

Prashant K. Purohit

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Education

Indian Institute of Technology, Delhi, B.Tech., Mechanical Engineering, 1993-1997.
California Institute of Technology, Pasadena, M. S., Applied Mechanics, 1997-1998.
California Institute of Technology, Pasadena, Ph.D., Applied Mechanics, 1998-2001.
Ph.D. Thesis: *Dynamics of phase boundaries in strings, beams and atomic chains.*

Positions held

01/06-present Assistant Professor, Mechanical Engineering and Applied Mechanics, University of Pennsylvania.
09/04-12/05 Postdoctoral scholar, Physics and Astronomy, University of Pennsylvania.
12/01-08/04 Postdoctoral scholar, Mechanical Engineering, California Institute of Technology.
09/97-11/01 Research assistant, Mechanical Engineering and Applied Mechanics, California Institute of Technology.

Honors/Awards

1. *Charles Lee Powell Graduate Fellowship*, California Institute of Technology, Pasadena, 1997.
2. *Silver medal* for graduating with the highest GPA in the mechanical engineering class, Indian Institute of Technology, Delhi, 1997.

Research interests

Statistical mechanics of DNA and filamentous bio-molecules, bio-polymer networks and bio-membranes, martensitic phase transitions in solids, micro-scale propulsion.

Professional societies

1. Member of the Biophysical Society,
2. Member of the American Society of Mechanical Engineers,
3. Member of the Society of Industrial and Applied Mathematics.

Professional service

1. Co-organizer of a mini-symposium on 'Biophysics problems in the mechanics of rods, surfaces and particles and their interactions with viscous fluids', SIAM conference on the mathematical aspects of materials science, 2008.
2. Co-chair of session on 'Bio-Inspired problems in Elasticity', ASME Mechanics of Materials Conference, 2007.
3. Co-chair of session at the World Conference on Computational Mechanics, Los Angeles, California, 2006.

University service

1. MEAM seminar chair, Fall 2007- present.
2. Organized a 'Panel discussion on research careers in industry' and 'Graduate research poster exchange' for the Nano/Bio Interface Center at Penn, 2008.
3. Member of MEAM faculty search committee for the micro/nano search, 2006, 2008.

4. Member of MEAM graduate admissions committee, 2006 – present.
5. Member of MEAM undergraduate curriculum review committee, 2006.
6. Member of Academic Performance Committee, 2006 – present.

Invited seminars

1. Department of Chemical and Biomolecular Engineering, University of Pennsylvania, Philadelphia, Feb 2009.
2. Department of Theoretical and Applied Mechanics, Cornell University, Ithaca, April 2008.
3. Department of Applied Mechanics, Indian Institute of Technology, Madras, Chennai, India, January 2008.
4. Solid Mechanics, Brown University, Providence, October 2007.
5. Centennial celebrations of Mechanical Engineering at California Institute of Technology, Pasadena, March 2007.
6. Department of Inorganic and Physical Chemistry, Indian Institute of Science, Bangalore, India, December 2003.

Conferences

1. NSF CAREER proposal writing workshop, George Mason University, Virginia, March, 2009.
2. Single molecule biophysics world networking workshop, Drexel University, Feb, 2009. (Invited talk)
3. Society of Engineering Science, University of Illinois, Urbana-Champaign, October, 2008. (Contributed talks)
4. ICTAM, Adelaide, Australia, August 2008. (Contributed talk)
5. IUTAM symposium on cellular, molecular and tissue mechanics, Woodshole, June, 2008. (Contributed talk)
6. SIAM conference on the Mathematical Aspects of Materials Science, Philadelphia, May, 2008. (Contributed talk)
7. US-India Nano Science and Engineering Institute, Chennai, India, January 2008. (Contributed talk)
8. Society of Engineering Science, Texas A&M University, October, 2007. (Contributed talk)
7. ASME Mechanics of Materials Conference, University of Texas, Austin, June 2007. (Invited talk)
8. Workshop in Nanomechanics of Biomolecules, Ascona, Switzerland, August 2006. (Invited poster).
9. World Conference on Computational Mechanics, Los Angeles, California, July 2006. (Invited talk)
10. Gordon Research Conference on Single Molecule Approaches to Biology, New London, New Hampshire, June 2006. (Contributed poster)
11. Materials Research Society Meeting, San Francisco, California, March 2005. (Contributed talk)
12. Biophysical Society Meeting, Long Beach, California, February 2005. (Contributed talk)
13. Single Molecule Biophysics Workshop, Aspen, Colorado, January 2005. (Contributed poster)
14. SIAM Conference on Mathematical Aspects of Materials Science, Los Angeles, California, May 2004. (Contributed talk)

