Richard D. James

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Education

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

Professional Appointments

2016 - 2025	Graduate Faculty - Department of Chemical Engineering and Materials Science (Senior Affiliate Member)
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 Minnesota

Visiting Positions

2019	Simons Fellow at the Isaac Newton Institute for Mathematical Sciences, Cambridge (Design of Materials Program) (5 months)
2016	Visiting Professorship (partly funded by the Leverhulme Trust), Mathematics Institute, Oxford (Fall term); Kieler Woche academic guest
2013 - 2014	Visiting Professor, Mathematics Institute, Oxford University (10 months)
2012	Visiting Professor, Hausdorff Institute, Bonn, for Mathematical Challenges of Materials Science and Condensed Matter Physics (organizer; supported by the Humboldt foundation, 2 months)
2010	Copernicus Visiting Scientist, University of Ferrara (1 month)
2006	John von Neumann Professorship, TU Munich (2 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)

Honors and Fellowships

2022 Advisor of Vinitendra Singh and Kalpesh Jaykar, winners of John & Jane Dunning Copper Fellowships (top two grades in AEM on the Written Preliminary Exam).

2020 TechConnect Business Innovation Award, for ferroelectric energy conversion (https://cse.umn.edu/aem/news/professor-richard-james-receives-techconnect-innovation-award); Advisor of Anjanroop Singh, recipient of the John and Jane Dunning Copper Fellowship.

2019 Vannevar Bush Faculty Fellowship (3M/5years for "blue sky" research; approximately ten awarded per year in all areas of science, engineering and mathematics); Mercator Fellow (Fellowship of the DFG for collaboration with German Researchers)

2018 Simons Fellow, Isaac Newton Institute for the Mathematical Sciences, Cambridge; Advisor of Gunjan Pahlani, awarded a John & Jane Dunning Copper Fellowship.

2014 Theodore von Kármán Prize, SIAM, shared with Weinan E; awarded at 5 year intervals, https://www.siam.org/prizes/sponsored/vonkarman.php

2009 Brown Engineering Alumni Medal, Brown University

2008 William Prager Medal, Society of Engineering Science; Warner T. Koiter Medal, American Society of Mechanical Engineers (ASME); Co-advisor (with P. H. Leo) to Liping Liu, winner of the Best Dissertation Award in the Physical Sciences and Engineering (2008) at the University of Minnesota; Advisor of Amartya Banerjee, awarded the John & Jane Dunning Copper Fellowship

2007 Honorary Consultant Professorship, Huazhong University of Science and Technology, Wuhan, China

2006 - 2007 Alexander von Humboldt Senior Research Award (Humboldtpreis – Metal Physics)

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. [68], 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 (One award given each year for research to a member of a department of science, engineering or mathematics at the University of Minnesota)

1976 - 1978 IBM Fellow at the Johns Hopkins University

Significant Committees

2017 Hiring committee: full professorship in Applied Mathematics and Modeling at TU Munich.

2016	Scientific Committee – Newton Institute Program on the Mathematical Design of New Materials; Committee on Climate-Smart Municipalities, Institute on the Environment (Exchange program between cities in Minnesota and Germany on implementation of clean energy infrastructure); CAREER Panel meeting (NSF)
2014	Hiring committees at Oxford: an Associate Professor Position, and a Junior Research Fellowship at Christ Church
2013	International Conference Committee of ICFSMA
2011 - 2013	Consultant for the Mathematics of Planet Earth 2013 initiative
2011	NSF Panels for the Career Award (CMMI) and the MRSEC Program
2010	NSF Panel in Civil, Mechanical and Manufacturing Engineering (CMMI)
2009 -	Energy Steering Committee (ESC), NSF Math and Physical Sciences Directorate (committee to map funding strategies for energy research at NSF), Organizing Committee, Hausdorff Institute of Mathematics, University of Bonn
2007 -	Referee/assessor for full professorships: Applied Analysis at the University of Bonn, Mathematical Biology at the University of Bristol
2006 -	Search committee for Department Head of Aerospace Engineering and Mechanics
2005 -	Scientific Advisory Board for the field of Mechanics, École Polytechnique
2003 - 2006	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	NSF advisory committee on Future Directions in Solid Mechanics 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)

Editorial Positions

2018-	Editor, with C. Dafermos and P. Maria Mariano, Birkhauser series on "Progress in Continuum Mechanics"

1999 - 2019 Chief Editor, with Sir J. M. Ball, *Archive for Rational Mechanics and Analysis*

1997 - Editorial Advisor, *Journal of the Mechanics and Physics of Solids*

2002 - 2005 Contributing Editor, *Mechanics of Advanced Materials and Structures*

2001 - 2006 Editorial Advisory Board, *SIAM Journal on Multiscale Analysis, Modeling and Simulation*

1998 - 2002 Editorial Board, *Interfaces and Free Boundaries*

1996 - 2009 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*,

1988 - 2005 Editorial Board, *Continuum Mechanics and Thermodynamics*

Professional Organizations

(typical) SIAM, MRS; various other societies of mathematics, mechanics, materials science on an occasional basis

Publications

(see also Google Scholar, `https://scholar.google.com/citations?user=gIS0-ekAAAAJ&hl=en`

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. L. Fosdick and R. D. James, The elastica and the problem of pure pending for a non-convex stored energy function, *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, G. Friesecke, and R. D. James, The mathematics of microstructure and the design of new materials, *PNAS* **96**, 8332–8333, doi: 10.1073/pnas.96.15.8332 (July 20, 1999)
60. 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.
61. 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.
62. 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.
63. 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.
64. 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.
65. R. Tickle and R. D. James, Magnetic and magnetomechanical properties of Ni_2MnGa *J. Magnetism and Magnetic Materials*, **195** (1999), pp. 627–638.
66. 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. .

67. Richard D. James and Kevin F. Hane, Martensitic transformations and shape memory materials, *Acta mater.*, **48** (2000), pp. 197–222.

68. 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.

69. R. D. James and R. Rizzoni, Pressurized shape memory thin films, *J. Elasticity* **59** (2000), pp. 399–436.

70. 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.

71. Qi Pan and R. D. James, Micromagnetic study of Ni_2MnGa under applied field, *J. Applied Physics* **87** (2000), pp. 4702–4706.

72. Monique Dauge, Gero Friesecke, Richard James, Korn inequalities for thin films, preprint.

73. 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

74. Antonio DeSimone and Richard D. James, A constrained theory of magnetoelasticity, *J. Mechanics and Physics of Solids*, **50** (2002), pp. 283–320.

