

# Mansoor A. Haider

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## A. EDUCATION

*Ph.D.* (1996) Mathematical Sciences, Rensselaer Polytechnic Institute (RPI), Troy, NY  
*B.Math* (1991) Applied Mathematics & Computer Science, University of Waterloo, Canada

## B. EMPLOYMENT (post-PhD)

2011-Present - *Professor*, Department of Mathematics, NCSU  
2012-2016 - *Director of Graduate Programs*, Department of Mathematics, NCSU (Mathematics & Applied Mathematics MS & PhD programs)  
2005-2011 - *Associate Professor*, Department of Mathematics, NCSU  
1999-2005 - *Assistant Professor*, Department of Mathematics, NCSU  
1997-1999 - *Instructor/NSF Post-Doc*, Department of Mathematics, Duke University  
- *Postdoctoral Associate*, Center for Mathematics and Computation in the Life Sciences and Medicine, Duke University  
1996-1997 - *Visiting Assistant Professor*, Department of Mathematics, Duke University  
Current Affiliations - *Associate Faculty*, Center for Research in Scientific Computation, NCSU  
- *Associate Faculty*, Center for Quantitative Sciences in Biomedicine, NCSU  
- *Associate Faculty*, Biomathematics Graduate Program, NCSU  
- *Associate Faculty*, Dept. of Biomedical Engineering, NCSU

## C. RESEARCH AREAS

- Applied mathematics: PDEs, continuum mechanics, boundary integral equations, perturbation methods, multiscale modeling
- Bio-mathematical modeling: biomechanics and mechano-biology of soft tissues, elasticity, viscoelasticity, poroelasticity, continuum mixture theories, contact problems, cell-matrix interactions, articular cartilage, osteoarthritis, tissue engineering, tissue development, ultrasonic imaging, OCT imaging
- Scientific computing: boundary element methods, finite element methods, artificial neural networks, machine learning, data clustering algorithms

## D. HONORS, AWARDS & APPOINTMENTS

- Editorial Board, Journal of Biomechanics (2007-Present)
- NCSU Gertrude M. Cox Award for Excellence in Teaching & Learning with Technology (2013)
- NCSU Academy of Outstanding Teachers (2005-Present)
- NCSU Outstanding Teacher Award (2004-05)
- ASME Richard Skalak Award for best paper in Journal of Biomechanical Engineering (2004)
- NSF Mathematical Sciences Postdoctoral Research Fellowship (1997-2000)
- NSF Graduate Research Fellowship (1993-1996)
- Huston Prize – Teaching award in Mathematical Sciences Department, R.P.I. (1993)

## E. FUNDING

### Active

1. *NSF-DMS-Math Biology*, \$430,000, 8/1/16-7/31/19  
“Remodeling of Pulmonary Cardiovascular Networks in the Presence of Hypertension,”  
*Co-Principal Investigator*, (PI: M. Olufsen, Co-PI: M.U. Qureshi)
2. *Distance Education and Learning Technology Applications (DELTA)*, \$119,000, 7/1/16-6/30/17  
“Postbaccalaureate Graduate Certificate in Mathematics: Initiating an Online Track,” with P.A. Gremaud (lead PI)

### Previously Held

3. *NCSU Research Innovation Seed Funding (RISF)*, \$33,876, 1/1/16 to 12/31/16  
“Discovery and modeling of clonality in forebrain stem cells during gliogenesis,”  
*Co-Principal Investigator*, (other Co-PIs Troy Ghashghaei (College of Veterinary Medicine) and John Meitzen (Biological Sciences))
4. *NSF-DMS-Math Biology*, \$343,687, 10/1/11-9/30/16  
“Arterial wall viscoelasticity and cardiovascular networks,”  
*Co-Principal Investigator*, (PI: M. Olufsen)
5. *Distance Education and Learning Technology Applications (DELTA)*, \$63,272, 8/15/11-6/30/13  
“Large Course Redesign (LCR) of Applied Differential Equations I (MA341),” with Dr. Alina Duca
6. *NSF – DMS – EMSW21 – Research Training Groups*, \$1,537,646, 7/1/07-6/30/13  
“EMSW21-RTG Mathematics of materials: model development, analysis, simulation and control”  
*Co-Principal Investigator* – Grant#DMS-0636590 (PI: Dr. Ralph Smith)
7. *North Carolina Biotechnology Ctr* (via subcontract), Subcontract Amount:\$39,319, 8/1/10-6/30/12  
“Optimizing in situ cross-linking of hyaluronic acid for cartilage tissue engineering”  
*Principal Investigator* on NCSU subcontract to Dept. of Chemistry, Duke University, Duke PI: Dr. Stephen Craig
8. *NIH – National Institute on Aging* (via subcontract), Subcontract Amount: \$254,752, 4/1/08-3/31/12  
“Viscoelastic properties of normal and OA chondrons”  
*Principal Investigator* on NCSU subcontract to NIH R01 grant# 2R01AG015768-11, Dept. of Surgery, Duke University Medical Center, Duke PI: Dr. Farshid Guilak
9. *NIH – National Institute of Biomedical Imaging and Bioengineering*, \$100,074, 9/29/03-7/31/07  
“Genetically designed materials for cartilage repair,”  
*Principal Investigator* on subcontract to NIH-1R01EB002263-01 via Dept. of Biomedical Engineering, Duke University  
Duke PIs: Dr. Lori Setton, Dr. Ashutosh Chilkoti
10. *The Whitaker Foundation*, \$238,675, 9/1/03-12/31/06  
“Multiphasic mechanics of the chondron: effects of the physicochemical environment”  
*Principal Investigator* – Grant#RG-02-0933 (funding rate: 44 out of 334 invited proposals)
11. *NSF – DMS – Applied Mathematics*, \$94,700, 9/1/02-8/31/05  
“Modeling mechanical cell-matrix interactions in articular cartilage”  
*Principal Investigator* – Grant#DMS-0211154
12. *DARPA/ONR*, \$97,941, 6/1/02-2/28/03  
“Time-reversal for electromagnetic waves in complex media”  
*Co-Principal Investigator*- Grant#N00014-02-1-0739 (PI: Dr. Jean-Pierre Fouque)
13. *NIH – National Institute on Aging*, 15% annual effort, 6/1/98-7/31/99  
“Viscoelastic properties of normal and osteoarthritic chondrons”  
*Co-Investigator* - NIH Grant#R01AG015768-01 (PI: Dr. Farshid Guilak)
14. *NSF- Mathematical Sciences Postdoctoral Research Fellowship*, \$75,000, 7/1/97-5/31/00  
“Modeling deformation in a biological soft tissue”

