princeton Materials Institute, 2000)
Rensselaer Polytechnic Institute (Department of Mathematical Sciences and Department of Mechanical Engineering, 1984c)
Rice University (Department of Mechanical Engineering, 1980c)
Sandia National Laboratories (1980, 1982)
Seagate (2003)
Stanford University (Division of Applied Mechanics, 1995c; Mechanics and Computation, 2004)
Sussex University (Department of Mathematics, 1992c)
Texas A & M University (Center for the Mechanics of Composites, 1992c)
3M (1997)
University of Texas at Austin (Department of Aerospace Engineering and Engineering Mechanics, 1991c)
Virginia Polytechnic Institute and State University (Department of Engineering Science and Mechanics, 1981c)
University of Warwick (Joint Complex Systems/MOAC seminar, 2005)
University of Wisconsin (Mathematics Research Center, 1983 x2, 1984; Department of Engineering Mechanics, 1987c, Engineering Physics Department, 1998c, Department of Mathematics, 2006c)
Worcester Polytechnic Institute (Department of Mathematics, 1992c)

Plenary Lectures, Named Lectures and Lecture Series

1993 International Centre for Mechanical Sciences, Udine (8 lectures on Shape-Memory Materials)

1994 SIAM Conference on Emerging Issues in Mathematics and Computation from the Materials Sciences, Pittsburgh (plenary lecture)

DMV - Seminar 1994: Lecture series on "The Mathematics of Microstructure" organized by the German Mathematical Society, Heinrich-Fabri Institut, Blaubeuren (10 lectures with J. M. Ball)

1995 90th birthday celebration for L. C. Young (lecture on "Applications of Young Measures in Materials Science")

International Conference on Industrial and Applied Mathematics, ICIAM-95, Hamburg (plenary lecture, on "Hysteresis")

1997 Bell Lecture, Department of Mechanical Engineering, Johns Hopkins University (lecture on "New Materials with Exceptionally Large Magnetostriction")

1998 German–American Frontiers of Science, Irving (lecture on "Minimizing energies that have no minimizer and the design of new materials")

1999 Institute Lecture, Isaac Newton Institute, Cambridge ("New Materials with Exceptionally Large Magnetostriction")

2000 Perspectives of Mathematics, a "millenium" conference at Goslar, Germany, Two lectures: "Mathematics of Microstructure", and "Wiggly Energies"

Interdepartmental Nanotechnology Seminar Series, University of Pennsylvania ("Recent research on the behavior of transforming materials at small scales

with applications to MEMS")

2001 British Applied Mathematics Colloquium, Reading University, U. K. (plenary lecture on "Deformable thin films: from macroscale to microscale and from nanoscale to microscale")

Summer School on Multiscale Problems in Nonlinear Analysis, Carnegie Mellon University (4 lectures on "Deformable thin films")

2002 Mary Upson Distinguished Lecture Series, Cornell University (three lectures to the College of Engineering, on "Deformable thin films", "Microstructure and nonattainment" and "Materials that combine ferroelectricity and ferromagnetism")

Frontiers of Solid Mechanics, Drucker Memorial Symposium (lecture), University of Florida ("Special lattice parameters and the design of materials")

2004 Keynote lecture: 3^{rd} GAMM-Seminar on Microstructures, University of Stuttgart, ("A way to search for new smart materials with unprecedented physical properties")

Plenary lecture: Interplay of magnetism and structure in functional materials, Benasque Center for Science, Spain (" 'Unlikely' combinations of physical properties")

Keynote lecture: SPIE Conference on Smart Structures and Materials, San Diego ("A way to search for new smart materials with unprecedented physical properties")

Plenary lecture: IUTAM Conference, Warsaw, Poland (ibid.)