75. 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.

76. 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.* **55** (2002), 1461–1506.

77. 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.

78. R. D. James and R. Rizzoni, Piecewise rigid body mechanics, *J. Nonlinear Sci.* **13** (2003), 165–114.

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80. 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.

81. 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 I* **334** (2002), pp. 173–178.

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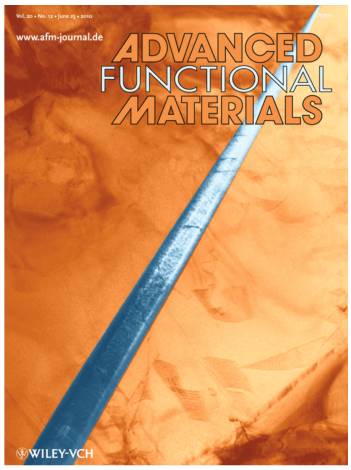

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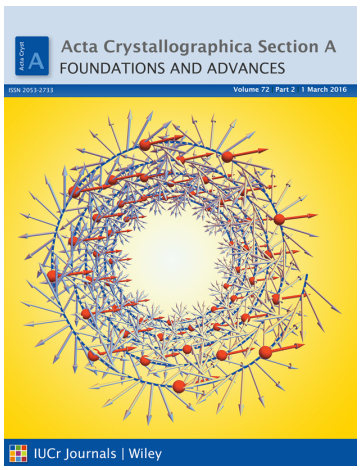

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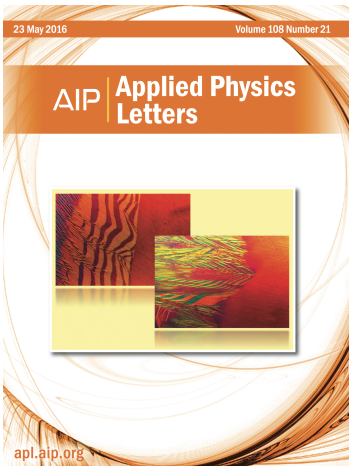

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Books and Book Chapters

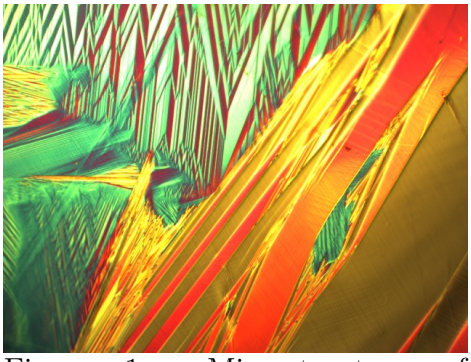

Figure 1: Microstructure of the "cofactor alloy" $Zn_{45}Au_{30}Cu_{25}$ taken from the video in [123]. See also [122,141].

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)

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Plenary and Named Lectures (55 as of 2023)

1994	Plenary lecture: SIAM Conference on Emerging Issues in Mathematics and Computation from the Materials Sciences, Pittsburgh
1995	90th birthday celebration for L. C. Young, "Applications of Young Measures in Materials Science"); Plenary lecture: ICIAM-95, Hamburg, "Hysteresis"
1997	Bell Lecture, Department of Mechanical Engineering, Johns Hopkins University, "New materials with exceptionally large magnetostriction"
1998	German–American Frontiers of Science, Irving, "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	Interdepartmental Nanotechnology Seminar Series, University of Pennsylvania "Recent research on the behavior of transforming materials at small scales"
2001	Plenary lecture: British Applied Mathematics Colloquium, Reading University, "Deformable thin films: from macro to micro and from nano to micro scales"
2002	Frontiers of Solid Mechanics, Drucker Memorial Symposium, University of Florida, "Special lattice parameters and the design of materials"
2004	Keynote lecture: 3^{rd} GAMM-Seminar on Microstructures, 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, "A way to search ..."

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 on structure..."

2006 Crocco Colloquium, Princeton, 2 lectures: "A way to search...","Lessons on..."; Two keynote lectures, US National Congress on Theoretical and Applied Mechanics (joint ASCE/ASME), Boulder; 10^{th} Anniversary Lecture, Max Planck Institute for Mathematics in the Sciences Leipzig, "New materials from mathematics: real and imagined"

2007 Plenary lecture: International Conference on Thermomechanical Modeling of Solids École Polytechnique, Paris, "Relation between compatibility and hysteresis..."; Keynote lecture: Society of Engineering Science, College Station, "Relation between compatibility and hysteresis and the search for new smart materials"; Penrose Lecture, Department of Aerospace Engineering and Mechanics, U of M

2008 Aziz Lectures, Department of Mathematics, University of Maryland, "Objective molecular dynamics" and "New materials from mathematics: real and imagined"; Plenary lecture: SIAM Conference on Mathematical Aspects of Materials Science; Prager Medal Lecture: Society of Engineering Science, "Objective MD"; Koiter Medal Lecture: ASME International Congress, "Objective MD"

2009 Mork Family Distinguished Lecture, Department of Chemical Engineering and Materials Science, USC, "Objective molecular dynamics"; Pacific Institute for the Mathematical Sciences – Center for Scientific Computing PIMS-CSC Distinguished Speaker, "Objective molecular dynamics"; Keynote Lecture: IAMCS Workshop on Math/Computational Challenges in Multi- scale Materials Modeling, "Viscometry of bulk materials and atomic structures"

2010 Plenary Lecture, Annual meeting of the Greater Midwestern Space Grant Consortium, "New materials: real and imagined"

2011 Plenary Lecture, TMS, San Diego, "Hysteresis, reversibility and shape memory"; Plenary Lecture, ISDMM11, 5th International Symposium on Defect and Material Mechanics, Seville, Spain, "Defects and reversibility in phase transformations"

2012 James K. Kno wles Lecture, Caltech (3^{rd} in this series), "Materials for the direct conversion of heat to electricity"; Keynote Lecture (one of three), ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems, Stone Mountain, GA, "The direct conversion of heat to electricity using multiferroic materials with phase transformations"

2013 Pedro Nunes Lecture, Lisbon, "New methods for the direct conversion of heat to electricity suggested by geometry"; Plenary Lecture (1 of 1), Mandel Symposium, "Compatibility, hysteresis and the direct conversion of heat to electricity" (June 27); Plenary Lecture (1 of 1), Oxford Solid Mechanics Meeting, "Compatibility, hysteresis and the direct conversion of heat to electricity"; Lecture (1 of 2), 2013 Heinz Gumin Prize Ceremony, in honor of the awarding of the prize to Stefan Müller

2014 "Landscapes of Mathematics" series, University of Bath; Theodore von Kármán Prize Lecture, SIAM Annual Meeting, Chicago.