## F. PUBLICATIONS

### Peer-reviewed journals & book chapters

- F58.** (2016) C. Battista, D. Bia, Y. Zocalo, R.L. Armentano, M.A. Haider and M.S. Olufsen, Wave propagation in a 1D fluid dynamics model using pressure-area measurements from ovine arteries, *Journal of Mechanics in Medicine and Biology*, Vol. 16, DOI: 10.1142/S021951941650007X.
- F57.** (2014) A. Aristotelous and M.A. Haider, Evaluation of diffusive transport and cellular uptake of nutrients in tissue engineered constructs using a hybrid discrete mathematical model, *Processes*, Vol. 2, pp. 333-344.
- F56.** (2014) A. Aristotelous and M.A. Haider, Use of hybrid discrete cellular models for identification of macroscopic nutrient loss in reaction-diffusion models of tissues, *International Journal for Numerical Methods in Biomedical Engineering*, Vol. 20, pp. 767-780.
- F55.** (2011) Z. Hu and M.A. Haider, Algebraic multigrid preconditioning for finite element solution of inhomogeneous elastic inclusion problems in articular cartilage, *Advances in Applied Mathematics and Mechanics*, Vol. 3, pp. 729-744
- F54.** (2011) B.N. Steele, D. Valdez-Jasso, M.A. Haider and M.S. Olufsen, Predicting arterial flow and pressure dynamics using a 1D fluid dynamics model with a viscoelastic wall, *SIAM Journal on Applied Mathematics*, Vol. 71, pp. 1123-1143
- F53.** (2011) M.A. Haider, J.E. Olander, R.F. Arnold, D.R. Marous, A.J. McLamb, K.C. Thompson, W.R. Woodruff and J.M. Haugh, A phenomenological mixture model for biosynthesis and linking of cartilage extracellular matrix in scaffolds seeded with chondrocytes, *Biomechanics and Modeling in Mechanobiology*, Vol. 10, pp. 915-924
- F52.** (2011) D. Valdez-Jasso, D. Bia, Y. Zocalo, R.L. Armentano, M.A. Haider and M.S. Olufsen, Linear and nonlinear viscoelastic modeling of aorta and carotid pressure-area dynamics under in vivo and ex vivo conditions, *Annals of Biomedical Engineering*, Vol. 39, pp. 1438-1456
- F51.** (2010) M. Stuebner and M.A. Haider, A fast quadrature-based numerical method for the continuous spectrum biphasic poroviscoelastic model of articular cartilage, *Journal of Biomechanics*, Vol. 43, pp. 1835-1839
- F50.** (2010) E. Kim, F. Guilak and M.A. Haider, An axisymmetric boundary element model for determination of articular cartilage pericellular matrix properties in situ via inverse analysis of chondron deformation, *Journal of Biomechanical Engineering*, Vol. 132:031011, 13 pages
- F49.** (2010) M.A. Haider, B.A. Benedict, E. Kim and F. Guilak, Computational modeling of cell mechanics in articular cartilage, in *Computational Modeling in Biomechanics* (eds. S. De, F. Guilak and M.R.K. Mofrad), Springer, New York, pp. 329-352.
- F48.** (2010) D.L. Nettles, M.A. Haider, A. Chilkoti and L.A. Setton, Neural network analysis identifies scaffold properties necessary for in vitro chondrogenesis in elastin-like polypeptide biopolymer scaffolds, *Tissue Engineering Part A*, Vol. 16, pp. 11-20.
- F47.** (2009) D. Valdez-Jasso, M.A. Haider, H.T. Banks, D.B. Santana, Y.Z. German, R. Armentano and M.S. Olufsen, Analysis of viscoelastic wall properties in ovine arteries, *IEEE Transactions on Biomedical Engineering*, Vol. 56, pp. 210-219.
- F46.** (2009) S.D. Olson and M.A. Haider, A level set reaction-diffusion model for tissue regeneration in articular cartilage, *International Journal of Pure and Applied Mathematics*, Vol. 53, pp. 333-353.
- F45.** (2009) D. Valdez-Jasso, H.T. Banks, M.A. Haider, D. Bia, Y. Zocalo, R.L. Armentano and M.S. Olufsen, Viscoelastic models for passive arterial wall dynamics, *Advances in Applied Mathematics and Mechanics*, Vol. 1, pp. 151-165.
- F44.** (2008) E. Kim, F. Guilak and M.A. Haider, The dynamic mechanical environment of the chondrocyte: A biphasic finite element model of cell-matrix interactions under cyclic compressive loading, *Journal of Biomechanical Engineering*, Vol. 130:061009, 10 pages.

- F43.** (2008) F.W. Mauldin, M.A. Haider, E.G. Lobo, R.H. Behler, L.E. Euliss, T.W. Pfeiler and C.M. Gallippi, Monitored steady-state excitation and recovery (MSSER) radiation force imaging using viscoelastic models, *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Controls*, Vol. 55, pp. 1597-1610.
- F42.** (2007) M.A. Haider and F. Guilak, Application of a three-dimensional poroelastic BEM to modeling the biphasic mechanics of cell-matrix interactions in articular cartilage, *Computer Methods in Applied Mechanics and Engineering*, Vol. 196, pp. 2999-3010.
- F41.** (2006) M.A. Haider, R.C. Schugart, L.A. Setton and F. Guilak, A mechano-chemical model for the passive swelling response of an isolated chondron under osmotic loading, *Biomechanics and Modeling in Mechanobiology*, Vol. 5, pp. 160-171.
- F40.** (2006) M.A. Haider and R.C. Schugart, A numerical method for the continuous spectrum biphasic poroviscoelastic model of articular cartilage, *Journal of Biomechanics*, Vol. 39, No. 1, pp. 177-183.
- F39.** (2006) H.A. Leddy, M.A. Haider and F. Guilak, Diffusional anisotropy in collagenous tissues: fluorescence imaging of continuous point photobleaching, *Biophysical Journal*, Vol. 91, pp. 311-316.
- F38.** (2006) F. Guilak, L.G. Alexopoulos, M.L. Upton, I. Youn, J.B. Choi, L.A. Setton and M.A. Haider, The pericellular matrix as a transducer of biomechanical and biochemical signals in cartilage, *Annals of the New York Academy of Sciences*, 1068:498-512.
- F37.** (2006) F. Guilak, M.A. Haider, F.P.T. Baaijens, T.A. Laursen and L.A. Setton, Multiphasic models of cell mechanics, in *Cytoskeletal Mechanics: Models and Measurements* (eds. M. Kaazempur-Mofrad and R. Kamm), pp. 84-102, Cambridge University Press, New York.
- F36.** (2005) F. Guilak, L.G. Alexopoulos, M.A. Haider, H.P. Ting-Beall and L.A. Setton, Zonal uniformity in mechanical properties of the chondrocyte pericellular matrix: micropipette aspiration of canine chondrons isolated by cartilage homogenization, *Annals of Biomedical Engineering*, Vol. 33, pp. 1312-1318.
- F35.** (2004) M.A. Haider, A radial biphasic model for local cell-matrix mechanics in articular cartilage, *SIAM Journal on Applied Mathematics*, Vol. 64, pp. 1588-1608.
- F34.** (2004) M.A. Haider, K.J. Mehta and J.P. Fouque, Time-reversal simulations for detection in randomly layered media, *Waves in Random Media*, Vol. 14, pp. 185-198.
- F33.** (2003) L.G. Alexopoulos, M.A. Haider, T.P. Vail and F. Guilak, Alterations in the mechanical properties of the human chondrocyte pericellular matrix with osteoarthritis, *Journal of Biomechanical Engineering*, Vol. 125, pp. 323-333.
- F32.** (2002) M.A. Haider and F. Guilak, An axisymmetric boundary integral model for assessing elastic cell properties in the micropipette aspiration contact problem, *Journal of Biomechanical Engineering*, Vol. 124, pp. 586-595.
- F31.** (2002) M.A. Haider, S. Venakides and S.P. Shipman, Boundary-integral calculations of two dimensional electromagnetic scattering in infinite photonic crystal slabs: Channel defects and resonances, *SIAM Journal on Applied Mathematics*, Vol. 62, No. 6, pp. 2129-2148.
- F30.** (2000) M.A. Haider and F. Guilak, An axisymmetric boundary integral model for incompressible linear viscoelasticity: Application to the micropipette aspiration contact problem, *Journal of Biomechanical Engineering*, Vol. 122, No. 3, pp. 236-244.
- F29.** (2000) S. Venakides, M.A. Haider and V. Papanicolaou, Boundary integral calculations of 2-d electromagnetic scattering by photonic crystal Fabry-Perot structures, *SIAM Journal on Applied Mathematics*, Vol. 60, No. 5, pp. 1686-1706.
- F28.** (2000) S. Venakides, M.A. Haider and V. Papanicolaou, Wave propagation in photonic crystal media, in *Scattering Theory and Biomedical Engineering Modelling and Applications* (eds. C. Dassios et al.), World Scientific, New Jersey, pp. 120-134.
- F27.** (1999) M.M. Beaky, J.B. Burk, H.O. Everitt, M.A. Haider and S. Venakides, Two dimensional photonic crystal Fabry-Perot resonators with lossy dielectrics, *IEEE Transactions on Microwave Theory and Techniques*, Vol. 47, No. 11, pp. 2085-2091.