2005 Plenary lecture: Bath Institute for Complex Systems, opening meeting, ("Lessons on structure from the structure of viruses")

James R. and Shirley A. Kliegel lecture, Caltech ("Lessons...", cf. 2005)

2006 Mathematics and Materials, Rome ("Lessons...", cf. 2005, 4 lectures) a minicourse with Weinan E, P-L Lions, F. Otto, G. Marrucci)

Crocco Colloquium (2 lectures: "A way to search...", cf. 2004, and "Lessons...", cf. 2005), Princeton University

Two Keynote Lectures, US National Congress on Theoretical and Applied Mechanics (joint ASCE/ASME), Boulder

Lecture series:"Lessons...", cf. 2005, 8 lectures; TU Munich

10^{th} Anniverary Lecture, Max Planck Institute for Mathematics in the Sciences Leipzig ("New materials from mathematics: real and imagined")

Lecture series: MULTIMAT, Antwerp (3 lectures)

Popular Lectures

1992 Edinburgh Mathematics Society and the Royal Society of Edinburgh (lecture to a general audience on paper folding and the microstructure of crystals)

Edinburgh International Science Festival (general lecture on "Smart Materials")

Mathematics in the Twenty First Century, a panel discussion at the Edinburgh Science Festival (panel member, together with Sir John Kingman (chair), T. B. Benjamin, Feng Kang, Jacob Palais)

Science Now, BBC Radio 4 (popular talk on "Smart Materials")

BBC World Service (popular talk on "Smart Materials")

1998 Research Fair, Graduate School, University of Minnesota (presentation to a general audience on "Smart Materials – How Matter in its Solid Phase Spontaneously Changes Shape")

1999 "Riverside Chat" to Distinguished McKnight University Professors, an after–lunch lecture on Smart Materials

2002 Lunch Talk to members of the Department of Chemical and Biomolecular Engineering ("Prospects and problems for shape memory materials")

2006 Lunch Talk to Student Chapter of the MRS ("Lessons on materials from the

structures of viruses")
Lunch Talk to members of the Space Grant Executive Committee ("New materials, real and imagined")

Invited Lectures at Conferences and Workshops, and Meetings Organized (contributed lectures not listed)

1980 Short Course on "Nonlinear Equations, Bifurcation Theory, and Thermodynamic Inequalities" at the National Bureau of Standards (seminar on thermodynamic inequalities)
23rd Meeting of the Society for Natural Philosophy, Rolla (presentation at a round-table session)
17th Meeting of the Society of Engineering Science (presentation at the session on Continuum Mechanics)

1981 18th Meeting of the Society of Engineering Science (presentation at the session on material instability and failure)
24th Meeting of the Society for Natural Philosophy, University of Illinois (presentation at a round table discussion)

1982 Seminar on Non-elliptic Continuum Mechanics, Madison
19th Meeting of the Society of Engineering Science (presentations at the sessions on Continuum Mechanics and Elasticity)

1983 Workshop on"Media with Microstructure and Wave Propagation," Houghton, Michigan (lecture)
Workshop on "Orienting Polymers," University of Minnesota (lecture)
Workshop on "The Laws and Structure of Continuum Thermodynamics," University of Minnesota (lecture)
Symposium on Phase Transformations at the 20th meeting of the Society of Engineering Science (lecture)
Conference on Phase Transformations and Material Instabilities in Solids, Madison, Wisconsin (lecture)
26th Meeting of the Society for Natural Philosophy (Organizer, with C. Dafermos)

1984 Conference on Phase Transformations in Continuum Mechanics, Madison, Wisconsin (lecture)
12th Southeastern Conference on Theoretical and Applied Mechanics (presentation in the session on localization of deformation)
American Society of Metals symposium on "Elastic Effects on Phase Transformations" (lecture)
20th Meeting of the Society of Engineering Science (presentation in the session of finite elasticity)

1985 Symposium Year on "Material Instabilities in Continuum Mechanics" at Heriot-Watt University (lecture series on Phase Transformations in Solids)
Institute for Mathematics and its Applications workshop on "Metastability and Incompletely Posed Problems," University of Minnesota(lecture)

1986 Symposium on Non-classical Continuum Mechanics: Abstract Techniques and Applications, University of Durham, U.K. (lecture)
Conference on "The Calculus of Variations and Nonlinear Elasticity; Theory and Numerical Analysis," Heriot-Watt University (lecture)

1987 Society of Metals Conference on Phase Transformations, Cambridge (lecture)
Institute for Mathematics and its Applications workshop on "Strain Softening and Localization" (lecture)

1988 Applied Mechanics and Engineering Sciences Conference, Berkeley (short talk)

The Mathematical Analysis of Material Microstructure (Meeting organized with R. Lipton, held at the Mathematical Sciences Institute, Cornell University)
Army Research Office Workshop on Smart Materials, Structures and Mathematical Issues, Blacksburg, Virginia (short presentation)
AMS Conference on Mathematical Problems Posed by Anisotropic Materials, Bowdoin College (co-organized with J. Taylor [chair], J. Cahn, R. Kohn)
Conference on Partial Differential Equations and Continuum Models of Phase Transitions, Nice, France (lecture)
Workshop on Random Media and Composites, Xerox Training Center (lecture)

