

JOHN R. COTTON

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CURRENT POSITION

Assistant Professor, Mechanical Engineering, Ohio University, July 2007-Present

EDUCATION

Doctorate of Philosophy in Engineering Mechanics, Virginia Polytechnic Institute and State University, Blacksburg, VA, August 1994-May 1998.

Dissertation Title: "Mechanical Modeling of Vestibular Hair Cell Bundles", Advisor: J.W. Grant

Master of Science in Engineering Mechanics, Virginia Polytechnic Institute and State University, Blacksburg, VA, August 1987-December 1989.

Thesis title: "A Viscoelastic Model for the Response of a Step Change in Velocity of the Human Otolith Organs", Advisor: J.W. Grant

Bachelor of Science in Engineering Science and Mechanics, Virginia Polytechnic Institute and State University, Blacksburg, VA, August 1983-June 1987

PREVIOUS POSITIONS

Assistant Professor, Department of Engineering Science and Mechanics, Virginia Polytechnic Institute and State University (Virginia Tech), August 2002-May 2007

Research Fellow, Bioengineering Science Research Group, School of Engineering Sciences, University of Southampton, Southampton, England, January 2000-August 2002

Postdoctoral Research Assistant, Department of Engineering Science and Mechanics, Virginia Polytechnic Institute and State University, Blacksburg, VA, May 1998-December 1999

Instructor, Virginia Polytechnic Institute and State University, Blacksburg, VA, spring 1999

Engineering Science and Mechanics Department, spring 1999

Physics Department, spring 1998, fall 1998, fall 1999

Graduate Research Assistant, Department of Engineering Science and Mechanics, Virginia Polytechnic Institute and State University, Blacksburg, VA, December 1994-August 1996 and August 1997-May 1998

Graduate Research Assistant, Department of Materials Science and Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA, August 1996-August 1997

Graduate Teaching Assistant, Engineering Science and Mechanics Department, Virginia Polytechnic Institute and State University, Blacksburg, VA, March 1988-December 1989, August-December 1994

Senior Analyst, **Viggen Corporation/AEPCO**, McLean, VA, May 1990-June 1993 and June 1994-August 1994

PUBLICATIONS

1. Miller, L.E., Wootten D.F., Nickols-Richardson S.M., Ramp W.K., Steele C.R., Cotton J.R., Carneal J.P., Herbert W.G., 2007, "Isokinetic Training Increases Ulnar Bending Stiffness and Bone Mineral in Young Women", **Bone**, Vol. 41, p. 685-689.
2. Nam, J.-H., J.R. Cotton, and W. Grant, 2007, "A Virtual Hair Cell: I. Addition of Gating Spring Theory Into a 3-D Bundle Mechanical Model", **Biophysical Journal**, Vol. 92, p. 1-11.
3. Nam, J.-H., J.R. Cotton, and W. Grant, 2007, "A Virtual Hair Cell: II. Evaluation of Mechanoelectric Transduction Parameters", **Biophysical Journal**, Vol. 92, p. 1-9.
4. Anderson, D.E. and J.R. Cotton, 2007, "Mechanical Analysis of Percutaneous Sacroplasty using CT Image based Finite Element Models", **Medical Engineering and Physics**, Vol. 29, p. 316-325.
5. Winwood K., P. Zioupos, J.D. Currey, J.R. Cotton, and M. Taylor, 2006, "Development rates of plastic and elastic components of strain in human cortical bone during tensile, compressive and shear fatigue loading and implications to bone biomechanics", **Journal of Biomedical Materials Research, Part A**, Vol. 79 (2), p. 289-297.
6. Winwood K., P. Zioupos, J.D. Currey, J.R. Cotton, and M. Taylor, 2006, "Strain patterns within human cortical bone during tensile and compressive fatigue loading and its implication to implant failure", **Journal of Musculoskeletal and Neuronal Interactions**, Vol. 6 (2), p. 134-41.
7. Nam, J.-H., J.R. Cotton, E.H. Peterson, and W. Grant, 2006, "Mechanical properties and consequences of stereocilia and extracellular links in vestibular hair bundles", **Biophysical Journal**, Vol. 90, pp. 2786-2795.
8. Nam, J.-H., J.R. Cotton and J.W. Grant, 2005, "Effect of Fluid Forcing on Vestibular Hair Bundles", **Journal of Vestibular Research**, Vol. 15 (5-6), p. 263-278.
9. Cotton, J.R., Winwood, K., Zioupos, P and Taylor, M, 2005, "Damage rate is a predictor of fatigue life and creep strain rate in tensile fatigue of human cortical bone samples", **Journal of Biomechanical Engineering**, Vol. 127, April, p 213-219.
10. Cotton, J. and W. Grant, 2004, "Computational models of hair cell bundle mechanics: I. Single stereocilium", **Hearing Research**, Vol. 197 (1-2), pp. 96-104.
11. Cotton, J. and W. Grant, 2004, "Computational models of hair cell bundle mechanics: II. Simplified bundle models", **Hearing Research**, Vol. 197 (1-2), pp. 105-111.
12. Silber, J., J. Cotton, J.-H. Nam, E. H. Peterson and W. Grant, 2004, "Computational models of hair cell bundle mechanics: III. 3-D utricular bundles", **Hearing Research**, Vol. 197(1-2), pp. 112-130.
13. Cotton, J.R., P. Zioupos, K. Winwood, and M. Taylor, 2003, "Analysis of creep strain during tensile fatigue of cortical bone," **Journal of Biomechanics**, v. 36, p 943-949.
14. Taylor, M., J. Cotton, and P. Zioupos, 2002, "Finite element simulation of the fatigue behaviour of cortical and cancellous bone", **Meccanica**, Vol. 37, pp. 419-429.
15. Cotton, J.R., J.W. Grant, M.K. Jensen, and B.J. Love, 2001, "Analytic solutions to the shear strength of interfaces failing under flexure loading conditions", **International Journal of Adhesion and Adhesives**, Vol. 21 (1) pp 65-70.
16. Cotton, J.R. and J.W. Grant, 2000, "A finite element method for mechanical response of hair cell ciliary bundles", **Journal of Biomechanical Engineering (Transactions of the ASME)**, Vol. 122, pp. 44-50.
17. Jensen, M.K. B.J. Love, J.W. Grant, J. Cotton, J.R. Keiser, and D.F. Wilson, 2000, "Comparison study of dicyandiamide-cured epoxy bonded steel joints and polyamidoamine-cured epoxy bonded steel joints", **International Journal of Adhesion and Adhesives**, Vol. 20, No. 6, pp. 437-444.

