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EDUCATION

Ph.D. Cornell University, USA 2003 – 2008

Major: Theoretical and Applied Mechanics (T&AM) *Minor:* Physics

Cumulative GPA: **4.04 / 4.0**

Dissertation: Atomistic-continuum mechanical models for deformations of single-walled carbon nanotubes (SWNTs); *Committee:* Subrata Mukherjee (T&AM, Chair), Timothy J. Healey (T&AM), Tomás A. Arias (Physics)

B.Tech. Indian Institute of Technology – Madras (IIT-Madras) 1999 – 2003

Major: Naval Arch and Ocean Engg *Minor:* Industrial Engineering

Cumulative GPA: **9.22 / 10.0**

PUBLICATIONS

Journals

[4] K. Chandraseker, S. Mukherjee, J.T. Paci, G.C. Schatz, 'An atomistic-continuum Cosserat rod model of carbon nanotubes', *Journal of the Mechanics and Physics of Solids*, Vol. 57, Issue 6, pp. 932-958, 2009.

[3] K. Chandraseker, S. Mukherjee, 'Atomistic-continuum and *ab initio* estimation of the elastic moduli of single-walled carbon nanotubes', *Computational Materials Science*, Vol. 40, Issue 1, pp. 147-158, 2007.

[2] K. Chandraseker, S. Mukherjee, Y.X. Mukherjee, 'Modifications to the Cauchy-Born rule: Applications in the deformation of single-walled carbon nanotubes', *International Journal of Solids and Structures*, Vol. 4, Issues 22-23, pp. 7128–7144, 2006.

[1] K. Chandraseker, S. Mukherjee, 'Coupling of extension and twist in single-walled carbon nanotubes', *ASME Journal of Applied Mechanics*, Vol. 73, Issue 2, pp. 315-326, 2006.

Conferences

[2] K. Chandraseker, S. Mukherjee, 'An atomistic-continuum elastic rod model of carbon nanotubes', *Proceedings of the 6th Int. Conf. on Computation of Shell & Spatial Structs. (IASS-IACM, 2008)*, Nano- & Micro-scale Structs., pp. 3-6, 2008.

[1] Y.K. Potdar, K. Chandraseker, A. Kale, R. Irani, R. McClain, M. Hartle, P. Domas, *Proceedings of the 13th Int. Conf. on Exp. Mech. (ICEM-13)*, Exptl. Analysis of Nano & Engg. Matls. and Structs., p. 629, 2007.

Posters

[2] K. Chandraseker*, S. Mukherjee, 'Atomistic-continuum mechanical modeling of SWNTs', Pan-American Advanced Studies Institute (PASI) on Nano and Biotechnology, San Carlos de Bariloche, Argentina, Nov 2006.

[1] K. Chandraseker*, S. Mukherjee, 'Atomistic-continuum mechanical modeling of SWNTs', 'Accelerating Innovation', Cornell Engineering Research Showcase, Ithaca, NY, Sept 2005.

RESEARCH SUMMARY

Department of Theoretical and Applied Mechanics, Cornell University, USA, 2004 – 2008

Graduate thesis: Atomistic-continuum mechanical models for deformations of SWNTs

• Atomistic-continuum (Tersoff-Brenner energetics) hyperelastic 2-dimensional shell model of SWNTs:
Key contributions – Modifications to the Cauchy-Born rule for inhomogeneous deformations,

investigation of coupling between extension and twist in SWNTs, extraction of improved elastic moduli including the coupling effects for SWNTs and comparison with *ab initio* simulations using pseudo-potential Kohn-Sham density functional theory.

- Development of a symmetry-based atomistic-continuum (self-consistent-charge density-functional-tight-binding energetics) 1-dimensional hyperelastic constitutive model of SWNTs: **Key contributions** – A unified framework that captures extension, twist, bending and shear deformations in SWNTs, including extension-twist and bending-shear coupling.

- Formulation of symmetry-based hyperelastic free energy representations for a 1-dimensional rod with deformable cross-section: In progress – **Key idea** – A generalization of the restricted rod theory (which assumes cross-sections to be rigid) through consistent introduction of additional strain measures that capture strains in the cross-section. The formulation would enable more accurate 1-dimensional representations of the deformations of SWNTs and DNA.

General Electric (GE) Global Research Center, Niskayuna (NY), USA, Summer 2006

R&D intern at the Lifting Technologies Laboratory (LTL), Energy & Propulsion Technologies (EPT).

- Development of finite-element (FE) based correction framework for X-ray diffraction residual stress measurements with analytic evaluation of the FE methodology.

- Baseline design study on lightweight piezoelectric actuator concepts for use in variable stator vanes – GE Global Research internal report.

General Electric (GE) Global Research Center, Niskayuna (NY), USA, Sep – Dec 2007

R&D intern at LTL, EPT. *Level-4 excellence award*

- Extension of finite-element (FE) based correction framework for X-ray diffraction residual stress measurements (developed in Summer, 2006) to account for multiple-step material removal.