2015 Department of Mechanical Engineering Distinguished Lecture, Colorado School of Mines; Plenary Lecture, ESOMAT 2015 (Antwerp); Panorama of Mathematics (Hausdorff Institute: Bonn)

2016 Keynote Lecture: 2nd Midwest Workshop on Mechanics of Materials and Structures (Northwestern)

2017 Timoshenko Lecture (Stanford University); Golden Medallion Lecture, College of Science and Engineering (UMN); Plenary lecture: SMST-2017, San Diego; Distinguished Lecture at IAS, Hong Kong University of Science and Technology

2018 Invited lecture, International Congress of Mathematicians, Rio de Janeiro; The Hooke Public Lecture (Oxford University, `https://www.youtube.com/watch?v=IBvHw_5mlRc`); Plenary: AMS Current Events Bulletin, Joint Mathematics Meetings, San Diego; Tedori-Callinan Distinguished Lecture, Department of Mechanical Engineering, University of Pennsylvania

2019 Challenges in Mechanics (Joint Pisa/Rome colloquium series); Truesdell Lecture (Society for Natural Philosophy)

2020 Keynote lecture: GAMM Seminar on Microstructures (Freiburg, Germany)

2023 Keynote lecture: 13th International Symposium on Hysteresis Modeling and Micromagnetics (Vienna, Austria)

Lecture Series (21 as of 2019)

1993 Lecture series: International Centre for Mechanical Sciences, Udine (8 lectures on shape memory materials)

1994 Lecture series: DMV - 1994, "The mathematics of microstructure", German Math Society, Heinrich-Fabri Institut, Blaubeuren (10 lectures with J. M. Ball)

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

2001 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 (3 lectures to the College of Engineering, on "Deformable thin films", "Microstructure and nonattainment" and "Materials that combine ferroelectricity and ferromagnetism");

2006 Mathematics and Materials, Rome ("Lessons on structure...", 4 lectures) a minicourse with Weinan E, P-L Lions, F. Otto, G. Marrucci); Lecture series: TU Munich, "Lessons on structure...", 8 lectures; Lecture series: MULTIMAT European research and training network, Antwerp "Lessons on structure...", 3 lectures

2007 Lecture series: Department of Mathematics, University of Bristol, "Lessons on structure from the structure of viruses", 3 lectures; Lecture series: Huazhong University of Science and Technology, Wuhan, China, 2 lectures: "Films of active materials", "Energy minimization and hysteresis"; Southern California Lecture Series (1 lecture each at Departments of Mechanical and Aerospace Engineering at UCSD, USC, UCLA, Caltech; first lecturer of this series)

2010 Copernicus Lecture Series, University of Ferrara, "Phase transformations in solids: new materials, new phenomena"

2012 Lecture series on "A mathematical perspective on the structure of matter" Hausdorff Research Institute for Mathematics, Bonn

2013 Mathematics for Planet Earth, an advanced course on "Compatibility, hysteresis and the direct conversion of heat to electricity" (Lisbon); Lecture series on "Compatibility, hysteresis and energy conversion, CNA Summer School, Carnegie Mellon (5 lectures, May 30 - June 7)

2014 Park City/Institute for Advanced Study Summer Mathematics Program: 5 lectures on "Phase transformations, hysteresis and energy conversion: the role of geometry in the discovery of materials" (lecture notes available)

2015 Southwest Mechanics Lecture Series (UT Austin, Texas A & M College Station, University of Houston); Eighth Summer School in Analysis and Applied Mathematics, Rome (3 lectures)

2016 Leverhulme Lectures on Mathematical Problems in Materials Science (University of Oxford, 3 lectures), https://www.maths.ox.ac.uk/groups/oxpde/oxpde-events/2016/leverhulme-lectures-mathematical-problems-materials-science

2019 Lecture series on "Supercompatibility and the direct conversion of heat to electricity", Newton Institute, Cambridge (4 lectures); Pattern Formation and Advanced Materials, International Centre for Mechanical Sciences Udine (6 lectures).

2023 Lecture series on "Origami and materials science" (4 lectures), Hausdorff Institute for Mathematics, Bonn, https://www.him.uni-bonn.de/programs/past-programs/past-trimester-programs/complex-materials/complex-materials-spring-school/

Popular Lectures and Articles

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, "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, Cornell, "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 the Space Grant Executive Committee, "New materials, real and imagined"; Radio Interview: MDR Radio Science Program, "New materials from mathematics, real and imagined")

2008 "AF sponsors research to improve antennas for micro air vehicles", Maria Callier, AFOSR Public Affairs, http://www.afmc.af.mil/news/story.asp?id=123092714); Popular Lecture to alumni of AEM,"New materials: real and imagined"

2011 "University of Minnesota engineering researchers discover new source for generating 'green' electricity", U of M press release picked up widely by the scientific community (e.g., www.livescience.com/16790-magnetic-metals-heat-electricity-nsf-bts.html) and popular press, e.g., www.popsci.com/technology/article/2011-06/new-alloy-can-convert-heat-directly-electricity

2012 Featured speaker at the AIAA Student and Professional Chapter Dinner; Featured speaker, Science and Engineering Day, sponsored by College of Science and Engineering, University of Minnesota,"New materials that turn heat into electricity"

2013 "Enhanced reversibility and unusual microstructure of a phase-transforming material" appears in Nature with coverage in BBC News, Chemistryworld (RSC), Materials 360 (MRS), Physicsworld (IOP), and Discovery news (see also https://www.youtube.com/watch?v=Bwy8xC3hous).