- F26.** (1997) M.A. Haider and M.H. Holmes Analytic approximations to the deformation of a thin compressible elastic layer by a rigid flat indenter, in *Applied Mathematics: Methods and Applications* (ed. G. Oyibo), pp. 257-288, Nova Science.
- F25.** (1997) M.A. Haider and M.H. Holmes, A mathematical approximation for the solution of a static indentation test, *Journal of Biomechanics*, Vol. 30, pp. 747-752.
- F24.** (1997) M.A. Haider and M.H. Holmes, Three dimensional viscoelasticity in finite strain: Formulation of a rate-type constitutive law consistent with dissipation, *IMA Volumes in Mathematics and its Applications*, Vol. 98, pp. 67-88.
- F23.** (1996) M.A. Haider and M.H. Holmes, Analytic approximations to the deformation of a thin elastic layer by a rigid flat indenter, *Nova Journal of Mathematics, Game Theory and Algebra*, Vol. 5, pp. 1-32.
- F22.** (1995) M.A. Haider and M.H. Holmes, Indentation of a thin compressible elastic layer: Approximate analytic and numerical solutions for rigid flat indenters, *Journal of the Mechanics and Physics of Solids*, Vol. 8, pp. 1199-1219.

### **Thesis**

- F21.** (1996) M.A. Haider, *Analytic Approximations for the Indentation of a Thin Linear Elastic Layer and a Viscoelastic Formulation in Finite Strain with Applications to the Mechanics of Biological Soft Tissues*, PhD Thesis, Rensselaer Polytechnic Institute, Troy, NY.

### **Peer-reviewed conference proceedings**

- F20.** (2017) M.U. Qureshi, M.A. Haider, N.C. Chesler and M.S. Olufsen, Simulating the effects of hypoxia on pulmonary hemodynamics in mice, *Proceedings of the 5<sup>th</sup> International Conference on Computational and Mathematical Biomedical Engineering*, 10-12 April 2017, 4 pages, submitted.
- F19.** (2010) D. Valdez-Jasso, D. Bia, M.A. Haider, Y. Zocalo, R.L. Armentano and M.S. Olufsen, Linear and nonlinear viscoelastic modeling of ovine aortic biomechanical properties under in vivo and ex vivo conditions, *Proceedings of the 32nd Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, 4 pages
- F18.** (2010) E. Kim, F. Guilak and M.A. Haider, Determination of in situ articular cartilage pericellular matrix properties via inverse BEM analysis of chondron deformation, *Proceedings of the ASME 2010 Summer Bioengineering Conference*, abstract 19308, Naples, FL, June 16-19, 2010, 2 pages.
- F17.** (2009) D. Valdez-Jasso, M.A. Haider, S.L. Campbell, D. Bia, Y. Zocalo, R.L. Armentano and M.S. Olufsen, Modeling viscoelastic properties of ovine arteries, *Proceedings of the ASME 2009 Summer Bioengineering Conference*, abstract 205640, Lake Tahoe, CA, June 17-21, 2009, 2 pages.
- F16.** (2007) F.W. Mauldin, O.B. Davis, M.A. Haider, E.G. Loba, T.W. Pfeiler and C.M. Gallippi, On the potential of combined ARFI and elastography to improve differentiation of material structure in viscoelastic tissue, *2007 IEEE Ultrasonics Symposium Proceedings*, 28-31 Oct. 2007, New York, NY, pp. 2040-2045.
- F15.** (2006) J.H. Levy, R. Behler, M.A. Haider, J.S. Marron and C. Gallippi, Discrimination of mechanical response to ARFI excitation in a raised atherosclerotic plaque, *The 1<sup>st</sup> International Workshop on Computer Vision for Intravascular and Intracardiac Imaging* (G Unal, I Kakadiaris, G Slabaugh and A Tannebaum, Eds.), pp. 58-65.
- F14.** (2006) M.A. Haider and F. Guilak, A three-dimensional poroelastic boundary element method applied to modeling biphasic cell-matrix interactions in articular cartilage, *Proceedings of the ASME 2006 Bioengineering Conference*, abstract 157465, Amelia Island, FL, June 21-25, 2006, 2 pages.
- F13.** (2005) M.A. Haider, R.C. Schugart, L.A. Setton and F. Guilak, A mechano-chemical model of osmotic loading of an isolated chondron, *Proceedings of the ASME 2005 Summer Bioengineering Conference*, ASME, abstract 168184, Vail, CO, June 22-26, 2005, 2 pages.
- F12.** (2005) M.A. Haider, D.L. Nettles, K. Trabbic-Carlson, A. Chilkoti and L.A. Setton, Predictive modeling of polypeptide hydrogel mechanical properties for cartilage repair using artificial neural networks, *Proceedings of the ASME 2005 Bioengineering Conference*, ASME, abstract 173514, Vail, CO, June 22-26, 2005, 2 pages.

- F11.** (2003) M.A. Haider, S. Beun, J. Latulippe and F. Guilak A spherical biphasic model for radial deformation in a chondron, *Proceedings of the Bioengineering Conference*, ASME, pp. 569-570.
- F10.** (2003) L.G. Alexopoulos, M.A. Haider, T.P. Vail and F. Guilak, Alterations in the mechanical properties of the human chondrocyte pericellular matrix with osteoarthritis, *Transactions of the Orthopaedic Research Society*, 28:107, 1 page.
- F9.** (2002) L.G. Alexopoulos, M.A. Haider and F. Guilak, The mechanical role of the chondrocyte pericellular matrix in articular cartilage: Micropipette aspiration of mechanically isolated chondrons, *Proceedings of the 3rd European Symposium in Biomedical Engineering and Medical Physics*, pp. 7-8.
- F8.** (2002) F. Guilak, L. Alexopoulos, R. Nielsen, H. Ting-Beall and M.A. Haider, The biomechanical properties of the chondrocyte pericellular matrix: Micropipette aspiration of mechanically isolated chondrons, *Transactions of the of the Orthopaedic Research Society*, 27:405.
- F7.** (2001) L.G. Alexopoulos, M.A. Haider and F. Guilak, An axisymmetric elastic layered half-space model for micropipette aspiration of the chondrocyte pericellular matrix, *BED-Advances in Bioengineering-Proceedings of the 2001 Bioengineering Conference*, ASME, Vol. 51, 2 pages.
- F6.** (1999) M.A. Haider and F. Guilak, A viscoelastic boundary element model of contact in the micropipette aspiration test, *BED-Advances in Bioengineering-Proceedings of the 1999 Bioengineering Conference*, ASME, 42:339-340.
- F5.** (1998) MA Haider and F Guilak, Boundary element analysis of contact problems in cartilage cell mechanics, in "Modeling and Simulation Based Engineering" (Eds. S.N. Alturi and P.E. O'Donoghue), *Proceedings of the International Conference on Computational Engineering Science*, Atlanta, GA, Oct. 1998, II:1769-1774, Tech Science Press.
- F4.** (1994) M.H Holmes and M.A. Haider, The role of matrix viscoelasticity and fluid flow in the compressive behavior of cartilage, *Proceedings of the Second World Congress of Biomechanics*, II: 29, Stichting.
- F3.** (1994) M.A. Haider and M.H. Holmes, An approximation to the steady-state deformation of articular cartilage under indentation, *Proceedings of the Second World Congress of Biomechanics*, II: 214, Stichting.