- Survey of computational methods to speed-up contact analysis, with implementation and evaluation of sub-structuring strategies in FE analysis of contact.

- Numerical implementation of a multiple load step creep and fatigue based crack growth model.

Sibley School of Mechanical & Aerospace Engineering, Cornell University, USA, Fall 2003

- Development of a finite-element based structural topology optimization code using genetic algorithms with an interactive graphical user interface.

Hochschule Bremen, Germany (DAAD student fellowship from IIT-Madras), Spring 2003

Undergraduate thesis research

- Finite-element based structural optimization of a doubly-stiffened ship deck panel.

PRESENTATIONS / POSTERS / WORKSHOPS

[* PRESENTING AUTHOR]

- K. Chandraseker*, S. Mukherjee. X US National Congress on Computational Mechanics (USNCCM-10), *Advanced computational methods with applications to MEMS and NEMS devices: A symposium in honor of Prof. Subrata Mukherjee*, Columbus, OH, July 2009.

- K. Chandraseker*, S. Mukherjee. Benet Labs Materials Forum: Symposium on *Nano-Scale Materials and Modeling*, Albany, NY, Feb 2009.

- K. Chandraseker*, 'Atomistic-continuum models for deformations of SWNTs', Doctoral defense, Cornell University, Ithaca, NY, Aug 2008.

- K. Chandraseker, S. Mukherjee*, 'An atomistic-continuum elastic rod model of carbon nanotubes', VI Int. Conf. on Computation of Shell & Spatial Structs. (IASS-IACM, 2008): Symposium on *Nano- & Micro-scale Structs.*, Ithaca, NY, May 2008. **Keynote lecture.**

- K. Chandraseker*, **Invited job talks** at:

1. ExxonMobil Upstream Research Company, Houston, TX, Feb 2008.

2. The Applied Math Lab, School of Engineering and Applied Sciences, Harvard University, Boston, MA, Feb 2008.

3. Berkeley Lab Computing Sciences, **Alvarez post doctoral fellowship finalist**, Lawrence Berkeley National Laboratory, Berkeley, CA, Feb 2008.

4. The Goodyear Tire and Rubber Company, Akron, OH, March 2008.

5. General Electric Global Research Center, Niskayuna, NY, March 2008.

6. Schlumberger R&D – Department of Modeling and Mechanics, Sugar Land, TX, April 2008.

- K. Chandraseker*, '1D and 2D atomistic-continuum models for deformations of SWNTs', **Invited department seminar**, Department of T&AM, Cornell University, Ithaca, NY, Feb 2008.
- K. Chandraseker*, Y.K. Potdar, S. Akkaram, V. Narayanan, R. Sharma, C. Sekaran, 'Accurate & efficient contact analysis; Multi-mission creep-fatigue crack propagation tool; Multi-step XRD residual stress measurement correction methodology', Lifting Technologies Lab (LTL) seminar, GE Global Research Center, Niskayuna, NY, Dec 2007.
- K. Chandraseker*, 'Atomistic-continuum mechanical modeling of SWNTs', **Invited talk**, Electron Devices Society, Cornell University, Ithaca, NY, Aug 2007.
- K. Chandraseker*, S. Mukherjee, 'An atomistic-continuum Cosserat rod model of carbon nanotubes', IX US National Congress on Computational Mechanics (USNCCM-9): Symposium on *Modeling and Computation of Active Small (nano) Systems*, San Francisco, CA, July 2007. ***Student presentation competition finalist***
- Y.K. Potdar*, K. Chandraseker, A. Kale, R. Irani, R. McClain, M. Hartle, P. Domas, ICEM-13: Symposium on *Measurement of Residual Stress and Strain in Composite Processing and Service Life*, Alexandroupolis, Greece, July 2007.
- K. Chandraseker*, S. Mukherjee, 'Atomistic-continuum mechanical modeling of SWNTs', Pan-American Advanced Studies Institute (PASI) on Nano and Biotechnology, San Carlos de Bariloche, Argentina, Nov 2006. ***Best poster award (third place)***
- K. Chandraseker*. Admission to doctoral candidacy examination, Cornell University, Ithaca, NY, Nov 2006.
- K. Chandraseker*, Y.K. Potdar, C. Seeley, 'Physics-based correction methodology for XRD residual stress measurements; Inchworm-based actuators for VSV control', Energy and Propulsion Technologies (EPT) seminar, GE Global Research Center, Niskayuna, NY, Aug 2006.
- K. Chandraseker*, Y.K. Potdar, C. Seeley, 'Corrections to XRD residual stress measurements; Inchworm actuator for VSV control', EPT poster session, GE Global Research Center, Niskayuna, NY, July 2006.
- K. Chandraseker*, S. Mukherjee, VII World Congress on Computational Mechanics (WCCM-7): Symposium on *Nanomechanics and Nanocomposites*, Los Angeles, CA, July 2006.
- S. Mukherjee*, H. Chen*, K. Chandraseker, 'Numerical modeling of deformation of carbon nanotubes', ASME Intl Mech Engineering Congress and Exposition, Orlando, FL, Nov 2005.
- K. Chandraseker*, S. Mukherjee, 'Atomistic-continuum mechanical modeling of SWNTs', '*Accelerating Innovation*', Cornell Engineering Research Showcase, Ithaca, NY, Sept 2005.
- K. Chandraseker*, S. Mukherjee, 'Extension & twist of SWNTs', USNCCM-8: Symposium on *Computational MEMS/NEMS*, Austin, TX, July 2005.
- Participant: 'Modeling the Nanoscale World', Cornell Nano Science & Technology Facility, Ithaca, NY, Oct 2005; International Assoc. for Boundary Element Methods (IABEM), Minneapolis, MN, May 2004.

