

# Curriculum Vitae: Pradeep Sharma

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**POSITION AND TITLE:**

Bill D. Cook Associate Professor in Department of Mechanical Engineering at University of Houston, Houston, TX

**EDUCATION:****1990–1994**

Bachelor of Science in Mechanical Engineering, August 1994  
Maharaja Sayajirao University of Baroda, India

**1995–2000**

Ph.D. in Mechanical Engineering, August 2000  
University of Maryland, College Park

**PROFESSIONAL ACCREDITATION:**

Chartered Physicist (Ch.Phys.)---Institute of Physics, London, UK, 2003

**PROFESSIONAL EXPERIENCES:**

2008-present, Bill Cook Endowed Associate Professor, Department of Mechanical Engineering, University of Houston, TX

2005-2008, Bill Cook Endowed Assistant Professor, Department of Mechanical Engineering, University of Houston, TX

Jan 2004-present, Assistant Professor, Department of Mechanical Engineering, University of Houston, TX

September 2000– October 2003, Research Scientist, General Electric Corp. R & D, Schenectady, NY

**AWARDS AND HONORS:**

- (1) ONR Young Investigator Award
- (2) Bill D. Cook Faculty Chair Position
- (3) ASME Thomas J.R. Hughes Young Investigator Award, 2009
- (4) Texas Space Grants Consortium New Investigators Program Award
- (5) University of Houston, Excellence in Research and Scholarship Award
- (6) Associate Editor: *Journal of Theoretical and Computational Nanoscience*
- (7) Guest Editor: *Mathematics and Mechanics of Solids*, 2007 (special issue on size-effects in mechanics)
- (8) Founding Editor: iMechanica Journal Club

**PATENTS**

- (1) Monolithic light emitting devices based on wide bandgap semiconductor nanostructures and methods for making same; US Patent Issued on October 17, 2006
- (2) Professional patent issued through University of Houston on “guided self-assembly”, 2006 (Co-inventors: Gemunu Gunaratne, Physics; Don Kouri, Chemistry; Fazle Hussain, Mechanical Engineering, Girish Nathan, Physics; Feng Shi, Mechanical Engineering)

## BOOK CHAPTER

**(Invited)** R. Maranganti, and **P. Sharma**, "A Review of Strain Field Calculations in Embedded Quantum Dots and Wires", *Handbook of Theoretical and Computational Nanotechnology*, Michael Reith and Wolfram Schommers (eds.), 2006, citations: 5

**REFEREED JOURNAL PUBLICATIONS:** Reprints and preprints of most listed papers are available on the following website: <http://www2.egr.uh.edu/~psharma/Index.html>

**ASTERIX \* indicates graduate student I advised. \*\*indicates a graduate student informally or formally co-advised.**

1. M.S. Majdoub\*, **P. Sharma** and T. Cagin, Enhanced Size-Dependent Piezoelectricity And Elasticity in Nanostructures Due to The Flexoelectric Effect", *Physical Review B*, 77, 125424-1 – 125424-9, 2008
2. M.S. Majdoub\*, **P. Sharma** and T. Cagin, "Dramatic Enhancement in Energy Harvesting For a Narrow Range of Dimensions in Piezoelectric Nanostructures", *Physical Review B*, 78, 121407 (R) ( 2008)
3. S. Sahoo, R. Maranganti, S. Lastella, G. Mallick, S. Karna, **P. Sharma** and P.M. Ajayan, "Reversible Separation of Single-Walled Carbon Nanotubes in Bundles", *Applied Physics Letters*, **93**, 083120, 2008
4. F. Shi\*, **P. Sharma**, D.J. Kouri, F. Hussain and G.H. Gunaratne, "Nanostructures with Long-Range Order in Monolayer Self-Assembly ", *Physical Review E*, 78, 025203, 2008
5. R. Maranganti\* and **P. Sharma**, "Length Scales at Which Classical Elasticity Breaks Down for Various Materials", *Physical Review Letters*, **98**, 195504-1– 195504-4, 2007
6. X.Zhang\*, **P.Sharma** and H.T.Johnson, "Quantum Confinement Induced Strain in Quantum Dots", *Physical Review B*, **75**, 155319-1– 155319-8, 2007
7. N.D. Sharma\*, R. Maranganti\* and **P. Sharma**, "On the Possibility of Piezoelectric Nanocomposites without using Piezoelectric Materials", *Journal of the Mechanics and Physics of Solids*, doi:10.1016/j.jmps.2007.03.016
8. R. Maranganti\* and **P. Sharma**, "A Novel Atomistic Approach to Determine Strain Gradient Elasticity Constants: Tabulation and Comparison for Various Metals, Semiconductors, Silica, Polymers and the (Ir) relevance for Nanotechnologies", *Journal of the Mechanics and Physics of Solids*, Vol. 55, issue 9, p. 1823-1852, 2007
9. S. Hu\*\*, G. Nathan\*\*, F. Hussain, D.J. Kouri, **P. Sharma**, and G.H. Gunaratne, "On Stability of Self-Assembled Nanoscale Patterns", *Journal of the Mechanics and Physics of Solids*, **55**, 1357– 1384, 2007
10. **(Invited Review Article)** R.Maranganti\*, **P.Sharma**, and L.Wheeler, "Quantum Notion of Stress", *Journal of Aerospace Engineering*, **20**, 22– 37, 2007
11. **P. Sharma**, and L.T. Wheeler, "Size-dependent Elastic State of Ellipsoidal Nano-inclusions Incorporating Surface/Interface Tension", *Journal of Applied Mechanics*, **74**, 447– 454, 2007
12. X. Peng\*\*, S. Ganti, **P. Sharma**, A. Alizadeh, S. Nayak, S. Kumar, "Strain Engineered Photoluminescence of Silicon Nanoclusters", *Physical Review B* **74**, 035339-1– 035339-5, 2006

