

September 22, 2011

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
 Mentor: Professor Huajian Gao
- Fall 1998 Visiting Postdoctoral Research Associate, UC Berkeley
 Department of Mechanical Engineering
 Mentor: Professor David Steigmann

Research Interests: mathematical modeling of nonlinear phenomena in materials and biology, phase transitions, dislocations and fracture in crystalline solids, nonlinear dynamics of bistable discrete systems and its continuum limit, dynamical systems, functional and partial differential equations.

Research Grants:

- 2010–2013 Principal Investigator, DMS-1007908, National Science Foundation, Division of Mathematical Sciences, budget: \$227,843.
- 2005–2011 Principal Investigator, *CAREER Award*, DMS-0443928, National Science Foundation, Division of Mathematical Sciences, budget: \$400,000.
- 2002–2006 Principal Investigator, *ADVANCE Fellow Award*, DMS-0137634, National Science Foundation, Division of Mathematical Sciences, budget: \$346,428.

Travel Grants, Honors and Awards:

- 2010 travel support from the National Science Foundation to attend U.S.-Japan Symposium *Connections: Bringing Together the Next Generation of Women Leaders in Science, Technology, Engineering and Mathematics* in Saitama, Japan, as one of 15 invited U.S. participants and visit Japanese universities, 2010.
- 2008 travel support from Excellence Cluster “Engineering Advanced Materials”, Friedrich-Alexander-University Erlangen-Nuremberg and the International Union of Theoretical and Applied Mechanics (IUTAM) to attend the IUTAM Symposium on the Progress in the Theory and Numerics of Configurational Mechanics and give an invited lecture, October 2008.
- 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, 2006	was among faculty members honored during the honors convocation at the University of Pittsburgh
1997	<i>Cornell Summer Doctoral Dissertation Fellowship</i> , Cornell University
1992	<i>Diploma with Honors</i> , University of Minnesota
1992	<i>Institute of Technology Dean’s List</i> , University of Minnesota
1987–1991	<i>Fellowship for Outstanding Academic Performance</i> , Novosibirsk State University, Russia

PUBLICATIONS

Refereed Journal Articles:

1. A. Vainchtein and P. Kevrekidis. Dynamics of phase transitions in a piecewise linear diatomic chain. *Journal of Nonlinear Science*, accepted, 2011.
2. A. Vainchtein. Effect of nonlinearity on the steady motion of a twinning dislocation. *Physica D*, 239: 1170–1179, 2010.
3. E. Trofimov and A. Vainchtein. Shocks vs kinks in a discrete model of displacive phase transitions. *Continuum Mechanics and Thermodynamics*, 22(5): 317–344, 2010.
4. A. Vainchtein. The role of spinodal region in the kinetics of lattice phase transitions. *Journal of the Mechanics and Physics of Solids*, 58(2): 227–240, 2010.
5. L. Truskinovsky and A. Vainchtein. Beyond kinetic relations. *Continuum Mechanics and Thermodynamics*, 22(6–8): 485–504, 2010.
6. A. Vainchtein and E. S. Van Vleck. Nucleation and propagation of phase mixtures in a bistable chain. *Physical Review B*, 79(14): 144123, 2009.
7. L. Truskinovsky and A. Vainchtein. Dynamics of martensitic phase boundaries: discreteness, dissipation and inertia. *Continuum Mechanics and Thermodynamics*, 20(2): 97–122, 2008.
8. 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*, 56(2): 496–520, 2008.

9. Y. Zhen and A. Vainchtein. Dynamics of steps along a martensitic phase boundary II: numerical simulations. *Journal of the Mechanics and Physics of Solids*, 56(2): 521–541, 2008.
10. B. L. Sharma and A. Vainchtein. Quasistatic propagation of steps along a phase boundary. *Continuum Mechanics and Thermodynamics*, 19(6): 347–377, 2007.
11. L. Truskinovsky and A. Vainchtein. Quasicontinuum models of dynamic phase transitions. *Continuum Mechanics and Thermodynamics*, 18(1-2): 1–21, 2006.
12. L. Truskinovsky and A. Vainchtein. Kinetics of martensitic phase transitions: Lattice model. *SIAM Journal on Applied Mathematics*, 66(2): 533–553, 2005.
13. L. Truskinovsky and A. Vainchtein. Quasicontinuum modeling of short-wave instabilities in crystal lattices. *Philosophical Magazine*, 85: 4055–4065, 2005.
14. 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.
15. L. Truskinovsky and A. Vainchtein. Peierls-Nabarro landscape for martensitic phase transitions. *Physical Review B*, 67:172103, 2003.
16. A. Vainchtein. Non-isothermal kinetics of a moving phase boundary. *Continuum Mechanics and Thermodynamics*, 15(1):1–19, 2003.
17. A. Vainchtein. Dynamics of non-isothermal martensitic phase transitions and hysteresis. *International Journal of Solids and Structures*, 39:3387–3408, 2002.
18. 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.
19. 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.
20. 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.
21. 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.
22. 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.