15. NATO Summer School on Soft Condensed Matter Physics in Molecular and Cell Biology, University of Edinburgh, Scotland, April 2004. (Contributed poster)
16. Workshop on Discrete models for Materials, University of Warwick, England, June 2003. (Contributed talk)
17. US National Congress on Theoretical and Applied Mechanics, Blacksburg, Virginia, July 2002. (Contributed talk)
18. Workshop on Atomistic and Continuum Models for Long Molecules and Thin Films, Ascona, Switzerland, July 2001. (Contributed poster)
19. ASME International Mechanical Engineering Congress and Exposition, Orlando, Florida, November, 2000. (Contributed talk)
20. 20th International Congress of Theoretical and Applied Mechanics, Chicago, Illinois, August, 2000. (Contributed talk)

Current and pending grants

1. "Nano/Bio Interface Center – Arratia and Purohit", Amount - \$50,000, Sept 2008-Jun 2009.
2. "Entropic elasticity of fluctuating filaments and networks", Prashant K. Purohit, (pending with CMMI, NSF).
3. "Dynamics of unfolding coiled-coil proteins in microfluidic devices – Theory and experiments", Paulo E. Arratia and Prashant K. Purohit, (pending with CBET, NSF).
4. "Swimming dynamics of *C.elegans* can reveal novel muscle phenotypes", Prashant K. Purohit, Todd Lamitina, and Paulo E. Arratia (R21 pending with NIH).

Graduate students (and postdocs) supervised

1. Ritwik Raj, MEAM Ph.D. student.
2. Tianxiang Su, MEAM Ph.D. student.
3. Neeraj Agrawal, CBE Ph.D. student (advisor – Ravi Radhakrishnan).
4. Mark Arsenault, MEAM Ph.D. student (advisor – Haim Bau).
5. Josue Sznitman, MEAM post-doc (advisor – Paulo Arratia).
6. Andre E. X. Brown, Physics Ph.D. student (advisor – Dennis Discher).

Courses taught

1. MEAM 354 Mechanics of Solids, Fall 2006, Spring 2008, Spring 2009.
2. MEAM 663 Entropic Forces in Biomechanics, Spring 2007, Fall 2008.
3. MEAM 519 Elasticity, Fall 2007.

Collaborative efforts (ongoing)

1. "Multiscale mechanics of fibrin networks", with John W. Weisel, Department of Cell and Developmental Biology and Dennis E. Discher, Department of Bioengineering, University of Pennsylvania.
2. "Swimming of *C. elegans*" with Paulo Arratia, Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania.
3. "Mechanics of DNA looping by two-site DNA enzymes" with Ravi Radhakrishnan, Department of Bioengineering, University of Pennsylvania.
4. "Confinement and manipulation of actin filaments by electric fields", with Haim Bau, Department of Mechanical Engineering and Applied Mechanics, and Yale Goldman, Department of Physiology, University of Pennsylvania.
5. "Shapes of 2D vesicles", George Biros, Georgia Institute of Technology.

Book chapters

1. "Mechanics of biological nanotechnology", Rob Phillips, Prashant K. Purohit and Jane' Kondev, chapter in *Springer handbook of nanotechnology*, Springer-Verlag, 693-727, (2003).