1989 Workshop on Regularity Problems in Nonlinear Elasticity, Heriot-Watt University (lecture)
Interdisciplinary Conference on Continuum Mechanics; Program for Foundational Studies, Ohio State University (co-organizer)
Problems in Liquid Crystals and Multiphase Materials, International School for Advanced Studies, Trieste (lecture)
"Elasticity Retreat," MIT's Talbot House, South Pomfret (lecture)
Calculus of Variations: Elasticity and Crystals, Centro Internazionale per la Ricerca Matematica, Trento

1990 U.S./Japan Workshop on Smart/Intelligent Materials and Structures, Honolulu (lecture and position paper)
Workshop on Dynamics of Phase Transformations, Courant Institute
XIth U. S. National Congress of Applied Mechanics, University of Arizona, Tucson (co-organized with J. Jenkins the symposium on Material Instabilities)
Mathematical Problems in Nonlinear Elasticity, Oberwolfach, Germany (lecture)
Army High Performance Computing Center opening ceremonies (lecture)
Calculus of Variations and Nonlinear Material Behavior, Carnegie-Mellon University (lecture)
Workshop on Microstructure and Phase Transition, Institute for Mathematics and its Applications Workshop organized with D. Kinderlehrer, J. L. Ericksen, and M. Luskin

1991 Workshop on Homogenization, Mathematical Sciences Research Institute, Berkeley (lecture)
American Association for the Advancement of Science, Washington, D. C. (lecture)
Contemporary Developments in Solid Mechanics, in honor of the 60th birthday of J. K. Knowles, Caltech (lecture)
Seminar on Dynamics and Flow Systems, University of Minnesota
Theory of Martensite, an informal workshop organized by Greg Olson, Northwestern University
Army Conference on Applied Mathematics and Computing, University of Minnesota (lecture)
International Centre for Mathematical Sciences opening meeting, Mathematical Problems in Materials Science, Royal Society of Edinburgh
Workshop on Whiskered Microstructures, Carnegie Mellon University (co-organized with D. Kinderlehrer and T. Einstein)
Materials Research Society meeting on Theory and Applications of Shape-Memory Materials, Boston (short talk)

1992 Thermodynamics of Materials, Oberwolfach, Germany (lecture)
Transitions de Phase, Université de Metz (lecture)
The Microstructure of Crystals (Organizer, with J. M. Ball), ICMS, Edinburgh
Micromagnetics and Magnetostriction (Organizer, with D. G. Lord and A. De Simone, and speaker), ICMS, Edinburgh

International Conference on Martensitic Transformations, Monterey
Workshop on Computational Methods in Materials Science (Organizer, with R. A. Nicolaides, D. Kinderlehrer and J. Turner), Carnegie-Mellon University
Society for Natural Philosophy, Pennsylvania State University (lecture)

1993
Society of Photo-Optical Instrumentation Engineers conference on Smart Structures and Materials
Eleventh Army Conference on Applied Mathematics and Computing, Carnegie Mellon University
Workshop on Metastability and Hysteresis, International Centre for Mathematical Sciences, Edinburgh
Workshop on Continuum Issues in Phase Transformations and other Recent Developments in Solid Mechanics, MIT's Talbot House, S. Pomfret, Vermont
A gathering of research workers with interests on the metastability, hysteresis, kinetics and microstructure of martensite, University of Minnesota (organizer)
Workshop on Material Microstructure, Institute for Advanced Study, Princeton

1994
Workshop on Micromechanics of Small Volumes, Institute for Mechanics and Materials, San Diego (co-organized with W. Gerberich and T. Shield)
SPIE Conference on Smart Structures and Materials (program committee and lecture)
12th U.S. National Congress on Applied Mechanics, Seattle (lecture)
Meeting on Calculus of Variations and Discontinuous Structures, Como, Italy (lecture)
38th Meeting of the Society for Natural Philosophy, Cornell University (lecture)
31st Meeting of the Society for Engineering Science, Texas A&M University (lecture)
ONR Meeting on Adaptive Quiet Structures with Active Materials, University of Maryland (research summary)
ASME Symposium on the Mechanics of Phase Transformations and Shape Memory Alloys, Chicago (lecture)
Mathematical Problems in Micromagnetics, University of Freiburg (lecture)