13. R. Maranganti\*, N.D. Sharma\* and **P. Sharma**, "Electromechanical Coupling in Non-piezoelectric Materials due to Nonlocal Size Effects at the Nanoscale: Fundamental Solutions (Green's Functions) and Embedded Inclusions", *Physical Review B* **74**,014110-1– 014110-14, 2006
14. X. Zhang\*, J.Kun\*\*, **P. Sharma** and B. Yakobson, "An Atomistic and Non-classical Continuum Field Theoretic Perspective of Elastic Interactions between Defects (Force Dipoles) of Various Symmetries and Application to Graphene", *Journal of the Mechanics and Physics of Solids*, **54**, 2304-2329, 2006
15. **P. Sharma** and X. Zhang\*, "Gauge Field Theoretic Solution of a Uniformly Moving Screw Dislocation and Admissibility of Supersonic Speeds", *Physics Letters A* **349**, 170–176, 2006
16. X. Zhang\* and **P. Sharma**, "On the Scaling of Strain in Arbitrary Shaped, Anisotropic Embedded Quantum Dots due to (Nonlocal) Dispersive Effects ", *Physical Review B*, **72**, 195345, 2005
17. X. Peng\*\*, S. Ganti, **P.Sharma**, A. Alizadeh, S. Nayak, S. Kumar, "Novel Scaling Laws for Band Gaps of Quantum Dots", *Journal of Computational and Theoretical Nanotechnology*, **2**, 3, 2005
18. A. Mathur\*\*, **P. Sharma**, R. Cammarata, "Negative Surface Energy: A Cautionary Note", *Nature Materials*, **4**, 186, 2005
19. Z. Li\*\*, P. Dharap\*\*, **P. Sharma**, S. Nagarajaiah and B. Yakobson, "A Physically Inspired Continuum Field Interpretation of (Stone-Wales) Defect Formation in Single Walled Carbon Nanotubes", *Journal of Applied Physics*,**97**,074303, 2005
20. F. Shahedipour-Sandvik, J. Grandusky, A. Alizadeh, C. Keimel, S. P. Ganti, S. T. Taylor, S. F. LeBoeuf and **P. Sharma**, "Strain Dependent Facet Stabilization in Selective-area Heteroepitaxial Growth of GaN Nanostructures", *Applied Physics Letters*, **87**, 233108, 2005
21. X. Zhang\* and **P. Sharma**, "Inclusions and Inhomogeneities in Second Gradient Elasticity with Couple Stresses and Related Problems", *International Journal of Solids and Structures*,**42**,3833, 2005
22. **P. Sharma**, and S. Ganti, "Gauge-field-theory Solution of the Elastic State of a Screw Dislocation in a Dispersive (non-local) Crystalline Solid ",*Proceedings of the Royal Society of London A* ,**461**, 1081, 2005
23. **P. Sharma**, A. Dasgupta, and G.Cuddalorepatta\*\*, "The Connection Between Microstructural Damage Modeling and Continuum Damage Modeling for Eutectic Sn-Pb Solder Alloys", accepted, *International Journal of Damage Mechanics*, **14**, 343-363, 2005
24. A. Alizadeh, **P. Sharma**, S. Ganti, S. LeBoeuf, L. Tsakalakos, "Templated Wide Bandgap Nanostructures", *Journal of Applied Physics*, **95**, No. 12, 8199, 2004
25. **P. Sharma**, S. Ganti, H. Ardebili, A. Alizadeh, "Scaling of Thermal Stresses in Passivated Nano-interconnects", *Journal of Applied Physics*, **95**, No. 5, p 2763, 2004
26. **P. Sharma** and S. Ganti, "Size-dependent Eshelby's Tensor for Embedded Nano-inclusions Incorporating Surface/Interface Energies", *Journal of Applied Mechanics*, Vol 71, 663, 2004
27. **P. Sharma**, "Inclusions and Defects in Chiral Solids", *International Journal of Solids and Structures*, **41**,6317, 2004
28. **P. Sharma**, S. Ganti and N. Bhate, "The Effect of Surfaces on the Size-Dependent Elastic State of (Nano) Inhomogeneities", *Applied Physics Letters*, **82**, No 4, 2003