2014 "Materials from Mathematics", SIAM News (invited), November 3, 2014. http://sinews.siam.org/DetailsPage/tabid/607/ArticleID/247/Materials-from-Mathematics.aspx

2015 "New materials: real and imagined", DPC lecture, Department of Physics, University of Antwerp

2016 "Twisted X-rays unravel the complexity of helical structures", article on publication [135] by Nicola Ashcroft (International Union of Crystallography) picked up widely in the scientific media, permanently archived at http://www.iucr.org/news/research-news/twisted-x-rays-unravel-the-complexity-of-helical-structures "Seven decades of Mathematics and Mechanics", Maria-Carme Calderer and R. D. James, SIAM News, https://sinews.siam.org/DetailsPage/tabid/607/ArticleID/767/Seven-Decades-of-Mathematics-and-Mechanics.aspx

2018 "Materials from Mathematics", lunch talk to graduate students, Mathematics, Penn State

2019 After dinner talk on "Crystallization", Kent State/CMU Symposium on Advanced Materials, Kent State; Interview on Energy Conversion by German National Radio, https://www.deutschlandfunk.de/energie-magnetmaterial-macht-aus-abwaerme-strom676.de.html?dram:article_id=451675

2020 Supercompatibility and the design of materials: Illustrating the Impact of the Mathematical Sciences. Webinar, August 18, 2020, with Robert V. Kohn, https://www.nationalacademies.org/our-work/illustrating-the-impact-of-the-mathematical-sciences Lecture to "The Invariants", an undergraduate mathematics society at the University of Oxford, https://www.invariants.org.uk/events/richard-d-james-supercompatibility-and-phase-transformations

2021 "The exact solution of all of continuum mechanics", SIAM News (invited), with Alessia Nota, Gunjan Pahlani and Juan J. L. Velázquez. Researchers develop new one-step process for creating self-assembled metamaterials, https://twin-cities.umn.edu/news-events/researchers-develop-new-one-step-process-creating-self-assembled-metamaterials (article about ref [169], picked up widely by scientific news outlets).

2022 "Origami and the structure of materials", SIAM News (invited), with Huan Liu, Paul Plucinsky, Fan Feng and Arun Soor, https://sinews.siam.org/Details-Page/origami-and-the-structure-of-materials Exploding and weeping ceramics provide path to new shape-shifting material (https://z.umn.edu/materialsresearch), news release from CSE at UMN on Ref. 170.

Invited Lectures at Universities and Research Institutes (c = colloquium)

Institute for Advanced Study (1993)

AFRL – Materials Directorate (2008, 2011), AI/ML Lecture Series (2023)

Air Force Institute of Technology (AFIT), Department of Mathematics, Dayton (2012c)

AFOSR (with ONR; Basic Research Forum – lunch talk to program managers, 2017)

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 (Institut für Angewandte Mathematik, 1992, 2007)

University of Bristol (Fluid mechanics and materials seminar, 2016)

Brown University (Solid Mechanics Seminar, 1980, 1988; PDE seminar 1999)

California Institute of Technology (Applied Sciences, 1984c, 1989c, 1994c, 1995c; Mechanical Engineering, 2002)

University of California, Berkeley (Mechanical Engineering, 2009; Applied Math Seminar (joint with LBL), 2017)

University of California, Santa Barbara (Materials Department and the Institute for Energy Efficiency, 2012c)

University of California, San Diego, (Mechanical and Aerospace Engineering, 2017)

Cambridge University, Cambridge, UK (Engineering, 2019c, Bio and Micromechanics Seminar, 2022)

Carnegie Mellon University (Department of Mathematics, 1991c, 1996c, 1997c, Civil and Environmental Engineering, 2010c)

University of Chicago (Computational and Applied Mathematics, 2003)

Columbia University (Applied Mathematics and Applied Physics, 2014c)

Cornell University (Department of Theoretical and Applied Mechanics, 1981c, 2002c, 2008c; Department of Chemical Engineering, 1984c; Mathematical Sciences Institute, 1988x2, Applied Mathematics Program, 2011)

Courant Institute (1984, 1988, 1991, 1993, 1998)

Academy of Sciences of the Czech Republic (Institute of Physics, Ústavní Seminár, 2007)

Duke University (Mechanical/Materials Engineering 2023c)

University of East Anglia (Department of Applied Mathematics, 1992c)

University of Edinburgh (Department of Applied Mathematics, 1992c)

ETH-Zurich (Mechanics seminar, 2007)

EPFL-Lausanne (Mathematics, 2014c)

Università di Ferrara (School of Engineering, 2004, 2009)

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, 2022)

General Motors Research (2003)

Georgia Institute of Technology (2006; Civil Engineering, 2017)

George Washington University (Civil Engineering, 2017)

University of Groningen (Mechanics, 2021c)

Harvard University (Applied Mechanics and Condensed Matter Physics, 1999)

Heriot-Watt University (Department of Mathematics, 1991)

Hong Kong University of Science and Technology (Department of Mathematics, 2017)

University of Houston (Department of Mechanical Engineering, 2007c)

University of Illinois, Urbana-Champaign (Department of Theoretical and Applied Mechanics, 1993c, 2000c)

University of Illinois, Chicago (Department of Mathematics, Statistics and Computer Science, 2021c)

The Johns Hopkins University (Department of Mechanical Engineering, 1994, 1997c)

Kiel University (Institute for Materials Research, 2007c, 2020c)

Lord Corporation (Corporate Research, 1998)

Massachusetts Institute of Technology (Department of Mechanical Engineering, 1988, 1993c, 1995c; Mechanics Seminar, 2005, 2015)

Maryland Institute of Materials Scientists (1989)

University of Maryland (Department of Mathematics, 1995c; Center of Scientific Computing and Mathematical Modeling, 2007)

Max–Planck–Institute for Mathematics in the Sciences, Leipzig (1997, 1998)

Medtronic Corporation (Corporate Research, 2011, 2015 x2, 2017)

University of Michigan (Department of Aerospace Engineering, 1987c; Mechanical Engineering 2014c)

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, 2011; Chemical Engineering and Materials Science, 1999c, 2005c, 2007c; Mechanical Engineering, 2000c; Electrical Engineering (Magnetics Seminar, 2003, 2006, 2011, 2015, 2022), Condensed Matter Physics Seminar (2022)

TU Munich (Department of Mathematics, 2006c; Oberseminar Analysis, 2013; Discretization in Geometry and Dynamics, 2016)

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, 2023c)

Northwestern University (Department of Civil Engineering, 1985; Department of Materials Science and Engineering, 1989)

University of Nottingham (Department of Theoretical Mechanics, 1999; Mathematics, 2014c)

Oxford University (Mathematics Institute, 1997, 1999c, 2005; Department of Materials, 1999; Applied Analysis Seminar, 2005; kick-off lecture for EPSRC solid mechanics project, 2006; Seminar on Solid and Liquid Crystals, 2013; Solid Mechanics Seminar, 2013)