18. Peterson, E.H., J.R. Cotton, and J.W. Grant, 1995. "Structural variation in ciliary bundles of the posterior semicircular canal: Quantitative anatomy and computational analysis", **Annals of the New York Academy of Sciences**, Vol. 781, pp. 85-102.
19. Grant, J.W., C.C. Huang, and J.R. Cotton, 1994. "Theoretical mechanical frequency response of the otolithic organs", **Journal of Vestibular Research**, Vol. 4, pp. 137-151.
20. Grant, J.W., and J.R. Cotton, 1990. "A model for otolith dynamic response with a viscoelastic gel layer", **Journal of Vestibular Research**, Vol. 1, pp. 139-151.

REFEREED ABSTRACTS (* denotes presenting author)

1. John Cotton*, "Implications of damage laws on bending fatigue of human cortical bone samples", **7th International Conference on Durability of Composite Systems, (DURACOSYS)**, Blacksburg, Virginia, September 10-13, 2006.
2. Jared Ragone and John Cotton*, "Finite Element Simulation of the MRTA Test of a Human Tibia", **American Society of Biomechanics (ASB) Annual Meeting**, Blacksburg, Virginia, September 6-9, 2006.
3. Dennis Anderson* and John R. Cotton, "Mechanical Analysis of Percutaneous Sacroplasty using CT Image based Finite Element Models", **American Society of Biomechanics (ASB) Annual Meeting**, Blacksburg, Virginia, September 6-9, 2006.
4. Jared Ragone* and John Cotton, "Finite Element Simulation of the MRTA Test of a Human Tibia", **14th Annual Symposium on Computational Methods in Orthopaedic Biomechanics**, Chicago, Illinois, Saturday, March 18, 2006.
5. Jong-Hoon Nam*, John Cotton, and John Grant, "Simulating in-vivo stimuli to 3-D virtual hair cells in turtle utricle.", **Association for Research in Otolaryngology MidWinter Meeting**, Baltimore, MD, February 5 - 9, 2006.
6. J. Nam*, J. Cotton, E.H. Peterson, and J.W. Grant, "Computational Analysis of Effects of Hair Bundle Shape and Loading Condition on Mechanotransduction", **Society for Neuroscience 35th Annual Meeting**, Washington DC, November 12-16, 2005
7. Jung-Hoon Nam, John Cotton, John Grant*, "Adding Channel Gating to Finite Element Models of Vestibular Hair Cell Bundles: A New Tool to Study Mechanoelectric Transduction", **Association for Research in Otolaryngology Midwinter Meeting**, New Orleans, February 22, 2005.
8. Christopher Whitlow*, Myles Reedy, John Cotton, Sandra Kaminsky, Joel Berry, P Morris, "Investigating Sacroplasty: Technical Considerations and Biomechanical Properties of Sacral Polymethylmethacrylate Infusions in Cadaveric Pelvic Specimens", **RSNA Radiological Society of North America 90th Scientific Assembly and Annual Meeting**, November 28 - December 3, 2004, Chicago, Illinois.
9. John R. Cotton*, Keith Winwood, Peter Zioupos, and Mark Taylor, "Relationship between cycles to failure and rates of damage and creep in fatigue tests of human cortical bone", **ASME Summer Bioengineering Conference**, Key Biscayne, Florida, June 25-29, 2003.
10. J. Wallace Grant*, Joe Silber, John Cotton, Ellengene Peterson. "Hair Cell Mechanics of Three-Dimensional Utricular Bundles." **Association for Research in Otolaryngology MidWinter Meeting**, Daytona Beach, FL February 22-27, 2003.
11. Peter Zioupos*, Keith Winwood, John R. Cotton, and Mark Taylor, "The development of elastic and 'plastic' strains during fatigue damage accumulation of human cortical bone" **13th Conference of the European Society of Biomechanics**, Wroclaw, Poland, September 1-4, 2002.
12. John R. Cotton*, Peter Zioupos, Keith Winwood, and Mark Taylor, "Creep formulation of strain accumulation during tensile fatigue of cortical bone", invited presentation to the Bone Mechanics Symposium at the **IVth World Congress of Biomechanics**, Calgary, Canada, August 4-9, 2002.
13. John R. Cotton*, Peter Zioupos, Keith Winwood, and Mark Taylor, "Nonlinear damage theory applied to two-step fatigue failure prediction in human cortical bone", **IVth World Congress of Biomechanics**, Calgary, Canada, August 4-9, 2002.

