

Amy C. Courtney, PhD

curriculum vita

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Education

- Harvard University and the Massachusetts Institute of Technology** 1989-1994
1994 Ph.D. in Medical Engineering & Medical Physics
- Harvard University** 1989-1992
1992 M.S. Medical Engineering
- Michigan State University** 1985-1989
1989 B.S. Engineering Mechanics with honors, minor in biomedical engineering
- Physics Instructor Training, United States Military Academy, West Point** 2007
Full-time, 10-week course including model lectures, practice lectures, lab equipment and execution, classroom technology, teaching style, honor code, academic and military organization.

Research Experience

- Ballistics Testing Group** 2001-present
Developed phenomenologically-based mathematical models in terminal ballistics showing a ballistic pressure wave contributes independently to mild traumatic brain injury, wounding and incapacitation. Beginning to quantify physical mechanisms of traumatic brain injury due to blast pressure waves. Developing time and frequency domain methods for extracting ballistic and forensic information from audio recordings of ballistic events.
- Department of Engineering, Western Carolina University** 2007
Research Scientist. Developed program of study and two courses for new Biomechanical Engineering major. Wrote NSF grant with colleagues on developing sensor and control algorithms for an intelligent orthotic device for counteracting pathologic hand tremor. Worked with industrial partners to develop undergraduate engineering projects.
- The Cleveland Clinic Foundation, Cleveland, OH** 1995-1998
Post-doctoral fellow, then Project Scientist. Quantified effects of aging and disease processes on bone. Designed experiments to identify strain thresholds for bone mass maintenance by measuring *in vivo* deformation of human calcaneal bone under various exercise and gravitational conditions. Published papers and successfully applied for grants from NASA, American Diabetes Association, and The Whitaker Foundation. Prepared written and oral presentations.
- Reebok International, Canton MA** 1994
Designed experiments and statistical analysis paradigms for measuring human performance and properties of athletic equipment. Designed experiments, statistical testing and reporting protocols to quantify material and biomedical performance in prototype athletic footwear and components.
- Beth Israel Hospital, Boston, MA** 1989-1994
Designed and performed experiments to quantify the effects of age and bone density on the strength of the human hip. Included mathematical modeling of damage accumulation in bone, bone imaging techniques, and mechanical testing. Part of a larger project that led to the development of a clinical risk index used to quantify an individual's risk of hip fracture due to a fall.

Department of Biomechanics, Michigan State University **1985-1989**
Conducted veterinary clinical experiments investigating the efficacy of knee ligament reconstruction techniques in dogs. Conducted experiments with allografts measuring the mechanical properties of patellar tendons and bone plugs for transplant. Conducted experiments with human subjects measuring human performance and properties of athletic footwear.

Brookhaven National Laboratory **1989**
Conducted experiments to quantify the efficacy of medications to preserve or enhance bone density.

University of Cincinnati **1987**
Conducted experiments on cadaveric specimens *in vitro* and *in situ* quantifying the roles of individual structures in knee stability and the mechanical properties of ligaments and tendons.

Awards and Recognition

2008 Department of the Army, Commander's Award for Public Service
2008 Member, Sigma Pi Sigma, The National Physics Honor Society
1997 International Society for Biomechanics Most Promising Young Scientist Award
1996 Whitaker Foundation grant
1989 National Science Foundation graduate fellowship
1985 MSU Alumni Distinguished Scholar (full scholarship)

Teaching Experience

United States Military Academy, West Point **2007 - 2008**
Assistant Professor of Physics – teaching a full load of four calculus-based introductory physics classes and associated laboratories in core program.

Southwestern Community College **2006**
Adjunct Professor– taught anatomy and physiology lecture/lab in undergraduate, transferable course.

The Cleveland Clinic Foundation/Ohio State University **1997-1998**
Adjunct Professor of Biomedical Engineering – supervised undergraduate and masters' degree students in research projects quantifying age- and disease-related changes in bone.

