Harish Narayanan

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CAREER GOAL
: *To pursue a career in academia as a mechanics educator at a distinguished institution of higher learning.*

EDUCATION
: ○ **University of Michigan**, Ann Arbor, MI   (2002 – Current)
  · Ph.D. in Mechanical Engineering and Scientific Computing, December 2007 *(Expected)*
    Dissertation topic: The mechanics and physics of biological growth
    Dissertation chair: Prof. Krishnakumar R. Garikipati

  · M.S. in Mathematics, December 2006

  · M.S.E. in Mechanical Engineering, December 2003

  ○ **University of Madras**, Madras, India   (1998 – 2002)
  · B.E. in Mechanical Engineering, July 2002 *(First class with distinction)*

ACADEMIC HONOURS
: ○ Received the *Sir C. P. Ramaswamy Aiyar Endowment Scholarship* from the University of Madras in 2001 – 2002 for excellent academic performance at the undergraduate level.

  ○ Received a *Certificate of Merit* for outstanding academic work throughout 12th grade, including securing the *First Rank in Physics*, AISSCE 1998 (C.B.S.E. 12th).

ACADEMIC INTERESTS
: ○ Classical and modern field theories of mechanics, Multi-physics phenomena

  ○ Analysis of numerical methods, Advanced finite element methods

  ○ Large scale, high performance computing

GRADUATE COURSEWORK
: ○ Theoretical mechanics, Continuum mechanics, Solid and structural mechanics, Theory of elasticity, Mechanics of polymers, Differential equations in mechanics, Mechanical vibrations

  ○ Finite element, difference and volume methods, Multi-grid methods, Spectral methods, Level set methods, Numerical linear algebra, Complex analysis, Methods of applied analysis

  ○ Computational modelling of biological tissue, Multi-physics phenomena at micro-scales, General relativity, Parallel computing

RESEARCH EXPERIENCE
: ○ January 2003 – Present: *Graduate Student Research Assistant* studying the physics of biological tissue growth. This doctoral thesis work is supervised by Prof. Krishnakumar R. Garikipati, Prof. Ellen M. Arruda and Prof. Karl Grosh in the Department of Mechanical Engineering, and Prof. Trachette L. Jackson in the Department of Mathematics.

  ○ October 2002 – December 2002: *Directed Research* under Prof. Krishnakumar R. Garikipati in collaboration with Prof. Michael Falk, working on numerical evaluation of Green's function solutions pertinent to defect formation in anisotropic solids under stress.

  ○ August 2001 – July 2002: *Undergraduate Senior Year Project* at the University of Madras on systematically evaluating the use of gaseous petroleum as a viable fuel for automobiles. This work was under the guidance of Prof. S. Sampath and Prof. B. S. Murthy.

TEACHING EXPERIENCE	○ September 2006 – December 2006: *Graduate Student Instructor* for *Mechanical Behaviour of Materials* (ME 382), working with Prof. Ellen M. Arruda and Prof. J. Wayne Jones.

PUBLICATIONS
○ "The micromechanics of fluid-solid interactions during growth in porous soft biological tissue," *H. Narayanan*, E. M. Arruda, K. Grosh, K. Garikipati, Biomechanics and Modeling in Mechanobiology (Submitted, 2007)

○ "Characterization and modeling of growth and remodeling in tendon and soft tissue constructs," E. M. Arruda, S. Calve, K. Garikipati, K. Grosh, *H. Narayanan*, pp. 63–75, Mechanics of Biological Tissue, edited by G. A. Holzapfel and R. W. Ogden, Springer, 2006

○ "The continuum elastic and atomistic viewpoints on the formation volume and strain energy of a point defect," K. Garikipati, M. Falk, M. Bouville, B. Puchala, *H. Narayanan*, Journal of the Mechanics and Physics of Solids, Vol. 54 (9) pp. 1929–1951, September 2006

○ "Biological remodelling: Stationary energy, configurational change, internal variables and dissipation," K. Garikipati, J. E. Olberding, *H. Narayanan*, E. M. Arruda, K. Grosh, S. Calve, Journal of the Mechanics and Physics of Solids, Vol. 54 (7) pp. 1493–1515, July 2006

○ "Material forces in the context of biotissue remodelling," K. Garikipati, *H. Narayanan*, E. M. Arruda, K. Grosh, S. Calve, pp. 77–84, Mechanics of Material Forces, edited by P. Steinmann and G. A. Maugin, Springer, 2005

○ "A continuum treatment of growth in biological tissue: The coupling of mass transport and mechanics," K. Garikipati, E. M. Arruda, K. Grosh, *H. Narayanan*, S. Calve, Journal of the Mechanics and Physics of Solids, Vol. 52 (7) pp. 1595–1625, July 2004

SELECTED TALKS
○ "The numerical implications of multiphasic mechanics assumptions underlying growth models," Ninth U.S. National Congress on Computational Mechanics, July 2007

○ "Finite Element Methods in General Relativity," 2006 University of Michigan Engineering Graduate Student Symposium, November 2006

○ "Viscoelastic and Growth Mechanics in Engineered and Native Tendons," 43rd Annual Technical Meeting of the Society of Engineering Science, August 2006

○ "The numerical implications of fluid incompressibility in multiphasic modelling of soft tissue growth," Seventh World Congress on Computational Mechanics, July 2006

○ "Tendon Growth and Healing: The Roles of Reaction, Transport and Mechanics," 15th U.S. National Congress on Theoretical and Applied Mechanics, June 2006

○ "Computational Modelling of Mechanics and Transport in Growing Tissue," Eighth U.S. National Congress on Computational Mechanics, July 2005

○ "A Continuum Treatment of Coupled Mass Transport and Mechanics in Growing Soft Tissue," Materials Research Society 2004 Fall Meeting, November 2004

○ "Multi-Scale Simulations of the Mechanics of Transport and Growth in Soft Tissue," 41st Annual Technical Meeting of the Society of Engineering Science, October 2004

○ "Material forces in the context of biological tissue remodelling," Seventh U.S. National Congress on Computational Mechanics, July 2003

○ "A continuum treatment of growth in tissue: Mass transport coupled with mechanics," Second M.I.T. Conference on Computational Fluid and Solid Mechanics, June 2003

PROFESSIONAL DEVELOPMENT
○ Recognised as an *Engineering Academic Scholar* by the office of the Associate Dean for Graduate Education after successfully completing the *Academic Careers in Engineering and Sciences* program, November 2005