ACADEMIC DISTINCTIONS

- Beckman Institute post-doctoral fellowship (declined), University of Illinois, Urbana-Champaign, Feb 2008.
- GE Global Research level-4 excellence award, Global Reward and Recognition Program, Niskayuna, Dec 2007.
- Best poster award (third place) at the PASI on Nano and Biotechnology, San Carlos de Bariloche, Argentina, Nov 2006.
- Finalist in the student presentation competition conducted by the US Association of Computational Mechanics (USACM) at USNCCM IX, July 2007.
- National Science Foundation (NSF) fellowship award to attend USNCCM IX, July 2007, and the PASI on Nano and Biotechnology, Nov 2006.

- Conference fellowship awarded by USNCCM VIII, Austin, TX, July 2005, and conference fellowship awarded by the Cornell graduate school for the academic years 2004-2007.
- American Bureau of Shipping award for the first rank in B.Tech., Naval Arch and Ocean Engg, IIT-Madras, 2003.
- Institute academic distinction award for the highest undergraduate GPA in Naval Arch and Ocean Engg, IIT-Madras, 1999-2003.
- DAAD (Deutscher Akademischer Austausch Dienst) fellowship, Hochschule Bremen, Germany, 2003.
- Ranked in the top 1.5% of all examinees in the All India IIT Joint Entrance Examination, 1999.
- Distinction awarded by the Central Board of Secondary Education (Govt. of India) for performance in the AISSE (High School, 1997) and AISSCE (Junior College, 1999) examinations.

TEACHING EXPERIENCE

- Mechanical Design Synthesis (M&AE 225): Hands-on design and fabrication course -- Taught weekly sections, graded assignments and design projects, guided student teams [30 students total] through concept design, machine-shop fabrication and testing of devices such as air motors.
- Finite Element Analysis for Mechanical and Aerospace Design (M&AE 570): Graded assignments, examinations, and guided student teams [30 students total] in design projects.
- Fluid Mechanics Laboratory (M&AE 427): Taught 3 weekly sections [30 students each], conducted weekly laboratory sessions, guided students in the preparation of laboratory reports and graded them.
- Nonlinear Dynamics and Chaos (T&AM 578): Graded weekly assignments, examinations and conducted office hours.
- Engineering Mathematics (MATH 293; T&AM 611): Taught 3 weekly sections [90 students], graded weekly assignments and examinations, conducted office hours.
- Fund'ls of Operations Research (HS 364 – IIT-Madras): Graded assignments and examinations.

SOFTWARE SKILLS

- Programming: MATLAB, C, C++, Microsoft Visual C++ (MFC), FORTRAN, LaTeX
- Computer algebra: Mathematica, Maple, Macsyma
- Finite Element Analysis packages: ANSYS, MSC-MARC, MSC-NASTRAN/PATRAN
- Microsoft Office Suite

GRADUATE COURSEWORK

- Mechanics of Materials with Oriented Microstructure • Inelasticity • Intro Solid-State Physics • Atomistic Modeling of Materials • Mechanics of MEMS/NEMS Devices • Computational Physics • Quantum Mechanics I • Continuum Mechanics and Thermodynamics • Nonlinear Elasticity • Finite Element Analysis • Nonlinear Dynamics and Chaos • Nonlinear Vibrations • Data Structs and Algorithms • Computational Solid and Structural Mechanics • Solid Mechanics • Boundary Element Methods

OTHER EXPERIENCE

- President of the Cornell SPICMACAY – Society for the Promotion of Indian Classical Music and Culture Amongst Youth, 2005-2007: Hosting artistes, and organization of Indian classical music concerts and music appreciation sessions.
- Project steward, ASHA Cornell: An action group for basic education in India. Projects - Kaingkarya, Jeevan Gnanodaya: Perform site visits in India for these projects, present reports and budgets.
- National talent scholarship in classical vocal music awarded by the Center for Cultural Resources and Training, Government of India (1994-2002).
- Institute track-and-field team (1999-2003), IIT-Madras.
- Institute Classical Music Coordinator (2002-2003), IIT-Madras cultural festivals: Saarang, Bharat Utsav.

REFERENCES

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- 2. Timothy J. Healey**
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- 7. Tomás A. Arias**
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