29. **P. Sharma**, and S. Ganti, "On the Grain-size Dependent Elastic Modulus of Nanocrystalline Materials with and without Grain Boundary Sliding", *Journal of Materials Research*, 1823-1826, 18, No.8, 2003
30. **P. Sharma**, and S. Ganti, "The Size-dependent Elastic State of Inclusions in Non-local Elastic Solids", *Philosophical Magazine Letters*, Vol. 83, No. 12, 745, 2003
31. **P. Sharma**, and R. Sharma, "On the Eshelby's Inclusion Problem for Ellipsoids with Non-Uniform Dilatational Gaussian and Exponential Eigenstrains", *Journal of Applied Mechanics*, 70, No 3, 418-425, 2003
32. **P. Sharma**, A. Dasgupta, S. Ganti and J. Loman, "Prediction of Rate-Independent Constitutive Behavior of Pb-Free Solders Based on First Principles", *IEEE Transactions on Components and Packaging*, **26**,659, 2003
33. **P. Sharma**, and A. Dasgupta, "Scale-Dependent Average Elastic Fields of Spherical and Cylindrical Inhomogeneities in Micropolar Medium and Overall Properties", *Physical Review B* **66**, 2241XX, 2002
34. **P. Sharma**, and S. Ganti, "Interfacial Elasticity Corrections to the Elastic State of Quantum Dots", *Physica Status Solidi (b)* **234**, No.3, R10–R12, 2002
35. **P. Sharma** and A. Dasgupta, "Micro-Mechanics of Creep-Fatigue Damage in Pb-Sn Solder due to Thermal Cycling: Part I", *Journal of Electronic Packaging*, Vol 124, 292, 2002
36. **P. Sharma** and A. Dasgupta , "Micro-Mechanics of Creep-Fatigue Damage in Pb-Sn Solder due to Thermal Cycling: Part II" *Journal of Electronic Packaging*, Vol 124, 298, 2002
37. **P. Sharma**, H. Ardebili and J. Loman, "A Note on the Thermal Stresses in Passivated Metal Interconnects", *Applied Physics Letters*, Vol. 79, No. 11, p 1706, 2001
38. A. Dasgupta, **P. Sharma**, K. Upadhyayula, " Micro-Mechanics of Fatigue Damage in Pb-Sn Solder due to Vibration and Thermal Cycling ", *International Journal of Damage Mechanics*, Vol. 10, No. 2, pp 101-132, 2001
39. **P. Sharma**, K. Upadhyayula, L. Lantz, and M. Pecht, "Impact of Preconditioning Voltage Bias and Temperature on Reliability of Plastic Encapsulated Microcircuits", *International Journal of Microelectronics Reliability*, Vol. 38, No. 4, pp. 581-584, 1998.