Université de Paris-Nord (Laboratoire des Propriétés Méchaniques et Thermodynamiques des Matériaux, 1995)

Pennsylvania State University (Mathematics, 2011c; Applied and Computational Math Seminar, 2018)

University of Pennsylvania (Mechanical Engineering and Applied Mechanics, 2000, 2010c)

Université Pierre et Marie Curie, Paris VI (Laboratoire Jacques-Louis Lions, 2009)

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; Materials Science and Nanoengineering, 2017)

Rutgers University (Mechanical & Aerospace Engineering, 2013c)

Sandia National Laboratories (1980, 1982)

Seagate (2003)

Stanford University (Applied Mechanics, 1995c; Mechanics and Computation, 2004)

Sussex University (Department of Mathematics, 1992c)

Texas A & M University (Center for the Mechanics of Composites, 1992c; Materials Science, 2014)

3M (1997, 2011)

University of Texas at Austin (Department of Aerospace Engineering and Engineering Mechanics, 1991c)

UTC Aerospace Systems, Burnsville, MN (2012)

Virginia Polytechnic Institute and State University (Department of Engineering Science and Mechanics, 1981c)

University of Warwick (Joint Complex Systems/MOAC seminar, 2005, Mathematics 2014c, Applied Mathematics Seminar 2014)

University of Wisconsin (Mathematics Research Center, 1983 x2, 1984; Department of Engineering Mechanics, 1987c, Engineering Physics Department, 1998c, Department of Mathematics, 2006c; Materials Science 2019c)

Worcester Polytechnic Institute (Department of Mathematics, 1992c)

University of Washington, Seattle (2013c)

University of Würzburg (Department of Mathematics, 2012c)

Invited Lectures at Conferences and Workshops, and Meetings Organized

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 and 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 and 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 Mate-

rials, 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 (presentation 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 Minnesota (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^{th} birthday David Kinderlehrer, Carnegie Mellon University (lecture); AHPCRC Annual Review (presentations on nano portfolio and individual project)

2007 First year review, MURI project on Galfenol, Penn State (lecture); BioQuant Workshop: Transport, Signaling and Structure Formation in Cellular Systems: Mathematics Meets Experiments, University of Heidelberg (lecture); MURI kick-off, Materials on the Brink, Caltech (lecture); Game Changer kick-off, Ohio State University (lecture)

2008 Atomistic Models of Materials: Mathematical Challenges, Oberwolfach (lecture); SIAM Conference on Mathematical Aspects of Materials Science (3 lectures); Galfenol Workshop – MURI review, University of Maryland (lecture); Geometric Analysis, Elasticity and PDE, Heriot-Watt University, Edinburgh (scientific organizing committee); International Conference on Martensitic Transformations, Santa Fe (lecture)

MURI on the Brink, year 1 review, Caltech (lecture); AFOSR Review of Applied Mathematics Program, Dayton (lecture); GameChanger Review, Ohio State University (lecture); Society of Engineering Science, minisymposium on Simulation of Defects (lecture); DARPA Review, Electromagnetic self-protection, Washington, D.C. (lecture); AFOSR meeting on Multiscale Methods, Boston (lecture)

2009 PDE and Materials, Oberwolfach (organizer, with S. Müller and Sir John Ball); Galfenol Workshop and MURI review, University of Maryland (lecture); Multiscale Seminar, University of Minnesota (lecture); MURI on the Brink, year 2 review, University of Maryland (lecture); AFOSR Review of Applied Mathematics Program, Dayton (lecture); GameChanger Review, Ohio State University (lecture); Mathematical Challenges of Molecular Dynamics, University of Bath (lecture)

2010 New Developments in Elasticity: The Legacy of Robert Hooke, Oxford (lecture); GameChanger Review, Ohio State University (lecture); NSF-PIRE meeting: train-

ing on grants management for PIRE recipients ; SIAM meeting on Mathematical Aspects of Materials Science (2 lectures); MURI Review, Materials on the Brink, Caltech (lecture); Phase Transformations, Mathematisches Forschungsinstitut Oberwolfach (lecture); Galfenol Workshop and MURI review, University of Maryland (lecture)

2011 NSF Workshop on Multiscale Methods, Civil, Mechanical and Manufacturing Division (lecture); MURI Review, Materials on the Brink, Caltech (lecture); Meeting in honor of the retirement of Ben Freund, Brown University (lecture); ICIAM, International Conference of Industrial and Applied Mathematics; Vancouver (two lectures); Workshop on Pattern Formation in Materials Science, OXMOS, Oxford (lecture); IREE meeting with 3M researchers on energy technology, organized by IREE (lecture); Integrated Computational Science and Engineering (ICMSE) lecture series, Wright-Patterson AFB (lecture); Magnetism and Magnetic Materials (MMM), Scottsdale (lecture)

2012 The Potential Threat of Future Power and Energy Technology Breakthroughs Workshop, MITRE Corporation (lecture); International Symposium on Current Problems in Solid Mechanics, in honor of R. J. Clifton, Symi, Greece (lecture); Program Review, Computational Mathematics, Arlington (lecture on future directions); Materials Genome Initiative Workshop, IMA, Minneapolis (organizer, panel); MURI Kickoff: Managing the Mosaic of Microstructure, CMU, Pittsburgh (lecture); Society for Natural Philosophy, CISM, Udine, Italy (lecture); Minnesota Power Systems Conference, Earle Brown Center (lecture); NSF-PIRE Annual Meeting, Crystal City (presentation on "Assessment" of the PIRE project); Organizer (with S. Conti, S. Luckhaus, S. Müller, M. Salmhofer, B. Schlein) – Mathematical Challenges of Materials Science and Condensed Matter Physics: from quantum mechanics through statistical mechanics to nonlinear pde, Hausdorff Institute, supported by the Humboldt foundation (summer, 2012).