1995
SPIE Conference on Smart Structures and Materials, San Diego (two short talks)
Workshop on Fractal Analysis and the Modeling of Materials, Los Alamos (lecture)
Workshop on Adaptive Quiet Structures, Naval Research Laboratory, Washington, D. C. (research summary)
Symposia on the "Mathematics of Thermodynamically Driven Microstructural Evolution" and "Design of Optimal Microstructures" at TMS, Cleveland (two short talks)

1996
SPIE Conference on Smart Structures and Materials, San Diego (four short talks)
Landscape Paradigms in Physics and Biology, Los Alamos (lecture)
ASME Symposium in Honor of J. L. Ericksen, Baltimore (lecture)
Conference on the Calculus of Variations, Oberwolfach (lecture)
DARPA Technology Interchange on Smart Materials, Washington, D. C. (research summary)
Conference on Phase Transformations and Nonlinear Elasticity, MIT's Talbot House, South Pomfret, Vermont (lecture)
Applied Mathematics Workshop for Materials Science and Industrial Applications Penn State University (lecture)

1997
Los Alamos Days, University of Arizona, Tucson (lecture)
SPIE Conference on Smart Structures and Materials, San Diego (short talk)
Workshop on the Relation between Atomic and Continuum Theory, CalTech (lecture)
SIAM Conference on Mathematical Aspects of Materials Science (program committee, symposium organizer, three talks)

Piezoelectrics Planning Workshop, ONR, Washington, D. C. (lecture)
Dynamic Deformation and Failure Mechanics of Materials, Conference in Honor of the 60th Birthday of Rodney J. Clifton, Caltech (lecture)
Mathematical Continuum Mechanics, Oberwolfach (conference organizer, with Alexander Mielke and John Ball)
McNU '97, Joint meeting of ASME, SES, etc. (two short talks)
DARPA Technology Interchange on Smart Materials, Washington, D. C. (lecture)
Conference on Continuum Physics and Analysis, Center for Nonlinear Analysis, Carnegie Mellon University (lecture)
Symposium on Calculus of Variations and PDE with Applications to Materials Science, AMS regional meeting, Atlanta (lecture)
DARPA/Boeing Technology Interchange on Shape Memory Alloys, University of Minnesota (host, lecture)
ASME, Symposia on Smart Materials and Functionally Graded Materials, Dallas (two short talks)

1998
SPIE Conference on Smart Structures and Materials, San Diego (lecture + short presentation to Shape Memory Alloy Consortium)
Conference on PDE and Continuum Mechanics, in honor of the 50th birthday of J. M. Ball (organizer, with S. Müller and V. Sverak)
Interdisciplinary Symposium on Mathematics in the Sciences, M–P–I Leipzig
MartWerks98: Martensite Theory Workshop, Northwestern University
MURI Kick-off, Computational tools for the atomic/continuum interface: nanometer to millimeter scale aircraft (organizer + short talk)
AFOSR Grantees and Contractors Meeting, WPAFB (lecture)
Society of Engineering Science, Pullman, Washington (two lectures)
American Mathematical Society Meeting on Mathematical Modeling of Inhomogeneous Materials: Homogenization and Related Topics, Penn State (lecture)
MURI discussion meeting, Caltech

1999
SPIE Conference on Smart Structures and Materials, Newport Beach (lecture + short presentation to Shape Memory Alloy Consortium)
DARPA conference on Biologically Inspired Flight
Workshop on Passage from Atomic to Continuum Scales, Max Planck Society, Castle Ringberg, Tegernsee, Germany (Organizer, with S. Müller, G. Friesecke and E. Salje)
DARPA TIM on Actuators, Newport News, VA (two presentations)
ASME Applied Mechanics Conference, Blacksburg (short talk)
MURI Review, Minneapolis (organizer and speaker)
DARPA Final Review, Shape Memory Alloy Consortium, Washington, DC
Isaac Newton Institute Workshops: Phase transformations and Homogenization, and Nonlocal Effects in Materials, Cambridge (two lectures)
MMM - Magnetism and Magnetic Materials, San Jose (3/4 hr. presentation)
Jam Session in California: an informal conference on the passage from atomic to continuum level, Pasadena (speaker)
Workshop on Dynamics, Oxford University (lecture)