### **Technical Reports**

- F2.** (2006) *Twelfth Industrial Mathematical and Statistical Modeling Workshop for Graduate Students* (Edited by A Chertock, MA Haider, MS Olufsen and R Smith), CRSC-TR06-23, 167 pages.
- F1.** (2005) *Eleventh Industrial Mathematical and Statistical Modeling Workshop for Graduate Students* (Edited by RT Buche, MA Haider, RC Smith and HT Tran), CRSC-TR05-46, 145 pages.

## **G. RESEARCH DIRECTION**

### **PhD students – Current**

- G29.** [Chair] Mallory McMahan (PhD, Applied Math)
- G28.** [Chair] Tricity Andrew (PhD, Applied Math)
- G27.** [Chair] Christine Mennicke (PhD, Applied Math), NSF Graduate Research Fellowship awardee
- G26.** [Chair] Micaela Mendlow (PhD, Applied Math)

### **PhD students – Graduated**

- G25.** [Co-Chair] Christina Battista (PhD, 2015, Applied Math, with M. Olufsen)
- Post-PhD position: Post-Doc, Hamner Institute, RTP, NC
- G24.** [Chair] Ahlam Elashgh (PhD, 2015, Applied Math), returned to Libya for faculty position
- G23.** [Chair] Amanda Mangum (PhD, 2014, Biomathematics)
- Post-PhD position: Assistant Professor (tenure track), Mathematics Dept., Niagara Univ.
- G22.** [Chair] Janine Haugh (PhD, 2010, Applied Math)
- Post-PhD position: Assistant Professor (tenure track), Dept. of Mathematics, UNC-Asheville
- G21.** [Co-Chair] Daniela Valdez-Jasso (PhD, 2010, Biomathematics, with M. Olufsen)

- Post-PhD position: Research Associate, Cardiovascular Biomechanics Laboratory, Dept. of Bioengineering & McGowan Institute for Regenerative Medicine, Univ. of Pittsburgh
- Current position: Assistant Professor (tenure track), Dept. of Bioengineering, Univ. of Illinois at Chicago

**G20.** [*Chair*] Eunjung Kim (PhD, 2009, Applied Math)

- Post-PhD positions:  
(2009-10) Postdoctoral Research Associate, Dept. of Mathematics & Interdisciplinary Center for the Study of Biocomplexity, University of Notre Dame  
(2010-present) Postdoctoral Associate, Integrated Mathematical Oncology, Moffitt Cancer Center

**G19.** [*Chair*] Sarah Olson (PhD, 2008, Biomathematics)

- Post-PhD position: (2008-11) VIGRE Postdoctoral Fellow, Mathematics Department, Tulane University
- (2011-present) Assistant Professor (tenure track), Dept. of Mathematics, Worcester Polytechnic Institute, NSF CAREER award winner

**G18.** [*Chair*] Brandy Benedict (PhD, 2008, Applied Math with Computational Math concentration)

- Post-PhD position: Assistant Professor (tenure track), Dept. of Mathematics, Merrimack College

**G17.** [*Chair*] Richard Schugart (PhD, 2005, Applied Math)

- Post-PhD position: Postdoctoral Fellow, Mathematical Biosciences Institute, Ohio State University
- Current position: Associate Professor, Dept. of Mathematics, Western Kentucky University

### **MS students - Graduated**

**G16.** [*Co-Chair*] Dominic Pafundi (MS, 2015, Applied Math)

**G15.** [*Chair*] Katherine Henry (MS, 2013, Applied Math)

**G14.** [*Chair*] Amanda Smith (MS, 2012, Applied Math)

**G13.** [*Co-Chair*] Daniela Valdez-Jasso (MS, 2008, Applied Math)

**G12.** [*Chair*] Carrie Ward (MS, 2005, Applied Math)

### **Postdoctoral fellows**

**G11.** Andreas Aristotelous (SAMSI post-doc), 2011-14

**G10.** Zhengzheng Hu (NSF RTG post-doc), 2009-12

**G9.** Michael Stuebner (NSF RTG post-doc), 2008-10

### **Undergraduate research students**

**G8.** Timothy Wessler, NCSU math undergraduate (Fall 2010-Summer 2012)

**G7.** Jeff Olander, NCSU math undergraduate (Spring 2008-Summer 2009)

**G6.** Leslie Watkins, NCSU math undergraduate (Spring 2009)

**G5.** Project Faculty, 2010 NCSU summer *REU Program in Modeling and Industrial Applied Mathematics*, Project: "Tissue engineering of the intervertebral disc," 4 students

**G4.** Project Faculty, 2009 NCSU summer *REU Program in Modeling and Industrial Applied Mathematics*, Project: "Modeling ultrasound imaging in cardiovascular tissue," 3 students

**G3.** Project Faculty, 2008 NCSU summer *REU Program in Modeling and Industrial Applied Mathematics*, Project: "Mathematical modeling of cartilage regeneration via hydrogels," 5 students

**G2.** Project Faculty, 2007 NCSU summer *REU Program in Modeling and Industrial Applied Mathematics*, Project: "Monte Carlo simulation of diffusion in hyaluronan-based scaffolds with applications to tissue engineering of articular cartilage," 3 students

**G1.** Project Faculty, 2006 NCSU summer *REU Program in Modeling and Industrial Applied Mathematics*, Project: "Mechano-chemical models for chondron deformation in articular cartilage subject to osmotic loading," 3 students

