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## Anna Vainchtein

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### Education:

- 1998 Ph.D. in Theoretical and Applied Mechanics, Cornell University  
Thesis Advisor: Professor Phoebus Rosakis  
Minor: Applied Mathematics
- 1992 B.S. in Geophysics, University of Minnesota, Twin Cities

### Appointments:

- 2006– Associate Professor  
University of Pittsburgh, Department of Mathematics
- 2003–2006 Assistant Professor  
University of Pittsburgh, Department of Mathematics
- 2002–2003 NSF ADVANCE Fellow and Research Assistant Professor,  
University of Pittsburgh, Department of Mathematics
- 2000–2002 Visiting Assistant Professor, University of Pittsburgh  
Department of Mathematics
- 1998–2000 Postdoctoral Research Associate, Stanford University  
Division of Mechanics and Computation  
Host Scientist: Professor Huajian Gao
- Fall 1998 Visiting Postdoctoral Research Associate, UC Berkeley  
Department of Mechanical Engineering  
Host Scientist: Professor David Steigmann

**Research Interests:** mathematical modeling of nonlinear material behavior, phase transitions and fracture in crystalline solids, nonlinear dynamics of bistable discrete systems and its continuum limit.

## Research Grants:

- 2005–2010 Principal Investigator, *CAREER Award*, DMS-0443928, National Science Foundation, Division of Mathematical Sciences, budget: \$400,000.
- 2002–2005 Principal Investigator, *ADVANCE Fellow Award*, DMS-0137634, National Science Foundation, Division of Mathematical Sciences, budget: \$346,428.

## Travel Grants, Honors and Awards:

- 2007 travel support from Centre de Recherches Mathematiques in Montreal, Canada, to attend the workshop “Functional and Delay Equations” in Halifax, Canada, and give an invited lecture, November 2007
- 2007 travel support from the German Research Foundation (DFG) to give an invited lecture during the workshop “Multiscale Problems in Three Applications” at the Weierstrass Institute for Applied Analysis and Stochastics, May 2007
- 2005 travel support from the German Research Foundation (DFG) to give an invited lecture during the workshop “Macroscopic limits and modulation theory for PDEs and lattice models” at the Weierstrass Institute for Applied Analysis and Stochastics, November 2005
- 2003 travel award from the Mathematical Sciences Research Institute to participate in the workshop “Defects and their Dynamics” at Banff International Research Station, August 2003
- 2003 was among faculty members honored during the honors convocation at the University of Pittsburgh
- 1997 *Cornell Summer Doctoral Dissertation Fellowship*, Cornell University
- 1992 *Diploma with Honors*, University of Minnesota
- 1992 *Institute of Technology Dean’s List*, University of Minnesota
- 1987–1991 *Fellowship for Outstanding Academic Performance*, Novosibirsk State University, Russia

## PUBLICATIONS

### Refereed Journal Articles:

- 1) L. Truskinovsky and A. Vainchtein. Dynamics of martensitic phase boundaries: discreteness, dissipation and inertia. *Continuum Mechanics and Thermodynamics*, in press, 2008.
- 2) B. L. Sharma and A. Vainchtein. Quasistatic propagation of steps along a phase boundary. To appear in *Continuum Mechanics and Thermodynamics*, 2007.
- 3) Y. Zhen and A. Vainchtein. Dynamics of steps along a martensitic phase boundary I: semi-analytical solution. *Journal of the Mechanics and Physics of Solids*, 2007, in press, published online.
- 4) Y. Zhen and A. Vainchtein. Dynamics of steps along a martensitic phase boundary II: numerical simulations. *Journal of the Mechanics and Physics of Solids*, 2007, in press, published online.
- 5) L. Truskinovsky and A. Vainchtein. Quasicontinuum models of dynamic phase transitions. *Continuum Mechanics and Thermodynamics*, 18(1-2): 1–21, 2006.
- 6) L. Truskinovsky and A. Vainchtein. Kinetics of martensitic phase transitions: Lattice model. *SIAM Journal on Applied Mathematics*, 66(2): 533–553, 2005.
- 7) L. Truskinovsky and A. Vainchtein. Quasicontinuum modeling of short-wave instabilities in crystal lattices. *Philosophical Magazine*, 85: 4055–4065, 2005.
- 8) L. Truskinovsky and A. Vainchtein. The origin of the nucleation peak in transformational plasticity. *Journal of the Mechanics and Physics of Solids*, 52: 1421–1446, 2004.
- 9) L. Truskinovsky and A. Vainchtein. Peierls-Nabarro landscape for martensitic phase transitions. *Physical Review B*, 67:172103, 2003.
- 10) A. Vainchtein. Non-isothermal kinetics of a moving phase boundary. *Continuum Mechanics and Thermodynamics*, 15(1):1–19, 2003.
- 11) A. Vainchtein. Dynamics of non-isothermal martensitic phase transitions and hysteresis. *International Journal of Solids and Structures*, 39:3387–3408, 2002.