2000
Jam Session in Minnesota: an informal IMA conference on the passage from atomic to continuum level (organizer, speaker)
MURI Workshop on Multiscale Physics, Newport, RI (speaker)
SIAM meeting on Mathematical Aspects of Materials Science, Philadelphia (main organizer with G. McFadden, two talks))
ARO Conference on Solid Mechanics, UCLA (lecture on research trends)
Aero-Smart, AFOSR meeting to reveiw Smart Materials, Texas A & M (lecture)

AFOSR 2000 Grantees Review in Mechanics and Materials, Dayton (lecture)
Mathematical Continuum Mechanics, Mathematisches Forschungsinstitut, Oberwolfach, Germany (organizer, with Stefan Müller and John Ball))

2001
MURI mid-term review, Caltech (organizer, speaker)
Jam Session: an informal conference on multiscale methods, Villard de Lans (speaker, 8hrs.)
MURI Workshop on Multiscale Physics, Newport, RI (speaker)
SPIE meeting on Smart Materials and Structures, Newport Beach (speaker)
AAM-NSF Conference on "Future Directions in Solid Mechanics", Northwestern University (participant)
International Conference on Adaptive and Smart Technologies, University of Maryland (Survey lecture on ferrromagnetic shape memory materials)

2002
SPIE, San Diego (short presentation, program review)
M^4-2002 Magnetic Sensor Materials & Devices, Iowa State University, Ames Iowa (lecture)
Gordon Conference on the mechanical behavior of thin films, Colby College, Maine (lecture)
MURI review, Minneapolis (organizer and two lectures)
AFOSR Contractors Meeting for Solid and Fluid Mechanics, Washington, DC (presentat of results of MURI research)
MURI review, MIT (presentation)
Conference on Current Trends in Mathematics and its Applications, in honor or Avner Friedman, Minneapolis (lecture)
Quasiconvexity and its Applications, Perspectives 50 years after C. B. Morrey's seminal paper, Princeton University (lecture)
Lunch Talk in the Department of Chemical and Biomolecular Engineering, Cornell University (informal presentation on martensite, shape-memory and future prospects)

2003
SPIE, San Diego (presentation, MURI program review)
US-EU Conference on Phase Transformations in Crystalline Solids, Digital Technology Center, University of Minnesota (organizer, with P. H. Leo, M. Luskin)
Conference on Nanomechanics, AHPCRC (lecture)
Calculus of Variations, Partial Differential Equations, and Multiscale Phenomena Carnegie Mellon University (lecture)
MURI review, University of Maryland (lecture)
Final MURI review, University of Minesota (organizer, two presentations)
SNP Meeting/IMA Conference: Multiscale Effects in Material Microstructures and Defects, Lexington (lecture)
PDE and Materials, Oberwolfach (organizer, with S. Müller and J. M. Ball)

2004
ARO Workshop, Inverse Techniques in Materials Design (lecture)
International Conference on Mechanics and PDE's, in honor of Marshall Slemrod, Madison, Wisconsin (lecture)
AHPCRC Review, Maryland (lecture and report on research of the Nano Portfolio)
SIAM meeting on Materials Science, Los Angeles (short presentation)
Variational Problems in Materials Science, Trieste (lecture)
25^{th} Anniversary of AEM (short presentation on research in Solid Mechanics)
Seminar on Multiscale Modeling and Computation, IMA, Minneapolis (lecture)
MURI Review, University of Maryland (lecture)
Prospects for Mathematics and Mechanics upon the 80^{th} birthday of Jerry Ericksen, IMA, Minneapolis (organizer, lecture)
Future Challenges in Multiscale Modeling and Simulation, IMA, Minneapolis (lecture)
Mathematical Models in Materials Science, Ferrara, Italy (lecture)