## H. PRESENTATIONS

### Invited Talks - Conferences & Workshops

- (2016) “Biomass and water accumulation in plant cells during fruit growth,” *The Thirteenth Annual Graduate Student Math Modeling Camp*, Rensselaer Polytechnic Institute, Troy, NY , 6/7/16
- (2014) “Modeling cartilage tissue engineering in cell-seeded scaffolds,” Minisymposium on *Modeling and simulation of complex biological systems*, 2014 SIAM Conference on the Life Sciences, Charlotte, NC, August 4-7, 2014.
- (2013) “Mathematical and computational mixture models for cartilage regeneration in cell-seeded scaffolds,” *12<sup>th</sup> U.S. National Congress on Computational Mechanics*, Special Session on “Cartilage Mechanics: Characterization & Computational Modeling,” Raleigh NC, July 22-25, 2013.
- (2012) “Continuum mixture models for cartilage tissue engineering in cell-seeded scaffolds,” *2012 Canadian Applied & Industrial Mathematics Annual Meeting*, special session on “Mathematical Biology & Medicine,” University of Toronto, June 24-28, 2012
- (2012) “Cell-substrate interactions in orthopaedic tissue engineering,” *The Ninth Annual Graduate Student Math Modeling Camp*, Rensselaer Polytechnic Institute, Troy, NY , 6/5/12
- (2012) “Porous mixture models for cartilage regeneration in cell-seeded scaffolds,” *4<sup>th</sup> International Conference on Porous Media*, Purdue University, May 14-16, 2012, invited talk in minisymposium on “Biological Porous Media”
- (2012) “Bridging cell and tissue scale models for cell-matrix interactions in articular cartilage,” *SAMSI UQ Transition Workshop*, RTP, May 21-23, 2012
- (2011) “Mixture models for cartilage tissue engineering using cell-seeded scaffolds,” *AMS Fall Southeastern Section Meeting*, Special Session on “Applications of Difference and Differential Equations to Biology,” Wake Forest University, Winston-Salem, NC, Sep. 24-25, 2011
- (2010) “Mechano-chemical models of ionic effects in the cellular microenvironment of articular cartilage,” *2010 SIAM Annual Meeting*, Minisymposium on “Fluids with Dynamic Microstructure,” Pittsburgh, PA, July 12-16, 2010
- (2010) “Continuum mixture models of biomechanical cell-matrix interactions in articular cartilage,” *2010 InterPore Conference and Annual Meeting*, Texas A&M University, College Station, TX, March 14-17, 2010, invited talk [single track conference]
- (2009) “Axisymmetric elastic BEM for in situ determination of articular cartilage micromechanical properties,” *10<sup>th</sup> U.S. National Congress on Computational Mechanics*, Special Session on “Computational Bioengineering,” Columbus, OH, July 16-19, 2009
- (2008) “Multiphasic models of cell-matrix interactions in articular cartilage,” Minisymposium on “Analysis and Simulations of Technological and Biological Complex Fluids,” *2008 SIAM Annual Meeting*, San Diego, CA, July 7-11, 2008
- (2008) “Turning gels into cartilage: modeling tissue regeneration in cell-seeded scaffolds,” *The Fifth Annual Graduate Student Math Modeling Camp*, Rensselaer Polytechnic Institute, Troy, NY , 6/10/08
- (2007) “Poroelastic BEMs for modeling biphasic mechanics of cell-matrix interactions in articular cartilage,” *9<sup>th</sup> U.S. National Congress on Computational Mechanics*, Special Session on “Computational Methods in Bioengineering,” San Francisco, CA, July 23-26, 2007
- (2007) “Continuum mixture models of the cellular microenvironment in articular cartilage,” *Applications of Analysis to Mathematical Biology Conference*, Duke University, 5/21/07
- (2007) “Biphasic poroelastic models for deformation in the cellular microenvironment of articular cartilage,” *2007 SIAM Conference on Mathematical and Computational Issues in the Geosciences*, Minisymposium on “Flow and Deformation Processes in Porous Media,” Santa Fe, NM, March 19-22, 2007
- (2006) “Multiscale biphasic continuum mixture models of the pericellular microenvironment in articular cartilage,” *2006 AMS Fall Central Sectional Meeting*, Special Session on “Mathematical Modeling of Biological Systems,” University of Cincinnati, Cincinnati, OH, 10/21/06
- (2006) “Optimal design of biocompatible materials for cartilage repair”, *The Third Annual Graduate*



*Student Math Modeling Camp*, Rensselaer Polytechnic Institute, Troy, NY , 6/6/06

(2005) “Mechano-chemical modeling of the local cellular environment in articular cartilage,” *2005 SIAM Annual Meeting*, Minsymposium on “Biological and Chemical Modeling with Applications,” July 2005, New Orleans, LA

(2004) “Time reversal numerical simulations for randomly layered media,” *4<sup>th</sup> SIAM Conference on Mathematical Aspects of Materials Science*, Minisymposium on “Light and Wave Propagation in Inhomogeneous Media: Theory and Modeling”, May 2004, Los Angeles, CA

(2003) “Mixture models of cell-matrix mechanics in articular cartilage and alterations with osteoarthritis,” *2003 AMS Fall Southeastern Section Meeting*, Special Session on “Mathematical Modeling in Physiology and Medicine,” October 2003, Chapel Hill, NC

(2003) “A radial biphasic model for local cell-matrix mechanics in articular cartilage,” *2003 Spring Southeastern Sectional Meeting of the AMS*, Special Session on “Applied Mathematics and Materials Science,” March 2003, Baton Rouge, LA

(2002) “A time-marching boundary element method for standard linear viscoelasticity,” *International Conference on Mathematics and Biology and 2002 Annual Meeting of the Society for Mathematical Biology*, Minsymposium on “Computational Biofluid Dynamics”, July 2002, Knoxville, TN

(1999) “A viscoelastic boundary element model of contact in the micropipette aspiration test,” *ASME Summer Bioengineering Conference*, Symposium on “Cell and Tissue Engineering,” June 1999, Big Sky, MT

(1998) “Boundary element analysis of contact problems in cartilage cell mechanics,” *International Conference on Computational Engineering Science*, Special Session on “Contact Mechanics,” October 1998, Atlanta, GA

(1995) “Analytic approximations to the deformation of a thin compressible elastic layer by a rigid flat indenter,” Workshop on *Applied Mathematics: Methods and Applications*, Winter, 1995, Troy, NY

#### **Invited Talks - External Colloquia & Seminars**

(2016) “Continuum mixture models for extracellular matrix regeneration in cartilage tissue engineering,” SoftMech research seminar, School of Mathematics & Statistics, Univ. of Glasgow, 9/21/16

(2015) “Mathematical modeling of extracellular matrix regeneration in cartilage tissue engineering,” Colloquium, College of the Holy Cross, Dept. of Mathematics and Computer Science, 11/18/15

(2011) “Mixture models for cartilage tissue engineering in biomaterial scaffolds seeded with chondrocytes,” Mathematical Sciences Colloquium, Worcester Polytechnic Institute, 11/18/11

(2011) “Mixture models for cartilage tissue engineering in biomaterial scaffolds seeded with chondrocytes,” Duke University Mathematical Biology Colloquium, 9/23/11

(2010) “Mathematical modeling of cell-matrix interactions in natural and tissue engineered articular cartilage,” Colloquium and SIAM Student Chapter Seminar, University of Tennessee, 4/30/10

(2009) “Mathematical modeling of cell-matrix interactions in articular cartilage,” Mathematics Department Colloquium, Tulane University, 1/29/09

(2007) “Multiphasic models of cell-matrix interactions in articular cartilage,” Applied Math Colloquium, UNC-Chapel Hill, 10/26/07

(2006) “The role of mechanics in osteoarthritis: modeling the cellular microenvironment in articular cartilage,” Seminar, Mathematical Biosciences Institute, Ohio State University, 10/23/06

(2005) “Mechanical and chemical models of the pericellular microenvironment in articular cartilage,” Duke Applied Math & Analysis Seminar, 11/28/05

(2002) “Modeling the role of the pericellular matrix in cartilage mechanics,” Cell Mechanics Group Seminar, Duke University Medical Center, May 2002

(1999) “Boundary integral computations of electromagnetic scattering in photonic crystal structures,” Dept. of Mathematics and Statistics, Simon Fraser University, February 1999

(1999) “Boundary integral computations of electromagnetic scattering in photonic crystal structures,” Dept. of Mathematics and Statistics, University of Maryland-Baltimore County, February 1999