Refereed journal publications

1. "Thermomechanics of a heterogeneous fluctuating chain", Tianxiang Su and Prashant K. Purohit, (*submitted*).
2. "The effects of fluid viscosity on the kinematics and material properties of *C.elegans* swimming at low Reynolds number", Prashant K. Purohit, X. Shen, P. E. Arratia, (*submitted*).
3. "The material properties of swimming nematodes reveal novel muscle phenotypes", Josue Sznitman, Prashant K. Purohit, Predrag Krajacic, Todd Lamitina and Paulo E. Arratia, (*submitted*).
4. "Multiscale mechanics of fibrin polymer: Gel stretching with protein unfolding and loss of water", Andre E. X. Brown, Rustem I, Litvinov, Dennis E. Discher, Prashant K. Purohit, John W. Weisel, To appear in *Science*, (2009).
5. "Mechanics of forced unfolding of proteins", Tianxiang Su and Prashant K. Purohit, *Acta Biomaterialia*, **5**, 1855-1863, (2009).
6. "Analytical and numerical solutions for shapes of quiescent 2D vesicles", Shravan Veerapaneni, Ritwik Raj, George Biro and Prashant K. Purohit, *Intl. J. Nonlin. Mech.*, **44**, 257-262, (2009).
7. "Plectoneme formation in twisted fluctuating rods", Prashant K. Purohit, *J. Mech. Phys. Solids*, **56**, 1715-1729, (2008).
8. "Geometry of mediating protein affects the probability of loop formation in DNA", Neeraj Agrawal, Ravi Radhakrishnan and Prashant K. Purohit, *Biophys. J.*, **94**(8), 3150-3158, (2008).
9. "The mechanics of short rod-like molecules in tension", Prashant K. Purohit, Mark E. Arsenault, Yale E. Goldman and Haim H. Bau, *Intl. J. Nonlin. Mech.*, **43**, 1056-1063, (2008).
10. "Confinement and manipulation of actin filaments by electric fields", Mark Arsenault, Hui Zhao, Prashant K. Purohit, Yale E. Goldman and Haim H. Bau, *Biophys. J.*, **93**(8), L42-L44, (2007).
11. "Effect of supercoiling on formation of protein mediated DNA loops", Prashant K. Purohit and Philip C. Nelson, *Phys. Rev. E*, **74**, pp061907 (1-14), (2006).
12. "The effect of genome length on ejection forces in bacteriophage lambda", Paul Grayson, Alex Evilevitch, Mandar Inamdar, Prashant K. Purohit, William Gelbart, Charles Knobler and Rob Phillips, *Virology*, **348**, 430-436, (2006).
13. "Forces during viral DNA packaging and ejection", Prashant K. Purohit, Mandar Inamdar, Paul Grayson, Todd Squires, Jane Kondev and Rob Phillips, *Biophys. J.*, **88**, 851-866, (2005).
14. "Mechanics of DNA packaging in viruses", Prashant K. Purohit, Jane Kondev and Rob Phillips, *Proc. Natl. Acad. Sci.*, **100**(6), 3173-3178, (2003).
15. "Force steps during viral DNA packaging". Prashant K. Purohit, Jane Kondev and Rob Phillips, *J. Mech. Phys. Solids*, **51**, 2239-2257, (2003).
16. "Dynamics of strings made of phase transforming materials", Prashant K. Purohit

- and Kaushik Bhattacharya, *J. Mech. Phys. Solids*, **51**, 393-424, (2003).
17. "Mobility of twin and phase boundaries", K. Bhattacharya, P. Purohit and B. Craciun, *J. de Physique IV*, **112**, 163-166, (2003).
 18. "On beams made of phase transforming materials", Prashant K. Purohit and Kaushik Bhattacharya, *Intl. J. of Solids Structures*, **39**, 3907-3929, (2002).

Refereed conference publications

1. "Mechanics of heterogeneous fluctuating elastic rods", Tianxiang Su and Prashant K. Purohit, To appear in the *Proceedings of the ASME-IDEFC conference, 2009*.
2. "Shape and energetics of DNA plectonemes", Prashant K. Purohit, *Proceedings of the IUTAM symposium on Cellular, molecular and tissue mechanics, 2008*. (To appear in 2009).
3. "Dynamics of strings made of phase transforming materials", *Proceedings of the 20th International Congress on Theoretical and Applied Mechanics*, (2001).