23. 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:

24. 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.
25. 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:

26. 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.
27. 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.
28. 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:

29. A. Vainchtein. Dynamics of steps along a phase boundary. *Oberwolfach Report* No. 58/2007, 2007.
30. 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.
31. A. Vainchtein. Kinetics of lattice phase transitions. *Oberwolfach Report* No. 55/2004, pp. 3017–3019, 2005.

Seminar 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 at Amherst (2000, 2010), University of Pittsburgh (2000–2011), 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), Technical University of Munich (2008), University of Tokyo (2010), University of Kyoto (2010), Weierstrass Institute for Analysis and Stochastics, Berlin, Germany (2010).
- invited speaker, 49th meeting of the Society for Natural Philosophy, October 2011, Michigan State University, East Lansing, MI, October 2011.
- IMA Hot Topics workshop *Strain induced shape formation: analysis, geometry and materials science*, May 2011, IMA, University of Minnesota, Minneapolis, MN, invited speaker.
- Minisymposium *Discrete and Continuous Waves*, SIAM Conference on Dynamical Systems, May 2011, Snowbird, UT, invited talk.
- U.S.-Japan Symposium *Connections: Bringing Together the Next Generation of Women Leaders in Science, Technology, Engineering and Mathematics*, one of 15 invited U.S. participants, poster presentation, Saitama, Japan, July 2010.
- Minisymposium *Lattice models in materials science: recent progress and open problems*, SIAM Conference on Mathematical Aspects of Materials Science, May 2010, Philadelphia, PA, organizer and speaker.
- *Special session on Mathematical Problems in Mechanics and Materials*, AMS conference, Lexington, KY, March 2010, invited talk.
- Fourth International Symposium on Defect and Material Mechanics, July 2009, Trento, Italy, invited talk.
- Minisymposium *Coherent structures in Hamiltonian lattices*, SIAM Conference on Dynamical Systems, May 2009, Snowbird, UT, invited talk.
- *IUTAM Symposium on the Progress in the Theory and Numerics of Configurational Mechanics*, October 2008, Erlangen, Germany, invited talk.

- Minisymposium *Interactions between Continuum Physics and Molecular Dynamics*, the 9th SIMAI Congress, September 2008, Rome, Italy, invited talk.
- *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.
- *Special Session on Mathematical Modeling of Nonlinear Phenomena in Biology and Mechanics*, AMS Fall Eastern Section Meeting, Pittsburgh, PA, November 2004, co-organizer and speaker.
- *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.
- Minisymposium *Dynamics of microstructure and Defects in Solids: Discrete and Continuum Models*, SIAM Conference on Mathematical Aspects of Materials Science, May 2004, Los Angeles, CA, co-organizer and speaker.
- *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

Courses taught at the University of Pittsburgh (2000-present):

Undergraduate: regular and honors sections of multivariable calculus (MATH 0240, fall 2000, spring 2001, fall 2001), matrix theory and differential equations (MATH 0250, fall 2001–2005, 2007 and spring 2002), introduction to matrices and linear algebra (MATH 0280, fall 2006 and spring 2009), regular and honors differential equations (MATH 0290, spring and fall 2008), honors linear algebra (MATH 1185, fall 2008), ordinary differential equations (MATH 1270, spring 2009) modeling in applied mathematics (MATH 1360, spring 2001 and 2002, fall 2007), tensor analysis and applications (MATH 1550, fall 2010)

Graduate: calculus of variations (MATH 3020, spring 2003, 2004, 2006, 2008, fall 2010) and partial differential equations (MATH 2900, spring 2005, 2007, 2010, 2011); 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

New course development:

2002 developed a new honors version of MATH 0250, a course on matrix theory and differential equations for science and engineering majors

2007 developed a new honors version of MATH 0290, course on differential equations for science and engineering majors

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), Dr. Evgeni Trofimov (2010-2011)

Graduate: Qi Mi (2003-2004), Evgeni Trofimov (2005-2010, defended Ph.D. thesis in July 2010; currently an assistant instructor, University of Pittsburgh), Yangyang Wang (since 2011), Lifeng Liu (since 2011), Matthew Wheeler (since 2011)

Undergraduate: Babak Masahledan (2003-2004), Michael Opferman (2005-2006), Ryan Ritrovato (2005), Edlyn Levine (2009-2011)

Advising and Student Committee service:

- Graduate student advising: Melissa Sovak (2003-2004), Evgeni Trofimov (2005-2010), Yu Yan (2004-2005), Huibin Cheng (2005-2007), Hyang Bo Shim (2005-2008), Sarah Hritz (2008-2010), Michelle Baker (2008-2010), Lifeng Liu (2010-present), Iryna Zhurak (2010-present)
- served on Ph.D. thesis committee of Stephanie Hoogendoorn (2006-2008), Robert Berry (2006-2009), Alexander Sviridov (2008-2010), Susmita Sadhu (2008-2011), chair of the Ph.D. committee of Evgeni Trofimov (2005-2010)
- served on Ph.D. thesis committee of Saundarapandian Mohanraj, National University of Singapore (2009)
- served on comprehensive exam committees of Evgeni Trofimov (2006, chair), Prince Chidyagwai (2007), Ian Price (2007), Justin Dunmyre (2008), Alexander Sviridov (2008), Susmita Sadhu (2008), Ryan O'Grady (2009), Attou Miloua (2010, chair), Michaela Kubacki (2011), Xin Xiong (2011), Tracy Stepien (2011)
- 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)
- undegraduate advisor for math and applied math majors

Other Teaching and Mentoring Activities

2004, 2011 invited guest speaker, Big Ideas in Mathematics class, November 2004 and 2011

2009, 2011 invited faculty panelist, Postdoc Panel, University of Pittsburgh SIAM Chapter

2006, 2009	invited speaker, undergraduate Math Club, March 2006 and 2009
2004-2005	provided integrals for the Integration Bee contests for undergraduate students at the University of Pittsburgh
2002-2005	faculty advisor for graduate student organization Women in Mathematics
2003	served on a panel “Women in Quantitative Sciences” at Undergraduate Advising Symposium, November 2003, University of Pittsburgh

PROFESSIONAL ACTIVITIES AND SERVICE

Editorial and Refereeing Activities:

2009-present	Associate Editor, <i>Journal of Elasticity</i>
2003-present	served on eight NSF panels
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 Fracture</i> , <i>Multiscale Modeling and Simulations</i> , <i>Discrete and Continuous Dynamical Systems</i> , <i>Nonlinearity</i> , NSF proposals

Conference and minisymposium organization:

2010	SIAM minisymposium <i>Lattice models in materials science: recent progress and open problems</i> , SIAM Conference on Mathematical Aspects of Materials Science, Philadelphia, PA, May 2010
2008	(co-organized with D. Swigon, University of Pittsburgh) conference <i>Constitutive Properties of Biomaterials</i> , an annual meeting of the Society for Natural Philosophy and IMA PI conference, September 19-21, 2008
2004	(co-organized with T. Healey, Cornell University) SIAM minisymposium <i>Dynamics of microstructure and Defects in Solids: Discrete and Continuum Models</i> , SIAM Conference on Mathematical Aspects of Materials Science, Los Angeles, May 2004
2004	(co-organized with W. Troy, University of Pittsburgh) <i>Special Session on Mathematical Modeling of Nonlinear Phenomena in Bi-</i>

ology and Mechanics, AMS Fall Eastern Section Meeting, Pittsburgh, November 2004

Seminar organization:

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| 2010-2011 | initiated and organized <i>Research Highlights Seminar</i> , an introductory research seminar for beginning graduate students and advanced undergraduates |
| 2008-2009 | organized applied mathematics seminar |
| 2004-2006 | initiated and organized <i>Faculty Circus</i> , a series of short faculty presentations for beginning graduate students |
| 2002-2008 | initiated and organized <i>Women in Mathematics</i> colloquium series funded by NSF |

Departmental Committees:

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| 2010-2011 | search committee in applied analysis |
| 2009-2010 | member of two reading committees for tenure and promotion review |
| 2009-2010 | graduate committee |
| 2008-2009 | NTS faculty search committee |
| 2007-2008 | search committee in stochastic analysis |
| 2006-2007 | search committee in applied analysis |
| 2005-2006 | search committee in algebra |
| 2004-2008 | planning and budget committee and executive committee |
| 2004-2005 | colloquium committee |
| 2004 | chair selection committee |
| 2004, 2006 | preliminary exam committee in analysis |
| 2003-2007 | graduate committee |
| 2001 | textbook selection committee for MATH 0250 |

University Committees:

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| 2009-2011 | Tenure Council, Selection Committee, College of Arts and Sciences |
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2010–2013 Undergraduate Council, College of Arts and Sciences

Outreach Activities:

2005–present co-initiated and co-organized (with J. Rubin, University of Pittsburgh) the annual High School Integration Bee competitions at the University of Pittsburgh

2005, 08, 09 served as a judge for middle school science competition organized by Pennsylvania Junior Academy of Science

2006–2007 co-initiated and co-organized (with B. Riviere, now at Rice University) Summer Math Days Programs for high school students at the University of Pittsburgh

2004–2005 coached students from Ft. Couch Middle School for Math League and Math Counts contests

Other Professional Activities

2011–2013 Secretary, Society for Natural Philosophy

2011 Truesdell Speaker Selection Committee, Society for Natural Philosophy

2006–2008 Treasurer, Society for Natural Philosophy

2006–present Selection Committee, Society for Natural Philosophy

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