- (1999) “Boundary integral computations of electromagnetic scattering in photonic crystal structures,” Dept. of Mathematics and Statistics, Bowling Green State University, February 1999
- (1999) “Boundary integral computations of electromagnetic scattering in photonic crystal structures,” Dept. of Mathematics, NCSU, February 1999
- (1998) “Contact problems for assessing cartilage matrix and cell mechanical properties,” Dept. of Applied Mathematics, University of Western Ontario, March 1998
- (1998) “Contact problems for assessing cartilage matrix and cell mechanical properties,” Dept. of Mathematical Sciences, Worcester Polytechnic Institute, February 1998
- (1998) “Contact problems for assessing cartilage matrix and cell mechanical properties,” Dept. of Mathematics and Statistics, McMaster University, February 1998
- (1997) “Approximate solution of a contact problem in soft tissue biomechanics,” Dept. of Applied Mathematics, University of Washington (Seattle), January 1997
- (1997) “Approximate solution of a contact problem in soft tissue biomechanics,” Dept. of Mathematics, Harvey Mudd College, February 1997

### **Contributed Presentations - Conferences & Workshops**

- (2016) “Stochastic modeling of cell proliferation and differentiation in developmental neurobiology,” *MBI Workshop Population Models in the 21<sup>st</sup> Century*, November 14-18, 2016 [poster]
- (2016) “Models and algorithms for 3D corneal biometry from optical coherence tomography,” *SIAM Conference on Imaging Science*, Albuquerque, NM, May 23-26, 2016 (poster)
- (2015) “Mixture models for cartilage extracellular matrix regeneration in cell-seeded scaffolds,” *SMB Annual Meeting*, Atlanta, GA, June 3-July 3, 2015, (talk)
- (2014) “Computational model for optical coherence tomography imaging of the human eye,” *MBI Workshop on Integrating Modalities and Scales in Life Science Imaging*, March 17-21, 2014 [poster]
- (2012) “Bridging cell and tissue scale models for nutrient diffusion and uptake in articular cartilage,” 2012 SIAM Conference on the Life Sciences, Aug 7-10, 2012, San Diego, CA (poster)
- (2010) “A fast quadrature-based numerical method for the continuous spectrum biphasic poroviscoelastic model of articular cartilage,” *2010 SIAM Conference on the Life Sciences*, July 12-15, 2010, Pittsburgh, PA (poster)
- (2010) “Determination of in situ articular cartilage pericellular matrix properties via inverse BEM analysis of chondron deformation,” Poster session on “Musculoskeletal Soft Tissues,” *2010 Summer Bioengineering Conference*, June 16-19, 2010, Naples, FL (poster)
- (2010) “Biomechanics of the cellular microenvironment in articular cartilage,” *34<sup>th</sup> SIAM Southeastern-Atlantic Section Annual Meeting*, Minisymposium on “Modeling in biomechanics and bioengineering,” 3/20/10, Raleigh, NC (talk)
- (2009) “Modeling viscoelastic properties of ovine arteries,” *2009 Summer Bioengineering Conference*, June 17-21, Lake Tahoe, CA (poster)
- (2008) “Mechano-chemical models of swelling in the microscopic environment of articular cartilage,” minisymposium on “Swelling Porous Materials”, *2008 SIAM Conference on Mathematical Aspects of Materials Science*, May 11-14, 2008, Philadelphia, PA (talk)
- (2007) “Artificial neural network modeling of structure-function relationships for ELP hydrogels in the cartilage repair problem,” *IMA Annual Program on Applications of Algebraic Geometry, Workshop on Applications in Biology, Dynamics and Statistics*, March 5-9, 2007, Minneapolis, MN (poster).
- (2007) “Modeling articular cartilage regeneration using hydrogel scaffolds,” *Applications of Analysis to Mathematical Biology Conference*, Duke University, 5/21/07 (poster)
- (2006) “A three-dimensional poroelastic boundary element method applied to modeling biphasic cell-matrix interactions in articular cartilage,” *2006 Summer Bioengineering Conference*, June 21-25, 2006, Amelia Island, FL (podium talk).
- (2005) “A mechano-chemical model of osmotic loading of an isolated chondron,” *2005 Summer Bioengineering Conference*, June 22-26, 2005, Vail, CO (podium talk).

- (2005) "Predictive modeling of polypeptide hydrogel mechanical properties for cartilage repair using artificial neural networks," *2005 Summer Bioengineering Conference*, June 22-26, 2005, Vail, CO (podium talk)
- (2004) "Mechano-chemical properties of articular chondrocytes under osmotic loading," *2004 BMES Annual Fall Meeting*, Philadelphia, PA, October 2004, (podium talk).
- (2004) "Modeling mechanotransduction in articular cartilage: The role of the pericellular matrix," *2004 SIAM Conference on the Life Sciences*, Minisymposium on "Mathematical Modeling of the Musculoskeletal System," July 2004, Portland, OR (talk)
- (2004) "Osmotic loading of articular cartilage cells using triphasic theory," *2004 SIAM Conference on the Life Sciences*, July 2004, Portland, OR (poster).
- (2004) "A biphasic model for local cell-matrix mechanics in articular cartilage", *4<sup>th</sup> SIAM Conference on Mathematical Aspects of Materials Science*, May 2004, Los Angeles, CA (poster).
- (2003) "Numerical method for time-reversal of waves in random media," *SIAM Conference on Computational Science and Engineering*, February 2003, San Diego, CA (poster).
- (2002) "Integral equation models of cell mechanics in articular cartilage," *First SIAM Conference on the Life Sciences*, March 2002, Boston, MA (poster).
- (2000) "Boundary integral model for 2-D electromagnetic scattering by photonic crystal structures," *3rd SIAM Conference on Mathematical Aspects of Materials Science*, May 2000, Philadelphia, PA (talk).
- (1999) "Boundary integral model of the micropipette aspiration contact problem," *IMA Workshop on Computational Modeling in Biological Fluid Dynamics*, January 1999, Minneapolis, MN (poster).
- (1998) "A computational model for mechanical testing of individual cartilage cells," *SIAM Annual Meeting*, July 1998, Toronto, Canada (talk).
- (1994) "The role of matrix viscoelasticity and fluid flow in the compressive behavior of cartilage," *Second World Congress of Biomechanics*, July 1994, Amsterdam (podium talk).
- (1994) "An approximation to the steady-state deformation of articular cartilage under indentation," *Second World Congress of Biomechanics*, July 1994, Amsterdam (podium talk).

### **Internal Talks**

- (2013) "Mathematical and computational mixture models for cartilage regeneration in cell-seeded scaffolds," Biomathematics Seminar, NCSU, 12/3/13
- (2013) "Mathematical modeling of cartilage tissue engineering," SUM Club talk, 11/20/13
- (2011) "A fast quadrature-based numerical method for the continuous spectrum biphasic poroviscoelastic model of articular cartilage," Numerical Analysis Seminar, NCSU, 1/25/11
- (2009) "Computational models for biomechanics of the pericellular matrix in articular cartilage," Numerical Analysis Seminar, NCSU, 3/10/09
- (2007) "Continuum mixture models for mechanics in the cellular microenvironment of articular cartilage," Mechanics and Materials Seminar, NCSU, 2/21/07
- (2007) "Finite element models of biphasic deformation in the cellular microenvironment of articular cartilage," Numerical Analysis Seminar, NCSU, 2/13/07
- (2006) "Artificial neural networks for analysis of cartilage repair using hydrogel scaffolds," Biomathematics Seminar, NCSU, 11/7/06
- (2005) "An accelerated numerical method for the continuous spectrum biphasic poroviscoelastic model of articular cartilage," Numerical Analysis Seminar, NCSU, September 2005
- (2003) "The role of cartilage mechanics in osteoarthritis: models and experiments," Biomathematics Seminar, NCSU, April 2003
- (2002) "Numerical simulation of time reversal for waves in random media," Numerical Analysis Seminar, NCSU, December 2002
- (2002) "Modeling the role of the pericellular matrix in cartilage mechanics," Numerical Analysis Seminar, NCSU, April 2002
- (2001) "Boundary integral models of 2-D electromagnetic scattering in photonic crystals," VISTA Seminar, Dept. of Electrical and Computer Engineering, NCSU, April 2001