2005 Workshop on Kinetics of Phase Transformations, Caltech (lecture)
Materials Research Society Meeting, San Francisco (lecture)
Workshops organized at the IMA, Minneapolis: Atomic Motion to Macroscopic Models: the Problem of Disparate Temporal and Spatial Scales in Matter, and Effective Theories for Materials and Macromolecules
Seminar on Multiscale Modeling and Computation, IMA, Minneapolis (lecture)
Advanced Active Thin Film Materials for the next Generation of Meso–Micro Scale Army Applications, Destin, Florida (lecture)
AHPCRC Review of the Nanotechnology Portfolio, Adelphi, Md (organizer, speaker)
SIAM Annual Meeting, Session on Geometry and Materials, New Orleans (lecture)
AHPCRC Annual Review (organizer, speaker)
DOE Multiscale project, kick-off (presentation on research)
First International Conference on Mechanics of Biomaterials & Tissues, Hawaii (lecture)

2006 Kick-off meeting for MURI project on Galfenol, University of Maryland (lecture)
Nanomechanics of Biomolecules, Ascona (organizer and speaker)
Multiscale Materials Modelling (MMM), Freiburg (symposium organizer and speaker)
PDE and Materials, Oberwolfach (organizer, with S. Müller and Sir John Ball)
Conference on Applied Analysis on the Occasion of the 65$^{\text{th}}$ birthday David Kinderlehrer, Carnegie Mellon University (lecture)
AHPCRC Annual Review (presentations on nano portfolio and individual project)

Thesis Students

1. Ho-Il Chung, M.Sc., Temperature increase during stress-induced phase transformation of the shape-memory alloy CuZnAl, Brown University, 1985 (at last contact, in shape-memory industry in Connecticut)
2. Xiaoping Liu, Ph.D., Stability of reversible martensitic materials and cloth under biaxial stretching, University of Minnesota, 1989 (formerly Assistant Professor, Department of Manufacturing Engineering, University of St. Thomas, now doing US–China joint business ventures)
3. Kaushik Bhattacharya, Ph.D., Microstructure of martensite, University of Minnesota, 1991 (currently Professor, Division of Applied Science, Caltech)
4. Antonio De Simone, Ph.D., Magnetization curves of ferromagnetic materials, University of Minnesota, 1992 (currently Professor, S.I.S.S.A., Trieste)
5. Chunhwa Chu, Ph.D., Hysteresis and microstructures: a study of biaxial loading on compound twins of copper-aluminum-nickel single crystals, University of Minnesota 1993 (currently Developmental Math Specialist/Learning Services Support Program Coordinator, College of Notre Dame, Belmont, CA)
6. Brian Berg, Ph.D. Bending of superelastic wires, University of Minnesota 1993 (currently Scientist, Boston Scientific)
7. Narendra Simha, Ph.D., The Mechanics of the tetragonal to monoclinic transition of zirconia and transformation toughening, jointly advised with Prof. Truskinovsky University of Minnesota 1994 (currently Assistant Professor, University of Minnesota, Orthopaedics)
8. Shad T. Jeseritz, M.S., Boundary-induced two-way shape memory effect in CuAlNi University of Minnesota 1995 (currently with the Air Force in Colorado Springs)
9. Paolo Aquilar, M.S., Paper folding, University of Minnesota 1995 (deceased; formerly President of *Kinematix*, doing commercial development of paper folding designs)
10. Bo Li, M.S., Computation of microstructure, University of Minnesota 1995 (currently Associate Professor, Department of Mathematics, UCSD)
11. Robert Tickle, Ph.D., Ferromagnetic shape memory materials, University of Minnesota, 2000 (currently running start-up company on computer aided machining, Minneapolis)

12. William Sheridan, M.S., Biaxial experiments on liquid crystal polymers, University of Minnesota, 2001 (currently at the Structural Dynamics Division of Boeing)
13. Richard Jun Cui, Ph.D., Martensitic phase transformation and ferromagnetic shape memory effect in iron palladium single crystals (currently Bioscience, Combichemistry and Characterization Technologies, GE Global Research Center, Albany)
14. Wayne Falk, Ph.D., Mechanics of Bacteriophage T4 tail sheath (currently ESPE Dental Products, 3M)
15. Liping Liu, Ph.D., Multiscale analysis and modeling of magnetostructive composites (currently postdoc, Caltech)

Current students: Liping Liu (joint with Perry Leo), John Messier (joint with Tom Shield), Shankar Krishnan, Jerry Zhang;