- 12) A. Vainchtein. Stick-slip interface motion as a singular limit of the viscosity-capillarity model. *Mathematics and Mechanics of Solids*, 6(3):323–341, 2001.
- 13) M. Lane, R.H. Dauskardt, A. Vainchtein and H. Gao. Plasticity contributions to interface adhesion in thin-film interconnect structures. *Journal of Materials Research*, 15(12): 2758–2769, 2000.
- 14) A. Vainchtein. Dynamics of phase transitions and hysteresis in a viscoelastic Ericksen’s bar on an elastic foundation. *Journal of Elasticity*, 57: 243–280, 1999.
- 15) A. Vainchtein and P. Rosakis. Hysteresis and stick-slip motion of phase boundaries in dynamic models of phase transitions. *Journal of Nonlinear Science*, 9: 697–719, 1999.
- 16) A. Vainchtein, T. Healey and P. Rosakis. Bifurcation and metastability in a new one-dimensional model for martensitic phase transitions. *Computer Methods in Applied Mechanics and Engineering*, 170: 407–421, 1999.
- 17) A. Vainchtein, T. Healey, P. Rosakis and L. Truskinovsky. The role of spinodal region in one-dimensional martensitic phase transitions. *Physica D*, 115:29–48, 1998.

### **Refereed Book Chapters:**

- 1) L. Truskinovsky and A. Vainchtein. Explicit kinetic relation from “first principles”. In *Mechanics of Material Forces*, editors P. Steinmann and G.A. Maugin, Advances in Mechanics and Mathematics, pp. 43-50, Springer, 2005.
- 2) A. Vainchtein, P.A. Klein, H. Gao and Y. Huang. A strain-gradient Virtual-Internal-Bond model. In *Modeling and Simulation-based Life Cycle Engineering*, S. Saigal, K.P. Chong, S.T. Thynell and H. Morgan, eds., Spon Press, London, pp. 31–46, 2002.

### **Refereed Conference Proceedings:**

- 1) H. Gao, A. Vainchtein, P.A. Klein and E.P. Chen. Introducing a length scale into modeling of fracture via a strain-gradient elasticity theory. In *Advances in Computational Engineering and Sciences* (S.N. Atluri and F.W. Brust, eds.), International Conference on Computational Engineering and Sciences, pp. 1766–1771, 2000.
- 2) H. Gao and A. Vainchtein. Higher-order gradient elasticity theories of fracture, Mechanics 2000 (Y. Bai and W. Yang, eds.), Beijing, pp. 64-69, 2000.

3) P.A. Klein, H. Gao, A. Vainchtein, H. Fujimoto, J. Lee and Q. Ma. Micromechanics-based modeling of interfacial debonding in multilayer structures. *Materials Research Society Symposium Proceedings*, vol. 594, pp. 371–376, 2000.

### **Non-refereed publications:**

- A. Vainchtein. Dynamics of steps along a phase boundary. *Oberwolfach Report* No. 58/2007, 2007.
- Y. Zhen and A. Vainchtein. Motion and nucleation of steps along a phase boundary. *Proceedings of 5th International Conference on Nonlinear Mechanics (ICNM-V)*, Shanghai University Press, Shanghai, pp. 1457-1463, 2007.
- A. Vainchtein. Kinetics of lattice phase transitions. *Oberwolfach Report* No. 55/2004, pp. 3017–3019, 2005.

### **Invited Talks and Conference Presentations:**

- Colloquia and seminars at Cornell University (1998, 1999, 2003), Stanford University (1998, 1999), McMaster University (1999), UC Berkeley (1999), UC Riverside (2000), University of Maryland (Baltimore County, 2000 and College Park, 2002), University of British Columbia (2000), Texas Tech University (2000), University of Michigan (2000, 2001), University of Nebraska (2000), Massachusetts Institute of Technology (2000), University of Massachusetts (Amherst, 2000), University of Pittsburgh (2000–2005), Carnegie Mellon University (2001), University of Minnesota (2002), University of Tennessee (2003), University of Salerno, Italy (2003), University of Akron (2004), University of Crete (2005), University of Kansas (2006), Temple University (2007).
- *Third Canadian Conference on Nonlinear Solid Mechanics*, June 2008, Toronto, Canada, invited talk.
- Minisymposium *Multiscale Models and Techniques for Defects in Solids*, SIAM Conference on Mathematical Aspects of Materials Science, May 2008, Philadelphia, PA, invited talk.
- *Oberwolfach Workshop on Material Theories*, December 2007, Oberwolfach, Germany, invited talk.
- *AARMS-CRM Workshop on Functional and Delay Equations*, November 2007, Halifax, Canada, invited talk.