2013 Program Review, AFOSR, Aerospace Materials for Extreme Environments, Arlington; Symposium CCC Organizer and Speaker, "Novel Functionality by Reversible Phase Transformation", Materials Research Society (San Francisco); MURI on the Mosaic of Microstructure, technology exchange, Evanston (lecture); JamesFest: Mathematics and Mechanics in the Search for New Materials, Banff International Research Station for Mathematical Innovation and Discovery; AFOSR Program Review on Computational Mathematics (Dr. Fariba Fahroo), presentation on Mosaic MURI research

2014 MURI on the Mosaic of Microstructure, review, Dayton, Ohio (lecture); International Workshop: From Microscopic to Continuum Models in Materials Science; (Gran Sasso Science Institute, L'Aquila, Italy); Oxbridge PDE Workshop (lecture); AFOSR/DARPA/NCI Strategic Workshop on the "Convergence of Physical Sciences for Biomedical Applications: Phase Transition and Network Dynamics in Living and Non-Living Systems."(lecture); IUTAM/M. Ortiz 60th birthday meeting, Burg Schnellenberg, Attendorf, Germany (lecture); IUTAM Symposium on Thermomechanical-Electromagnetic Coupling in Solids, Paris (lecture); International Symposium on length scales in solid mechanics: mathematical and physical aspects, in Honor of Pierre Suquet's 60th Birthday, Paris (lecture); 60th birthday meeting of R. V. Kohn, IMA, Minneapolis (lecture); SIAM-MRS inaugural joint meeting (lecture); REACT magnet project review (x2).

2015 Nitinol in coffee...to now, 50th birthday meeting for Kaushik Bhattacharya, Caltech (lecture); TMS Middle East-Mediterranean Materials Congress on Energy and Infrastructure Systems, Doha (lecture); NSF-SIAM Symposium on Mathematical and Computational Aspects of Materials Science (lecture); Workshop on Advancing Caloric Materials for Efficient Cooling, UMD (lecture); Review of AFOSR Aerospace Materials for Extreme Environments (lecture).

2016 Solid Mechanics, Oberwolfach (short lecture); AFOSR Review – program on electromagnetics (lecture); PIRE Review; Mosaic of Microstructure MURI (presentation representing the MURI group, AFOSR); Centre de Recherche Mathématique, Montréal (lecture at the 60th birthday meeting, Irene Fonseca); 75th birthday meeting for David Kinderlehrer (CMU, lecture); SIAM Waves and Coherent Structures (Philadelphia, lecture); Mosaic MURI review meeting (Caltech, lecture); Conference on Hysteresis, Avalanches and Interfaces (Oxford, organizer, lecture); Keble College Complexity Workshop (lecture); Kick-off meeting, MURI – Universal Electromagnetic Surface (Caltech, lecture); Magnetoelasticity mini-workshop (Oberwolfach, lecture); RDF Presentation (Institute on the Environment, short talk).

2017 AFOSR Review on electromagnetics, Arlington (speaker); Intelligent Materials Meeting, Kiel (speaker); Colorado School of Mines, Kickoff for DMREF project on Soft Magnetism (speaker); Two MURI presentations on Origami and Maxwell's equations (remote presentations); Intelligent materials 2017 (Kiel; main lecture); IMA Workshop on Multiscale Methods (speaker, organizer); ONR Review of Applied and Computational Mathematics (Reza Malek-Madani, Code 311; speaker); Workshop on Phase Transformations in Oxides for Energy Conversion and Storage (AEM-UMN, organizer, with B. Jalan and E. Quandt; speaker) with participants from IonE, Ames Laboratory, Kiel University, University of Maryland, and the University of Minnesota; International Liquid Crystal Elastomer Conference, Rice University (speaker); Presentation to Xcel Board (The direct conversion of heat to electricity using fast switching of ferroelectric oxides); ICOMAT-2018 (presentation; co-author of a Plenary lecture)

2018 AFOSR Review on electromagnetics, Arlington (speaker); IMA Conference on Liquid Crystals, Soft-matter Packing and Active Systems (Co-organizer); IMA Conference on Liquid Crystals, Metamaterials, Transformation Optics, Photonic Crystals, and Solar Cells (Co-organizer, speaker); IMA Conference on Multiscale Methods (co-organizer with M. Luskin and C. Reina); MURI Review - Universal Electromagnetic Surface (presentation); First International Workshop on Martensitic Microstructures (co-organizer, with H. Seiner, `www.aem.umn.edu/~james/research/Meetings_Files/1stiwmu.html`) Thermag 2018, Darmstadt (presentation); First International Workshop on the Conversion between Magnetic, Electric and Thermal Energies (COMET) (co-organizer, with Bharat Jalan, Ole Martin Løvvik and Hanus Seiner, `http://www.aem.umn.edu/~james/research/Meetings_Files/1stcomet.html`) The interaction of light with materials (co-organizer, speaker; SIAM Conference on Mathematical Aspects of Materials Science);

2019 The mathematical design of new materials (speaker), Newton Institute, Cambridge, UK; Origami MURI Review (Universal Electromagnetic Surface), Caltech; Kent State/Carnegie Mellon applied mathematics symposium on advanced materials, Kent State

2020 SIAM Annual Meeting (invited lecture in the NSF-DMREF session); AFOSR Com-

putational Mathematics Review (presentation on behalf of the MURI group on Strongly Correlated Electrons); MRS (invited)

2021 Institute for Mathematical and Statistical Innovation meeting on Mathematical and Computational Materials Science (organizer)

2022 Polycrystals: Microstructure and Plasticity (ICMS, Edinburgh); Intelligent Materials (Kiel University); Variational Challenges in Materials Science and Imaging (Vienna); SIAM Annual Meeting (Philadelphia, 2 invited lectures); Equilibrium and non-Equilibrium Pattern Formation in Soft Matter: From Elastic Solids to Complex Fluids (Banff International Research Station for Mathematical Innovation and Discovery, Banff, CA); AFRL Computational Math Program Review.

2023 VBFF Review (U. Chicago), Society of Engineering Science (2 invited lectures, several contributed)

2024 Defense Research Exchange Forum (DBREF; zoom lecture to DoD personnel on Mathematical Design of Materials);

Ph.D. and M.S. 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, St. Thomas, now US–China joint business ventures)
3. Kaushik Bhattacharya, Ph.D., Microstructure of martensite, University of Minnesota, 1991 (currently Professor and Vice Provost for Research, Caltech)
4. Antonio De Simone, Ph.D., Magnetization curves of ferromagnetic materials, University of Minnesota, 1992 (currently Professor, S.I.S.S.A., Trieste, and Scuola Superiore Sant'Anna, Pisa; also, Secretary General of the International Centre for Mechanical Sciences)
5. Chun-Hwa 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 Senior Principal Scientist, Medtronic Corportation)
8. Shad T. Jeseritz, M.S., Boundary-induced two-way shape memory effect in CuAlNi University of Minnesota 1995 (Senior Director of Engineering, Seagate)
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 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 Structural Dynamics Division, Boeing)