Postdoctoral Fellows

Oscar Bruno (Professor, Caltech), Nikan Firoozye (S. C. Bernstein), Tatiana Wilenski (unknown), Chunhwa Chu (Developmental Math Specialist/Learning Services Support Program Coordinator, College of Notre Dame, Belmont, CA), Hungyu Tsai (Assistant Professor, Michigan State University), Gustavo Gioia (Assistant Professor, Theoretical and Applied Mechanics, Illinois), Jian Li (Professor, Huazhong University), Raffaella Rizzoni (Dipartimento di Ingegneria, Ferrara), Guiseppe Puglisi (Università di Barri), Kevin Hane (Assistant Professor, University of Akron), Bill Qi Pan (Micron Corp.), Rob Tickle (Start-up), Martin Tijssens (TNO Madymo, Delft), Marcel Arndt (current, shared with Luskin, Tadmor), Soren Flexner (current, shared with Palmstrøm), Kaushik Dayal (joint with Elliott).

Consulting

Current: none. Previous: Damping in shape memory materials; shape-memory materials in medicine with various companies; computations on active materials.

Patents and Disclosures

Z04054, Highly reversible shape-memory and other alloys, R. D. James and Z. Zhang, pending.

Research Grants (continuing grants not relisted)

2006 NSF-FRG: Collaborative research on modeling and computation of objective structures in materials science and biology, submitted
MURI: Materials on the brink: unprecedented transforming materials, submitted, with participants from Caltech and the University of Maryland
NIH, R21 EB005997-01, "Combinatorial Discovery of Memory Alloys for Fracture Resistant Arterial Stents", with participants from from the University of Maryland, General Electric, Boston Scientific
MURI, Development of Galfenol, with Beth Stadler (ECE) and participants from the University of Maryland, 100K

2005 Phase II STTR, N03-T002, Marlow Corporation (administered by ONR), Compositions and processing for improved high temperature shape memory alloys,
Phase II STTR, AF03-T010, Dominca (administered by AFOSR), Development of a shear stress sensor, with M. Luskin and C. Palmstrøm, $ 210K, 2 years.
DESIGN OF ACTIVE MATERIALS: new transforming materials with unprecedented physical and mechanical properties, PI: James, $ 150K/year, 2 years.
Multiscale Methods for Active Materials and HPC, Army High Performance Computing Center, PI: James, approx. $ 100K/year.
Multiscale Design of Advanced Materials based on Hybrid *Ab Initio* and

Quasicontinuum Methods, PI: James, with M. Luskin, E. Tadmor and others from UCSD, PNNL, PI: Luskin, 2M, 3 years.

2003 NIRT: Nanotechnology and Interdisciplinary Research, Nanoscale shape memory actuators and swimming bugs – theory, computing, and MBE synthesis. PIs: James, Luskin, Palmstrom, $ 250K/year, 4 years.

Multiscale Methods for Active Materials and HPC, Army High Performance Computing Center, PI: James, $ 100K/year, 1 year (possible renewal).

Graduate school, to run the US-EU meeting on Phase Transformations in Crystalline Solids, 8K.

2002 Postdoctoral grant, for G. Fadda, Development of Multiscale Methods for Atomic to Continuum, Minnesota Supercomputer Institute, approx. $ 20K.

2001 Multiferroic Materials, MURI project administered by ONR (Minnesota PIs: James, Shield), $ 135K/year, 3+2 years, Minnesota part.

Artificial Homo-Biferroic Multilayers, CAESAR Institute, Bonn 6K/year travel grant.

Computational Tools for the Atomic/Continuum Interface. Successful renewal of +2 of 3+2 funding.

2000 Mathematical theory and numerical methods for microscale biomedical devices, with M. Luskin and H. Othmer, NSF $ 865,168/3 years.

Investigation of Ferromagnetic Shape Memory in Heusler Alloys, with James MacLaren, ONR, $ 46K/2 years

Development of ferromagnetic shape memory alloys, with R. O'Handley, M. Wuttig, Mide Corp., Boeing, DARPA $ 158,000/18 mo.