#### **INVITED UNIVERSITY AND CONFERENCE TALKS**

1. Brown University, March 24<sup>th</sup>, 2008
2. Stanford University, December 6<sup>th</sup>, 2007
3. University of California at Berkeley, 12<sup>th</sup> March, 2007
4. George Washington University, 4<sup>th</sup> December, 2006,
5. University of Maryland at College Park, 7<sup>th</sup> December, 2006
6. Texas A&M University, College Station, 7<sup>th</sup> April, 2006
7. **(Invited Plenary Talk)** Mechanical Strain- Band Structure Coupling in Quantum Dots: New Size-Effects and Reverse Coupling, Office of Naval Research Workshop, December 5, 2006

8. **(Invited)** P. Sharma “Experiences of an Early Career Researcher in Academia”, ASME International Mechanical Engineering Congress and Exposition, Nov 5-10, 2006, Chicago, Illinois
9. 1-day **short course** on nanomechanics at Ecole Polytechnique, Tunisia, June 2006
10. **(Invited Plenary Talk)** “Mechanics and Quantum Dots: New Size Effect and Reverse Coupling”, Thin Air Wyoming Philosophical Society Meeting (NSF funded conference), August 8-11, 2005,
11. **(Invited Plenary Talk)** “Size-dependent Mechanics of Quantum Dots”, Euromech Colloquium on Size-dependent Mechanics, June 13-16, 2005, Groningen, Netherlands
12. University of Texas at Austin, June 28<sup>th</sup>, 2005
13. “Size-dependent Mechanics of Embedded Nano-inclusions and the Related Problem of Homogenization: Nonlocal Strain Gradient and Surface Elasticity Effects”, McMat Mechanics and Materials 2005 Conference, Baton Rouge, LA, June 1-3<sup>rd</sup>, 2005
14. “Novel Scaling Laws for Band Gaps of Quantum Dots and Strain Coupling”, McMat Mechanics and Materials 2005 Conference, Baton Rouge, LA, June 1-3<sup>rd</sup>, 2005
15. “Part I: Rate theory of failure at the nanoscale: from atoms and chemical bonds to the yield point evaluation”, McMat Mechanics and Materials 2005 Conference, Baton Rouge, LA, June 1-3<sup>rd</sup>, 2005  
Boris I. Yakobson, Ming Hua, **Pradeep Sharma (Presenting author)**
16. “Part II: Rate theory of failure at the nanoscale: from atoms and chemical bonds to the yield point evaluation, McMat Mechanics and Materials 2005 Conference”, Baton Rouge, LA, June 1-3<sup>rd</sup>, 2005  
Boris I. Yakobson, Ming Hua, **Pradeep Sharma (Presenting author)**
17. 1 day **short course** on nanomechanics at Texas A & M, 2004

**GRANTS** (~Total Funds Obtained: \$ 2,308,944, Amount Allocated to Self: \$ 1, 101, 491). HEAF startup package is NOT included below or in any analysis.

- (1) NSF GK12, **\$3,000,000, PI: Sharma**, 20 %
- (2) TcSUH, **\$ 15, 000, PI: Sharma**, 33 %
- (3) NSF, 2008-2011, **\$ 420, 000, PI: Sharma**, 50 %
- (4) NSF NIRT, 2007-2011, 4 years, **\$ 1.20 million, PI: Sharma**, 25 %
- (5) Aerospace Workforce Innovation Network (AWIN), Texas Workforce Commission, 2007-2009, 2 years, **\$ 248, 944, PI: Karolos Grigoriadis**, 16 %
- (6) GEAR—University of Houston, 2007-2008, **\$ 46, 970, PI: Sharma**, 50 %
- (7) NSF, **\$3,067** , “US-Tunisia Planning Visit: Research Collaboration between University of Houston and Ecole Polytechnique de Tunisie”, **PI: Sharma**, 100 %
- (8) TcSUH, **\$ 20, 000, PI: Sharma**, 33 %
- (9) Bill D. Cook Faculty Scholar, 2006-2011, 5 yrs, **\$ 100, 000**
- (10) NASA URETI, 2004-2006, 2 yrs, **\$ 140, 500, PI: David Zimmerman**
- (11) NASA URETI, 2006-2007, 1 yr, **\$ 55, 000 , PI: David Zimmerman**

- (12) ONR Young Investigator Award, 2005-2008, 3 yrs, **\$ 262, 471, PI: Sharma**, 100 %
- (13) Texas Advanced Research Program (2006-2008), 2 yrs, **\$ 100, 000, PI: Sharma**, 50 %
- (14) TLC<sup>2</sup> (2005-2005), 1 yr, **~\$ 30, 000, PI: Sharma**, 100 %
- (15) TLC<sup>2</sup> (2005-2005), 1 yr, **~\$ 30, 000, PI: Sharma**, 100 %
- (16) Texas Space Grants Consortium (TSGC) New Investigators Program (2005), **\$ 10, 000, PI: Sharma**, 100 %
- (17) GEAR, University of Houston (2006-2007), **~\$ 30,000, PI: Sharma**, 100 %
- (18) University of Houston New Faculty Award (2005), **\$ 6000, PI: Sharma**, 100 %
- (19) University of Houston Small Grant (2005), **\$ 3000, PI: Sharma**, 100 %
- (20) University of Houston Small Grant (2006), **\$ 3000, PI: Sharma**, 100 %