13. Jun Cui, Ph.D., 2002, Martensitic phase transformation and ferromagnetic shape memory effect in iron palladium single crystals (formerly Senior Scientist, Energy Materials Group, PNNL; now Professor, Materials Science and Engineering, Iowa State)
14. Wayne Falk, Ph.D., 2004, Mechanics of bacteriophage T4 tail sheath; Doctoral Dissertation Fellow, (currently Staff Senior Fellow CDRH/OSEL, FDA)
15. Liping Liu, Ph.D., 2006, Multiscale analysis and modeling of magnetostrictive composites (Professor, Departments of Mechanical Engineering and Mathematics, Rutgers University)
16. John Messier, M.S., 2006, Testing system for ferromagnentic shape memory microactuators (previously Scientist, Department of Civil Engineering, University of Minnesota; now, co-founder, North Loop BrewCo)
17. Zhiyong Zhang, Ph.D., 2007, Special lattice parameters and the design of low hysteresis materials, (Principal Engineer, Nordson Medical)
18. Swedesh K. Srivastava, Ph.D., 2008, Epitaxial growth and characterization of multifunctional heterostructures, integrating ferromagnets, ferroelectrics, insulators, and III-V semiconductors (co-advised with C. J. Palmstrøm)
19. Ganesh babu M. Bora, M.S., 2010, Mechanical testing of low hysteresis NiTi series of alloys (co-advised with T. Shield; currently Process Engineer, Ingersoll Rand, Trane division)
20. Krishnan Shankar, Ph.D., 2012, Theory of magnetostriction for nanowires, currently at COMSOL.
21. Xian Chen, Ph.D., 2013, The influence of compatibility conditions on the microstructure at phase transformation. (Associate Professor, Hong Kong University of Science and Technology).
22. Yintao Song, Ph.D., 2013, Energy conversion using phase transformation in multiferroic materials (Co-Founder and Chief Architect, Savant Labs).
23. Amartya Banerjee, Ph.D., 2013, Density functional methods for objective structures: theory and simulation schemes. (Assistant Professor, UCLA).
24. Vivekanand Dabade, Ph.D., 2017, Understanding magnetic hysteresis in cubic materials, (Doctoral Dissertation Fellow; now Assistant Professor, Indian Institute of Science, Bangalore).
25. Fan Feng, Ph.D., 2018, Phase transformation in helical structures: theory and application (now postdoc, Cavendish Lab, Cambridge).
26. Hanlin Gu, Ph.D., 2020, Cofactor conditions in the design of reversible martensitic phase transformation materials. (Postdoctoral Fellow, Peking University, China)
27. Gunjan Pahlani, Ph.D., 2022, Objective Molecular Dynamics: an atomistic analogue of exact solutions of continuum mechanics (Intel; jointly advised with Thomas Schwartzentruber)

Current Graduate Students

Gunjan Pahlani, Shivam Sharma, Anjanroop Singh, Huan Liu, Ashutosh Pandey, Kalpesh Jaykar, Ankit Kumar, Kevin Sheehan, Peter Yip (co-advised by Tom Schwartzentruber)

Postdoctoral Fellows

Oscar Bruno (Professor, Caltech), Nikan Firoozye (Managing Director, Nomura International London and University College London), Tatiana Wilenski (unknown), Chunhwa Chu (Developmental Math Specialist/Learning Services Support Program Coordinator, College of Notre Dame, Belmont, CA), Hungyu Tsai (Lincoln Financial Group), Gustavo Gioia (Professor, Okinawa Institute of Science and Technology

Graduate School), Jian Li (Professor, Huazhong University of Science and Technology), Raffaella Rizzoni (Associate Professor, Dipartimento di Ingegneria, Ferrara), Guiseppe Puglisi (Università di Bari), Kevin Hane (Design Engineer), Bill Qi Pan (IM Flash Technologies), Rob Tickle (Start-up on computer-aided manufacturing), Martin Tijssens (TNO Madymo, Delft), Yaniv Ganor (DEKA Research & Development), Kaushik Dayal (Professor, CMU), W. Falk (Staff Senior Fellow CDRH/OSEL, FDA), Cui Jun (Professor, Materials Science and Engineering, Iowa State University), Liping Liu (Professor, Mathematics and Mechanical Engineering, Rutgers), Peter Chung (Professor, Mechanical Engineering, UMD), Zhiyong Zhang (Principal Engineer, Nordson Medical), Swedesh K. Srivastava (co-advised with C. J. Palmstrøm, microelectronics industry), Marcel Arndt (BMW, co-advised with Luskin, Tadmor), Soren Flexner (co-advised with Palmstrøm, Senior Software Development Engineer at Intelius), Vijay Srivastava (GE Global Research), Yeranuhi Hakobian (second postdoc, MIT, then unknown), Kanwal Preet Bhatti (GE Global Research), Ajeet Kumar (Professor, IIT Delhi), Henrik van Lengerich (Advanced Research Specialist, 3M), Xian Chen (Associate Prof. HKUST; also, Lawrence Berkeley Laboratory), Yintao Song (Co-Founder and Chief Architect, Savant Labs), Ryan Haislmaier (joint with Bharat Jalan; now with Intel); Vivekanand Dabade (Assistant Professor, Indian Institute of Science, Bangalore), Paul Plucinsky (Assistant Professor, USC), Ashley Bucsek (Assistant Professor, U. Michigan), Ananya Renuka Balakrishna (Assistant Professor, UCSB), Fan Feng (Postdoctoral Fellow, Cavendish Lab, Cambridge), Shaghayegh Rezazadeh (wind energy industry in RI), Georgios Grekas (Researcher at Institute of Applied and Computational Mathematics, Foundation for Research and Technology-Hellas, Crete). Patricia Lia Pop-Ghe (Scientist, Electric Hydrogen, Natick, Massachusetts), Shoham Sen (postdoc at University of Houston).

Interns

Nadège Zarrouati, École Polytechnique (2008); Anna Zanzottera, Politecnico di Milano (2011); Rishabh Agrawal (2018), IIT Guwahati; Mariana Isabel Verdugo (2018), UC Berkeley.

Consulting

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

Intellectual Property

R. D James and Bharat Jalan, "The direct conversion of heat to electricity using phase transformations in ferroelectric oxides" No. 10,950,777, Issued March 16, 2021

R. D James and Huan Liu, "Vertical axis wind turbines and methods of manufacturing the same", https://license.umn.edu/product/a-novel-vertical-axis-wind-turbine-vawt. Full patent application (PCT/US24/11355) filed on January 12, 2024.