14. Grant, J.W.*, J. Cotton, J. Silber, and E. Peterson, "Modeling current-displacement relations of utricular hair cells", **Twenty-fourth Midwinter Meeting of the Association for Research in Otolaryngology**, St Petersburg, FL, January 27-31, 2002.
15. Taylor, M.* and J.R. Cotton, "Numerical simulation of the fatigue behaviour of cortical and cancellous bone", **15th AIMETA Congress of Theoretical and Applied Mechanics**, Taormina, Italy, September 26-29, 2001.
16. John R. Cotton*, Peter Zioupos, Keith Winwood, Paul Anderson, Graham R. Davis and Mark Taylor, "Static FEA of cortical bone tensile test with variations in modulus identified from micro-CT scans", **The European Society for Biomaterials Conference**, London, UK, September 12-14, 2001.
17. Mark Taylor*, John R. Cotton, and Peter Zioupos, "A stochastic approach to simulate the variable fatigue life of cortical bone using a combined CDM and FE method" **The European Society for Biomaterials Conference**, London, UK, September 12-14, 2001.
18. John R. Cotton*, Peter Zioupos, and Mark Taylor, "Simulation of material property evolution of cortical bone in fatigue bending and its implications on cancellous bone" **XVIIIth Congress of the International Society of Biomechanics**, Zurich, Switzerland, July 8-13, 2001.
19. John R. Cotton*, Peter Zioupos, and Mark Taylor, "Simulated material property degradation during fatigue of human cancellous bone, as modelled by a regular honeycomb structure" **ASME Summer Bioengineering Conference**, Snowbird, Utah, June 27-July 1, 2001
20. Cotton, J., J. Silverman, E. Peterson, and W. Grant*, "Ciliary bundles of striolar hair cells: Are they mechanically specialized?", **Twenty-third Midwinter Meeting of the Association for Research in Otolaryngology**, St. Petersburg, Florida, February 20-24, 2000.
21. Cotton, J.R.* and J.W. Grant, "Finite element analysis of utricular hair cell bundles", **18th Southern Biomedical Engineering Conference**, Clemson University, Clemson, SC, May 20-23, 1999.
22. Cotton, J.R. and J.W. Grant*, "Mechanical models of ciliary bundles that encode the same direction of head movement in the utricle of the Red Eared Turtle ", **Twenty-second Midwinter Meeting of the Association for Research in Otolaryngology**, St. Petersburg, FL, February 14-18, 1999.
23. Cotton, J.R.* and J.W. Grant, "Biomechanics of vestibular hair cell bundles", **1998 International Mechanical Engineering Congress and Exposition**, Anaheim, CA, November 15-20, 1998.
24. Cotton, J.R.*, E.H. Peterson, and J.W. Grant. "Mechanical nonlinearities in deformation of hair cell ciliary bundles.", **Twenty-first Midwinter Meeting of the Association for Research in Otolaryngology**, St. Petersburg, FL, February 15-19, 1998.
25. Cotton, J.R.*, and J.W. Grant. "Analytic and finite element analysis of stereocilia-link systems: using deformation modes to infer hair cell bundle properties.", **Twentieth Midwinter Meeting of the Association for Research in Otolaryngology**, St. Petersburg, FL, February 2-6, 1997.
26. Cotton, J.R.*, J.W. Grant, and E.H. Peterson, "Finite element model of utricular ciliary bundles in a turtle, *Thrachemys (Pseudemys) scripta*". **Twenty-sixth Annual Meeting of the Society for Neuroscience**, Washington, DC, November 16-21, 1996.

PROFESSIONAL ACTIVITIES

Reviewer

- Annals of Biomedical Engineering
- Medical Engineering and Physics
- Journal of Biomechanics
- Journal of Theoretical Biology
- Bone
- Mechanics Research Communications

American Society of Mechanical Engineers (ASME), member

American Society for Engineering Education (ASEE), member

TRAINING

Engineering Education Scholars Program, **University of Wisconsin**, Madison, WI, July 12-18, 1998

Clinical Internship in Biomedical Engineering, **Veterans Administration Hospital**, Salem, VA, May-August 1996

PERSONAL

Spent a year backpacking through Oceania, Asia, Africa, and Europe, June 1993-May 1994