- (2000) “A boundary integral model for mechanical testing of individual cartilage cells,” Numerical Analysis Seminar, NCSU, February 2000
- (1998) “Boundary integral model for mechanical testing of individual cartilage cells,” Scientific Computation and Applied Mathematics Seminar, Duke University, October 1998.
- (1997) “Viscoelastic modeling of biological soft tissues,” Dept. of Civil Engineering, Duke University, March 1997
- (1996) “Approximate solution of a contact problem in soft tissue biomechanics,” Scientific Computation and Applied Mathematics Seminar, Duke University, October 1996

### **Training & Outreach**

- (2015) Panelist for session on “Paths to the doctorate: finding the right graduate program for you,” *2015 Field of Dreams Conference*, Birmingham, AL, Nov. 6-8, 2015.
- (2015) Panelist for session on “Preparing a Successful Grant Application,” *Joint Math Meetings*, San Antonio TX, Jan 10-13, 2015, organized by Project NEXT
- (2015) Talk on “Writing effective recommendation letters for students applying to mathematics doctoral programs,” *MAA Southeastern Section Meeting*, Project NEXT session, UNC-Wilmington, 3/12/15
- (2010) “Applied mathematics & applications to the biomechanics of orthopaedic soft tissues,” Future Scientists Club, Enloe High School, Raleigh, NC (2/25/10)
- (2008) “Cartilage regeneration,” Scope Academy, NCSU, 10/11/08 (talk to NCSU PAMS alumni)
- (2005) “Mathematical modeling applied to soft tissue biomechanics & understanding osteoarthritis,” presentation to Board of Directors, NCSU PAMS Foundation (4/15/2005)

### **I. CONFERENCE & WORKSHOP ORGANIZATION**

- I15.** (2017) Lead Organizer, *SAMSI Industrial Mathematical and Statistical Modeling Workshop for Graduate Students*, NC State University, July 16-26, 2017.
- I14.** (2016) Invited Mentor (1 of 4), *The Thirteenth Annual Graduate Student Math Modeling Camp*, Rensselaer Polytechnic Institute, Troy, NY, June 7-19, 2016.
- I13.** (2015) Minisymposium on “Multiscale models of biophysical and biomechanical effects in soft tissues,” SMB Annual Meeting, Atlanta, GA, June 3-July 3, 2015, co-organized with Sarah Olson (WPI)
- I12.** (2014) Minisymposium on “Modeling arterial wall mechanics and adaption using structurally based constitutive laws,” 2014 SIAM Conference on the Life Sciences, Charlotte, NC, August 4-7, 2014, co-organized with Mette Olufsen (NCSU)
- I11.** (2012) Invited Mentor (1 of 4), *The Ninth Annual Graduate Student Math Modeling Camp*, Rensselaer Polytechnic Institute, Troy, NY, June 5-8 2012.
- I10.** (2010) Organizing Committee, *34<sup>th</sup> SIAM Southeastern-Atlantic Section Conference*, North Carolina State University, March 20-21, 2010
- I9.** (2010) Co-organizer (with Sarah Olson, Tulane), Minisymposium on “Modeling in Biomechanics and Bioengineering,” *34<sup>th</sup> SIAM Southeastern-Atlantic Section Conference*, North Carolina State University, March 20-21, 2010, 8 speakers
- I8.** (2009) Co-organizer (with Greg Forest, UNC-CH), Special Session on “Mathematical Progress and Challenges for Biological Materials,” *2009 AMS Spring Southeastern Section Meeting*, North Carolina State University, April 4-5, 2009, 13 speakers
- I7.** (2008) Invited Mentor (1 of 4), *The Fifth Annual Graduate Student Math Modeling Camp*, Rensselaer Polytechnic Institute, Troy, NY, June 10-13 2008.
- I6.** (2008) Co-organizer (with Lynn Bennethum, UC-Denver), Minisymposium on “Swelling Porous Materials,” *2008 SIAM Conference on Mathematical Aspects of Materials Science*, Philadelphia, PA, May 2008, 8 speakers
- I5.** (2006) Chair, *SAMSI/CRSC 12<sup>th</sup> Industrial Mathematical and Statistical Modeling Workshop for Graduate Students*, North Carolina State University, July 24-August 1, 2006

- I4.** (2006) Invited Mentor (1 of 4), *The Third Annual Graduate Student Math Modeling Camp*, Rensselaer Polytechnic Institute, Troy, NY, June 6-9 2006, designed project and mentored a group of 6 graduate students for one week on the topic: “Optimal design of biocompatible materials for cartilage repair”
- I3.** (2006) Organizer, Minisymposium on “Modeling in Biological Tissues,” *2006 Joint SIAM/SMB Conference on the Life Sciences*, Raleigh, NC, August 2006, 5 speakers
- I2.** (2005) Chair, *SAMSI/CRSC 11<sup>th</sup> Industrial Mathematical and Statistical Modeling Workshop for Graduate Students*, North Carolina State University, July 25-August 2, 2005
- I1.** (2004) Organizer, Minisymposium on “Mathematical Modeling in the Musculoskeletal System,” *2004 SIAM Conference on the Life Sciences*, Portland, OR, July 2004, 8 speakers

## **J. WORKSHOPS ETC.**

- J16.** (2011-12) *Statistical and Applied Mathematical Sciences Institute (SAMSI) Fellow*, 2011-12 Program on Uncertainty Quantification
- J15.** (2009) Faculty Consultant, *15<sup>th</sup> SAMSI/CRSC Industrial Mathematical & Statistical Modeling Workshop for Graduate Students*, Raleigh, NC, July 19-27, 2009, Project: “Resource issues impacting national security,” Industrial sponsor: MIT-Lincoln Lab
- J14.** (2008) Faculty Consultant, *14<sup>th</sup> SAMSI/CRSC Industrial Mathematical & Statistical Modeling Workshop for Graduate Students*, Raleigh, NC, July 19-28, 2008, Project: “Estimating position and velocity of flight vehicles using angle-only measurements,” Industrial sponsor: MIT-Lincoln Lab
- J13.** (2007) Faculty Consultant, *23rd Annual Workshop on Mathematical Problems in Industry (MPI)*, June 11-15, 2007, University of Delaware, faculty consultant on project “Modeling diffusion in a lens capsule via fluorescence recovery after photobleaching”
- J12.** (2007) IMA Annual Program on Applications of Algebraic Geometry, Workshop on *Applications in Biology, Dynamics and Statistics*, IMA, Minneapolis, MN, March 5-9, 2007
- J11.** (2004) Faculty Consultant, *10<sup>th</sup> SAMSI/CRSC Industrial Mathematical & Statistical Modeling Workshop for Graduate Students*, Raleigh, NC, July 26-August 3, 2004, Project: “Identifying respiratory parameters from plethysmography data,” Industrial sponsor: CIIT Centers for Health Research
- J10.** (2004) *Single Cell Mechanics Workshop*, MIT, Cambridge, MA, October 2004, attendance by invitation only
- J9.** (2004) *2004 Whitaker Foundation Biomedical Engineering Research Conference*, La Jolla, CA, August 2004, by invitation only for PIs on Whitaker Foundation research grants
- J8.** (2003) Faculty Consultant, *9<sup>th</sup> SAMSI/CRSC Industrial Mathematical & Statistical Modeling Workshop for Graduate Students*, Raleigh, NC, July 21-29, 2003, Project: “Modeling the conductivity of concrete,” Industrial sponsor: National Institute of Statistical Sciences
- J7.** (2003) IPAM workshop on *Cells & Materials: at the Tissue Engineering Interface*, UCLA, Los Angeles, CA, February 2003
- J6.** (2002) Faculty Consultant, *8<sup>th</sup> CRSC Industrial Mathematics Modeling Workshop for Graduate Students*, Raleigh, NC, July 22-30, 2002, Project: “Mathematical models for articular cartilage,” Industrial sponsor: Duke University Medical Center
- J5.** (2002) SIAM symposium on *Computational Models and Simulation for Intra-Cellular Processes*, October 2002, Washington DC
- J4.** (2002) SAMSI workshop on *Inverse Problem Methodology in Complex Stochastic Models*, September 2002, Research Triangle Park, NC
- J3.** (2001) *Teaching Summer Session Courses Professional Development Seminar*, Faculty Center for Teaching and Learning, NCSU
- J2.** (2000) Faculty Consultant, *6<sup>th</sup> CRSC Industrial Mathematics Modeling Workshop for Graduate Students*, Raleigh, NC, July 24-August 1, 2000, Project: “Diffusion models of photobleaching experiments for articular cartilage,” Industrial sponsor: Duke University Medical Center
- J1.** (1999) IMA Workshop on *Computational Modeling in Biological Fluid Dynamics*, IMA, Minneapolis, MN, January 1999