#### **GRADUATE STUDENTS SUPERVISED**

- (1) Xinyuan Zhang (PhD)— **graduated, 2007**  
 “Mechanics and Quantum Dots: Strain Size Effects and “Reverse” Coupling”
- (2) Ravi Maranganti (PhD) —joined 2004
- (3) Nikhil Sharma (PhD)—joined 2005
- (4) Majdoub Sabri (PhD) —joined 2005
- (5) Feng Shi (PhD)—joined 2005
- (6) Chenyan Guo (MS)—**graduated**  
 “Comparison of Pseudopotential and K·P Approaches for Calculation of Strain-Band Structure Coupling in Quantum Dots”
- (7) Parnia Mohammadi (PhD)---joined 2006
- (8) Shyam Anandapillai (MS)---**graduated**  
 “Quantum Dot-DNA Interaction: A Preliminary Study”
- (9) Mohamed Gharbi (PhD)--- joined January 2008
- (10) Kaushik Sirvole (MS)---joined August 2007
- (11) Prakash Chhapadia (MS)---joined September 2008
- (12) Afif Goussiem (PhD)---joined January 2009

#### **UNDERGRADUATE STUDENTS SUPERVISED**

- (1) Peter Frick, Summer 2006

## TEACHING ACCOMPLISHMENTS AND EVALUATIONS

- (1) Developed two new undergraduate courses (senior level): (i) Introduction to Nanotechnology (ii) Advanced Mechanics of Solids
- (2) Developed two new graduate courses: (i) Nanomechanics of Materials (ii) Micromechanics of Materials.
- (3) Taught required undergraduate courses, Mechanics I (Statics) and Mechanics II (Dynamics).
- (4) **All** teaching evaluations are above college average for the same level. The average is “1”.

<b>COURSE NUMBER Section</b>	<b>TITLE</b>	<b>RESPONSES</b>	<b>EVALUATION SCORE 1=average</b>
MECE 2336, Fall 07	Mechanics I (Statics)	TBD	<b><i>TBD</i></b>
MECE 3336, Sp 07	Mechanics II (Dynamics)	31	<b><i>1.19</i></b>
MECE 5397, Fall 06	Advanced Mechanics of Solids	11	<b><i>1.03</i></b>
MECE 7397, Sp 06	Micromechanics of Materials	8	<b><i>1.10</i></b>
MECE 5397, Fall 05	Introduction to Nanotechnology	6	<b><i>1.16</i></b>
MECE 7397, Sp 05	Nanomechanics of Materials	8	<b><i>1.18</i></b>
MECE 5397, Fall 04	Introduction to Nanotechnology	13	<b><i>1.12</i></b>
MECE 7397, Sp 04	Nanomechanics of Materials	9	<b><i>1.06</i></b>

### PROFESSIONAL SOCIETIES:

ASME (American Society of Mechanical Engineer), APS (American Physical Society), MRS (Materials Research Society), IoP (Institute of Physics)

### ACADEMIC AND COMMUNITY SERVICES:

- Reviewer for: Physical Review Letters, Physical Review B, Physical Review E, Journal of the Mechanics and Physics of Solids, Applied Physics Letters, Philosophical Magazine, Proceedings of the Royal Society, Journal of Physics: Mathematical, Journal of Physics: Condensed Matter, Journal of Materials Research, Journal of Applied Mechanics, International Journal of Solids and Structures, Surface Science, Journal of Mechanics of Materials and Structure, Mathematics and Mechanics of Solids, Journal of Elasticity, Physica Status Solidi
- Organizer of various sessions and symposiums in ASME annual conference 2003-2007.
- Associated editor of Journal of Computational and Theoretical Nanoscience
- iMechanica Journal Club Founding and Chief Editor
- Initiated participation in outreach program (administered by Dr Julie Trenor in Engineering College) to retain women in engineering

**UNIVERSITY SERVICES:**

- Departmental committee on graduate curriculum reform (Chair: Professor Lewis Wheeler)
- Departmental committee on mentorship and scholarship (Chair: Professor David Zimmerman)
- University committee on sexual harassment
- Engaged in graduate student recruiting activities in India
- Engaged in graduate student recruiting activities in Tunisia. Established formal ties via NSF visit grant.