Research Grants

2024 3D-3D Functional Oxide Membranes (PI: Bharat Jalan), MURI Proposal (in preparation)

Generative AI for Spintronics (PIs: Ellad Tadmor, Stefano Martiniani). Large group proposal (in preparation)

MN Bridge Grant (Office of Technology Commercialization), for development and commercialization of a vertical axis wind turbine, $ 35K

Launch MN, matching grant for the MN Bridge Grant to bring it to $ 70K (pending)

2023 MURI: Bio-Inspired Architectures for the Deep Sea (BIMADS), with Shashank Pryia, $ 250K/year., 3+2 years

AFRL: Group and Graph-theoretic Analysis of Multistability in Origami Structures, (supports Kevin Sheehan), $ 92,045.

Group invariant solutions of Maxwell's equations exhibiting non-standard constructive/destructive interference, $ 458,505, 3 years, AFOSR.

Launch MN, matching grant for the MN Bridge Grant to bring it to $ 70K (pending)

2022 AFRL: Group and Graph-theoretic Analysis of Multistability in Origami Structures, $458,505.

Medtronic, renewal of gift to the University of Minnesota $25K/1 year.

Search for compatible Zirconia-based shape memory ceramics, collaboration with Eckhard Quandt, University of Kiel, funded by the Deutsche Forschungsgemeinschaft (DFG); funding for visits of James by a Mercator Fellowship.

2020 LUCI Fellowship. Supports interaction with AFOSR (Phil Buskohl, Matt Grasinger)

2019 Vannevar Bush Faculty Fellowship: The mathematical design of materials, $3M/5 years

Simons Fellowship, approx. $4K/5 months subsistence and travel to the Isaac Newton Institute, Cambridge, UK.

Proposal to the Advanced Light Source, Berkeley, for beamtime, with Xian Chen and Eckhard Quandt

2018 Crystallization beyond crystals: the mathematics of non-periodic ordered materials, ONR, $ 100K/3 years.

Energy conversion using phase change materials in the small temperature difference regime, Norwegian Centennial Chair Program (NOCC), $ 150K/2 years, with Bharat Jalan.

2017 MURI: Revolutionary advances in correlated electron materials: from strongly correlated electrons to large scale DFT and quantum embedding, $ 250K/year for 3+2 years, with researchers from Berkeley, Caltech, Cornell and UCSB.

Medtronic, renewal of gift to the University of Minnesota $50K/1 year.

2016 Partial funding of Visiting Professorship at Oxford University (Fall, 2016), The Leverhulme Trust, £36K.

DMREF: Accelerated soft magnetic alloy design and synthesis guided by theory and simulation, NSF, $ 475/4 years, with researchers from Case Western Reserve and Colorado School of Mines.

"Conversion between Magnetic, Electric, and Thermal energies in phase change materials (COMET)". A program of collaborative research with Xian Sherry Chen (HKUST/Caltech) and Ole Martin Lovvik, PI, University of Oslo, Norwegian Research Council and SINTEF, $10 K (U of M part).

The direct conversion of heat to electricity using fast switching of ferroelectric oxides, Institute on the Environment RDF Fund (University of Minnesota), with Bharat Jalan, $717K, 3 years.

Universal Electromagnetic surface – exploiting active electronics and active origami to generate a programmable electromagnetic response, MURI with researchers from Caltech, CMU, Princeton, $7.5M/3+2 years.

Medtronic, Gift to the University of Minnesota $50K/1 year.

2015 Interaction of Coherent Radiation and Objective Structures for Radar, Photonics and Structure Determination, AFOSR ($150K/year), 3 years.

2014 Mathematical theory for the discovery of multifunctional nanomaterials: systematic search for new nanostructures with unprecedented physical properties, ONR ($30K/year)

2012 Managing the Mosaic of Microstructure, MURI with CMU, Caltech, Georgia Tech, Michigan, Northwestern, Purdue, $7.3M/3+2 years.

2011 IREE Special Opportunities Grant, "New energy technology based on the direct conversion of heat to electricity using multiferroic alloys", with C. Leighton, 1 year, 220K

2010 International Collaborative Partnership for Integrated Research and Education (PIRE) NSF, with researchers from Caltech, Carnegie Mellon, New York University, and foreign collaborators from SISSA (International School for Advanced Studies, Trieste), Antwerp, Bonn, Warwick and Oxford (5 years, 1.7M, U of M portion)

2009 Predictive simulation and design of materials by quasicontinuum and accelerated dynamics methods, with E. Tadmor and M. Luskin, DOE (3 years, 630K); Multiscale methods for the design of structural materials from first principles with T. Dumitrica, AFOSR (3 years, 201K)

2008 DARPA project on Electromagnetics and Self-Protection, with G. Candler, 350K (18 months); NSF-FRG: Collaborative research on modeling and computation of objective structures in materials science and biology (with E. Tadmor and M. Luskin), approx. 1.2M/year

2007 MURI: Materials on the brink: unprecedented transforming materials, with participants from Caltech, Rutgers, Univ. Washington, and the Univ. of Maryland, 850K (5 years, James contribution); GameChanger: Multifuctional hybrid composite structures for load bearing antennas, AFOSR, (3 years, 100K/year, James contribution), with participants from Ohio State, Michigan, Dayton

2006 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, 100K/year (U of M part), with T. Shield (PI); MURI, Development of Galfenol, with Beth Stadler (ECE) and participants from the University of Maryland, 100K/year (James contribution)

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, ARO, 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, $ 1500.

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

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

Current Externally Funded International Collaborations

University of Kiel, Germany, Prof. Dr. Eckhard Quandt, "Reinhart Koselleck Project on Crystallographically Compatible Ceramic Shape Memory Materials". Also, joint UMN/Kiel "Materials for Brain" project (DFG), includes student exchanges.

Hong Kong University of Science and Technology, Prof. Xian Sherry Chen, "Highly reversible shape memory alloys", includes student exchanges.

University of Oslo and SINTEF, Prof. Ole Martin L /ovvik, "Conversion between Magnetic, Electric, and Thermal energies in phase change materials (COMET)", includes student exchanges.

Institute of Thermomechanics, Prague, Czech Repbulic, Prof. Hanus Seiner, currently visiting AEM as a Fulbright Fellow, "High mobility and micromechanics of macrotwin interfaces in modulated martensites", includes student exchanges.