## **K. TEACHING (NCSU)**

- *Undergraduate*: Calculus III (MA242), Applied Differential Equations I (MA341/H), Applied Differential Equations II (MA401), Introduction to Numerical Analysis II (MA428), Methods of Applied Math I (MA450), Methods of Applied Math II (MA451)
- *Graduate*: Numerical Solution of PDEs – Finite Element Methods (MA587), Introduction to Partial Differential Equations (MA534), Advanced Mathematics for Engineers and Scientists I&II (MA501, 502), Introduction to Complex Variables (MA513), Mathematical Modeling of Physical & Biological Processes I&II (MA 573/574)
- *Graduate Courses Developed (special topics)*: Introduction to Boundary Integral and Fast Multipole Methods (MA797), Introduction to Perturbation Methods (MA797), Introduction to Continuum Mechanics of Elastic and Viscoelastic Solids (MA591/BMA590), Applied Modeling and Analysis Techniques (MA591), Distance Education version of Advanced Mathematics for Engineers and Scientists I (MA 501)

## **L. SERVICE**

### **Departmental**

- *Director of Graduate Programs in Mathematics and Applied Mathematics* (~150 students), 2012-16
- *Regular Committees*: Personnel Evaluation Committee (2008-10), Faculty Advisory Committee (elected, 2005-07, 2009-11, 2014-16), Math Undergraduate Honors Committee (2005-12), PhD Prelim Exam Committee (2008-09), Computer Committee (2004-09), Graduate Recruitment Committee (2005-12), Undergraduate Course & Curriculum Committee (2003-04), Undergraduate Committee for Non-Majors (2003-04)
- *Hiring Committees*: General Math Hiring Committee (2011-12, Chair), Applied Analysis Hiring Committee (2010-11, Chair), Interdisciplinary Hiring Committee (2008-09), General Math Hiring Committee (2007-08), PDE Hiring Committee (2002-03, 2005-06, 2006-07), Applied Math Hiring Committee (2001-02)
- *Ad-hoc Committees*: Applied Math Undergraduate BS Degree Review (2011, Chair), Interdisciplinary Mathematics Grad Program Committee (2005-06, 2009-10), Differential Equations Textbook Selection Committee (2000-01, 2007-08), Teaching Awards Committee (2007-09)
- *Seminars*: Applied Math Graduate Student Seminar (co-organizer: 2001-02, faculty participant: 2002-03, chair: 2003-05, co-organizer 2006-17), Numerical Analysis Seminar (organizer: 2000-01), NSF RTG program Research Training Modules (co-organizer, 2008-12)
- *REG Program*: REG Faculty Mentor (Summers 2007, 2010, 2011)
- Maintained website for NCSU NSF RTG Program on *Mathematics of Materials* (2007-12)
- Graduate Recruiting Weekend research talks (2001, 2005-07, 2010), Biomathematics Program Graduate Recruiting Weekend talks (2008, 2010)
- NCSU Mathematics Department representative at Graduate School Career Fair (for minority recruiting), *3<sup>rd</sup> Annual Iowa Mathematical Field of Dreams Conference* University of Iowa, Iowa City, IA (9/27/09)
- TA supervisor of 1-2 graduate students each semester since 1999

### **University**

- Member, Cluster Hiring Committee in “Modeling the Living Embryo” (2015-17)
- Faculty Senate Grievance Panel Member (2016-17)
- Member, Cluster Hiring Committee in “Precision Medicine” (2012-15)

- Member, Biomathematics Graduate Admissions Committee (2007-09)
- Member, Biomedical Engineering Undergraduate Admissions Committee (2003-04)
- Chair, Biomathematics Lucas Research Award Committee (2004-05, 2007-08)

### **External**

- Editorial Board, *Journal of Biomechanics* (2007-Present)
- Reviewer for *SIAM Journal on Applied Mathematics*, *SIAM Journal on Numerical Analysis*, *Journal of Fluid Mechanics*, *Journal of Biomechanics*, *Journal of Biomechanical Engineering*, *Biophysical Journal*, *Annals of Biomedical Engineering*, *Biomechanics & Modeling in Mechanobiology*, *Computer Methods in Applied Mechanics & Engineering*, *Osteoarthritis and Cartilage*, *Finite Elements in Analysis & Design*, *Cellular & Molecular Bioengineering*, *Journal of Theoretical Biology*, *International Journal of Solids & Structures*, *Medical Engineering & Physics*, *Scientific Reports*, *International Journal for Numerical Methods in Biomedical Engineering*
- Panel reviewer for NSF programs in the Division of Mathematical Sciences (3 times) and Division of Civil, Mechanical and Manufacturing Innovation (1 time)
- Reviewed book proposal on continuum mechanics of biological materials for Cambridge University Press
- Reviewed Boyce & Brannon differential equations undergraduate textbook for Wiley
- Review Boyce & DiPrima differential equations textbook (9<sup>th</sup> Ed) for Wiley
- Reviewed 9<sup>th</sup> edition of Kreysig's "Advanced Engineering Mathematics" for Wiley & Sons
- Faculty Mentor for Uniform Admissions Process at Mathematical Field of Dreams Conference (Math Alliance)- advised under-represented minority seniors in preparing their graduate school applications (2013, 2014, 2015)

### **M. PATENTS**

- (2015) Co-author on U.S. Patent#9043156, "Combined Acoustic Radiation Force Impulse (ARFI) Ultrasound and Elastography and Monitored Steady State Excitation Recovery (MSSER) Ultrasound" by UNC-Chapel Hill and Siemens Corp., in collaboration with CM Gallippi (UNC-CH), EG Loba (NCSU), O Davis (NCSU) and FW Mauldin (Va Tech)

### **N. SOCIETY MEMBERSHIPS**

- Society for Industrial and Applied Mathematics (SIAM), American Society of Mechanical Engineers (ASME), Society for Mathematical Biology (SMB)