Travel grant for travel to Mathematisches Forshungsinstitut Oberwolfach, The Clay Mathematics Institute, $ 1500K

1999 DURIP Equipment grant for a magnetomechanical testing machine, with T. Shield, DoD $ 250,000.

Investigation of Ferromagnetic Shape Memory in Heusler Alloys, with James MacLaren, ONR $ 50,000./6 months

1998 MURI: Computational Tools for the Atomic/Continuum Interface: Nanometer to Millimeter Scale Aircraft, $ 5 million/3+2 years, PI=RDJ, with participants from the U of M, Cornell, Yale and Caltech

Design, Modeling and Computation of Active Thin Films, ARO, $ 94,991 for 98–99

Shape–Memory and Magneto–Memory Materials: Strategies for Improvement, Reliability and Small Scale Behavior, ONR, $ 332,463 for 1998–2001

1997 Experimental, Analytical and Computational Study of Nematic Optical Polymers $ 215,014/3 years, with E. Fried and D. Carlson (NSF Mechanics)

Active Thin Films and Tiny Aircraft $ 119,913/6 months, with M. Luskin (AFOSR)

Novel High Performance Magnetoferroelastic Actuators with M. Wuttig and Boeing, $ 544,000/2 years (U of M portion, $ 158,000/2 years), (DARPA)

Research Experience for Undergraduates, $ 5,000 (NSF)

1996 Analysis, Design and Computation of Active Materials, 7/96-6/99 $ 184,914, with M. Luskin

ASSERT award for graduate students, 8/91-6/98, $ 804,466 (ONR)

1995 Shape Memory and Magnetostrictive Materials: Composites, Small Volumes and Strategies for Improvement, $ 328,000/3 years, with T. W. Shield

Transitions and Defects in Ordered Materials, $ 745,000/5 years with M. Luskin and D. Kinderlehrer (NSF Applied Mathematics)

Novel High Performance Magnetoferroelastic Actuators with M. Wuttig and T. Shield (DARPA) $ 478,860/2.25 years

1993 ASSERT award for a graduate student, (ARO)

1992 ASSERT award for a graduate student, (ONR)

1991 "Basic Research on the Improvement of Magnetostrictive and Shape-Memory Materials," $384,000/3 years (ONR)
"Transitions and Defects in Ordered Materials," $750,000/3 years, with M. Luskin and D. Kinderlehrer (NSF, 5 programs in engineering and mathematics)
"Transitions and Defects in Crystals," $150,000/year, with M. Luskin and D. Kinderlehrer; postdoctoral support (ARO)
"Transitions, Defects and Whiskered Microstructures," $570,598/3 years, with M. Luskin and D. Kinderlehrer (AFOSR)
"Mathematical Problems in Materials Science," support for a year-long activity in this area, with J. M. Ball (SERC)

1990 Graduate School, for EDM machine, $20,000, with P. Leo and T. Shield

1989 Army High Performance Computing Research Center, $65,000,000/approx. 5 years. Small fraction of this for research support. Supports one student.
"Instrumentation for Studies of Stress-Induced Phase Transformation," $56,261, (NSF)
"Research on the Improvement of Shape-Memory and Related Materials," approx. $90,000/yr. (Army URI program)

1988 "Transitions and Defects in Ordered Media − Nonlinear Analysis, Computation and Experiment," with J.L. Ericksen, D. Kinderlehrer, P. Leo, M. Luskin, $1,034,736/3 years. Supported by five programs at NSF

1987 Travel to Institute of Metals Conference on Phase Transformations, Cambridge (European ARO office), approx. $2,000

1986 "Phase Transformations in Solids," National Science Foundation. $108,824/2 years. (Submitted on April 29, 1986. Funded February 1, 1987. Proposal/Project Number 8664132)
"Instrumentation for Studies of Stress-Induced Phase Transformations," DOD-University Research Inst. Program. $102,501 + 25% contributed by the University of Minnesota (Awarded: April 15, 1986). Eventually the University of Minnesota contributed approximately $75,000 due to increases in the exchange rate.

1985 Start-up funds for laboratory on the microstructure and behavior of crystals, $120,000, University of Minnesota

1984 "Mechanics of Multiphase Microstructures," National Science Foundation (Materials Research Laboratory), $20,000 (Awarded: 7/84)

1983 "Mechanics of Martensitic Transformations," National Science Foundation (Materials Research Laboratory), $12,500 (Awarded: 7/83)
"The Acoustic Wave Distributed Feedback Laser," Cottrell Foundation, $14,000. With N.M. Lawandy (Awarded: 4/83)

1982 "Thermomechanics of First-Order Phase Transformations in Solids" National Science Foundation (MEA-8209303), $106,887 (Awarded: 11/82)

1980 "Investigations in Thermomechanics on the Shape-Memory Phenomenon," National Science Foundation, $105,500. With R.L. Fosdick