- *Bernard Coleman Symposium*, 44th Annual Technical Meeting Society of Engineering Science, October 2007, College Station, TX, invited talk.
- *International Conference on Thermo-Mechanical Modeling of Solids*, Ecole Polytechnique, Palaiseau, France, July 2007, invited talk.
- Workshop *Multiscale Problems in Three Applications*, Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany, May 2007, invited talk.
- International Symposium on Defect and Material Mechanics, Aussois, France, March 2007, invited talk.
- AMS Special Session on Calculus of Variations and Nonlinear PDEs: Theory and Applications, Joint Mathematics Meetings, New Orleans, LA, January 2007, invited talk.
- Minisymposium *Instabilities in solids, structures and materials*, 15th US National Congress on Theoretical and Applied Mechanics, Boulder, Colorado, June 2006, invited talk.
- Workshop *Macroscopic limits and modulation theory for PDEs and lattice models*, Weierstrass Institute for Applied Analysis and Stochastics, Berlin, Germany, November 2005, invited talk.
- Special Session on Calculus of Variations, AMS Central Sectional Meeting, Lincoln, NE, October 2005, invited talk.
- *The Rational Modeling of Materials and Structures*, symposium in honor of G. Del Piero, June 2005, invited talk.
- Workshop *Thermodynamic Material Theories*, December 2004, Oberwolfach, Germany, invited talk.
- *Prospects for Mathematics and Mechanics upon the 80th Birthday of J. Ericksen*, IMA symposium, November 2004, selected talk.
- *Symposium on active materials*, 41st Annual Technical Meeting Society of Engineering Science, October 2004, Lincoln, NE, invited talk.
- *Special symposium in honor of G.A. Maugin*, 40th Annual Technical Meeting Society of Engineering Science, October 2003, Ann Arbor, MI, invited talk.
- SNP Meeting/IMA PI Conference: *Multiscale Effects in Material Microstructures and Defects*, September 2003, University of Kentucky, Lexington.

- Workshop *Defects and their dynamics*, August 2003, Banff International Research Station, Canada, invited talk.
- EUROMECH Colloquium *Mechanics of Material Forces*, May 2003, University of Kaiserslautern, Germany, invited talk.
- *2nd Canadian Conference on Nonlinear Solid Mechanics*, June 2002, Vancouver, BC, invited talk.
- *14th US National Congress on Theoretical and Applied Mechanics*, June 2002, Blacksburg, VA. symposium in memory of C. Truesdell, invited talk.
- *IUTAM Symposium on Material Instabilities and Effect of Microstructure*, May 2001, Austin, TX, invited talk.
- *Meeting of the Society for Natural Philosophy*. September 2000, Berkeley, CA, invited talk.
- *ASME Mechanics and Materials Conference*. Advances in the Continuum Mechanics and Thermodynamics of Material Behavior, June 1999, Blacksburg, VA.
- *The 35th Annual Technical Meeting of the Society of Engineering Science*. September 1998, Pullman, WA.
- *Second SIAM conference on Mathematical Aspects of Materials Science*. May 1997, Philadelphia, PA.
- *ASME Mechanics and Materials Conference*. June 1996, Baltimore, MD.

## TEACHING EXPERIENCE

### Courses Taught at the University of Pittsburgh (2000-2006):

Undergraduate: regular and honors sections of multivariable calculus (MATH 0240, fall 2000, spring 2001, fall 2001), matrix theory and differential equations (MATH 0250; taught regular sections in fall 2001, spring 2002 and fall 2005 and 2007 and developed and taught a new honors version of this course in the fall 2002-2004), introduction to matrices and linear algebra (MATH 0280, fall 2006), regular and honors differential equations (MATH 0290, spring and fall 2008), honors linear algebra (MATH 1185, fall 2008), senior-level modeling in applied mathematics (MATH 1360, spring 2001 and 2002, fall 2007)

Graduate: calculus of variations (MATH 3020, spring 2003, 2004, 2006 and 2008) and partial differential equations (MATH 2900, spring 2005 and 2007); advanced calculus (MATH 1530, fall 2005 and MATH 1540, spring 2006), a preparatory course for graduate preliminary examination

**Major areas of teaching interest:** ordinary and partial differential equations, linear algebra, mathematical modeling, nonlinear dynamics, calculus of variations, bifurcation theory

### Supervision of Postdoctoral and Student Research Projects:

Postdoctoral: Dr. Enrico Babilio (2004-2005; currently an assistant professor (ricercatore) at the University of Naples Federico II, Italy), Dr. Yubao Zhen (2005-2006; currently an assistant professor at Harbin Institute of Technology, China)

Graduate: Qi Mi (2003-2004), Eugueni Trofimov (2005-present, Ph.D. candidate in mathematics)

Undergraduate: Babak Masahledan (2003-2004), Michael Opferman (2005 - 2006), Ryan Ritrovato (2005)

### Advising and Student Committee service:

- Graduate student advising: Melissa Sovak (2003-2004), Eugueni Trofimov (2004-present), Yu Yan (2004-2005), Huibin Cheng (2005-2007), Hyang Bo Shim (2005-2008)

- serve on Ph.D. thesis committee of Stephanie Hoogendoorn (2006-present), Robert Berry (2006-present)
- served on comprehensive exam committees of Eugueni Trofimov (2006, chair), Prince Chidyagwai (2007), Ian Price (2007), Justin Dunmyre (2008), Alexander Sviridov (2008), Susmita Sadhu (2008)
- served on M.S. thesis committees of Sara Marashinia (2007), Michael Chiacchiero (2007) and Ahmet Izmirliglu (2008)
- served on undergraduate thesis committee of William Klieber (2005-2006)
- served on M.S. Examination committee of Gordon Weinberg (2003)
- undergraduate advisor for 8 math and applied math majors

### **Departmental Committee Service:**

spring 2001	textbook selection committee for MATH 0250
2002-present	faculty advisor for graduate student organization Women in Mathematics
2003-2007	graduate committee
2004 and 2006	preliminary exam committee in analysis
2004	chair selection committee
2004-2005	colloquium committee
2004-present	planning and budget committee and executive committee
2005-2006	search committee in algebra
2006-2007	search committee in applied analysis
2007-2008	search committee in stochastic analysis

### **Other Professional Activities:**

2000–present	reviewer for <i>Mathematical Reviews</i> , <i>Archive for Rational Mechanics and Analysis</i> , <i>SIAM Journal of Mathematical Analysis</i> , <i>Journal of Elasticity</i> , <i>International Journal of Solids and Structures</i> , <i>Continuum Mechanics and Thermodynamics</i> , <i>Journal of the Mechanics and Physics of Solids</i> , <i>Advances in Mechanics and Mathematics</i> , <i>Journal of Nonlinear Science</i> , <i>International Journal of</i>
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*Fracture, Multiscale Modeling and Simulations, Discrete and Continuous Dynamical Systems*, NSF proposals (served on six NSF panels)

- 2002 developed a new honors course on linear algebra and differential equations
- 2002–present initiated and organized “Women in Mathematics” colloquium series funded by NSF
- 2003 served on a panel “Women in Quantitative Sciences” at Undergraduate Advising Symposium, November 2003, University of Pittsburgh
- 2004 co-organized (with T. Healey, Cornell University) a minisymposium for SIAM conference on Mathematical Aspects of Materials Science, May 2004, Los Angeles; co-organized (with W. Troy, University of Pittsburgh) a special session at AMS regional meeting, November 2004, Pittsburgh
- 2004–2005 coached students from Ft. Couch Middle School for Math League and Math Counts contests; provided integrals for the Integration Bee 2004 and 2005 contests at the University of Pittsburgh
- 2005 served as a judge for middle school science competition organized by Pennsylvania Junior Academy of Science
- 2005–present co-organized (with J. Rubin, University of Pittsburgh) the annual High School Integration Bee competitions at the University of Pittsburgh
- 2006–2007 co-organized (with B. Riviere, University of Pittsburgh) the annual Summer Math Days Programs for high school students at the University of Pittsburgh
- 2007 developed a new honors course on differential equations for science and engineering majors
- 2006–2008 Treasurer, Society for Natural Philosophy
- 2008 served as a judge at the Pennsylvania Junior Academy of Science Competition, February 2008
- 2008 co-organizing (with D. Swigon, University of Pittsburgh) the conference *Constitutive Properties of Biomaterials*, an annual meeting of the Society for Natural Philosophy and IMA PI conference, September 19–21, 2008

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