Harvard University **1993**
Teaching Assistant – Calculus I and II

Publications

A thoracic mechanism of mild traumatic brain injury due to blast pressure waves, A Courtney, M Courtney, Medical Hypotheses, [doi:10.1016/j.mehy.2008.08.015](https://doi.org/10.1016/j.mehy.2008.08.015) , also <http://precedings.nature.com/documents/2169/version/1>

Comments on "Ballistics: A Primer for the Surgeon", M Courtney, A Courtney, Injury, **39**(8):964-5; DOI: 10.1016/j.injury.2008.03.020 (2008).

Links between traumatic brain injury and ballistic pressure waves originating in the thoracic cavity and extremities, A Courtney, M Courtney, Brain Injury **21**, 657 (2007).
Also <http://arxiv.org/ftp/arxiv/papers/0808/0808.1443.pdf>

Apparent measurement errors in "Development of biomechanical response corridors in the thorax to blunt ballistic impacts", M Courtney, A Courtney, Journal of Biomechanics **41**, 486 (2007).

The ballistic pressure wave theory of handgun bullet incapacitation, M Courtney, A Courtney, (2008) <http://arxiv.org/ftp/arxiv/papers/0803/0803.3053.pdf>

Scientific evidence for hydrostatic shock, M Courtney, A Courtney, (2008) <http://arxiv.org/ftp/arxiv/papers/0803/0803.3051.pdf>

A method for testing handgun bullets in deer, M Courtney, A Courtney, (2007). arxiv.org/ftp/physics/papers/0702/0702107.pdf

Review of criticisms of ballistic pressure wave experiments, the Strasbourg goat tests, and the Marshall and Sanow data, M Courtney, A Courtney, (2007). arxiv.org/ftp/physics/papers/0701/0701268.pdf

Ballistic pressure wave contributions to rapid incapacitation in the Strasbourg goat tests, M Courtney, A Courtney, (2007). arxiv.org/ftp/physics/papers/0701/0701267.pdf

Relative incapacitation contributions of pressure wave and wound channel in the Marshall and Sanow data set, M Courtney, A Courtney, (2007). arxiv.org/ftp/physics/papers/0701/0701266.pdf

An acoustic method for determining ballistic coefficients, M Courtney, A Courtney, (2007) <http://arxiv.org/ftp/arxiv/papers/0705/0705.0391.pdf>

The truth about ballistic coefficients, M Courtney, A Courtney, (2007) <http://arxiv.org/ftp/arxiv/papers/0705/0705.0389.pdf>

Using sound of target impact for acoustic reconstructions of shooting events, M Courtney, A Courtney, (2007) www.ballisticstestinggroup.org/impactsound.pdf

Epistemological distinctions between science and history, M Courtney, A Courtney, (2008) <http://arxiv.org/ftp/arxiv/papers/0803/0803.4245.pdf>

Comments regarding "On the Nature of Science" M Courtney, A Courtney, *Physics in Canada*, Vol. 64 No. 3, (2008).

Sheep Collisions: The Good, The Bad, and the TBI, M Courtney, A Courtney, (2007) http://arxiv.org/PS_cache/arxiv/pdf/0711/0711.3804v1.pdf

Acoustic Measurement of Potato Cannon Velocity, M Courtney, A Courtney, *The Physics Teacher*, **45** 496-497 (2007). arxiv.org/ftp/physics/papers/0612/0612118.pdf

Five Frequently Fatal Freshman Physics Fantasies, M Courtney, N Althausen, A Courtney. *Physics Education* **42** 116, (2007). Also arxiv.org/ftp/physics/papers/0605/0605152.pdf

Who is the Customer in Higher Education? M Courtney, A Courtney, (2006). arxiv.org/ftp/physics/papers/0612/0612117.pdf

An extensometer for global measurement of bone strain suitable for use in vivo in humans. Gail P. Perusek, Brian L. Davis, James J. Sferra, Amy C. Courtney, Susan E. D'Andrea J. *Biomechanics* 34:385-391, 2001

Effects of age, density and geometry on the bending strength of human metatarsals. Amy C. Courtney, Brian L. Davis, Timothy Manning and Helen Kambic. *Foot & Ankle International* 18(4): 216-221, 1997

Etiology and prevention of age-related hip fractures. WC Hayes, ER Myers, SN Robinovitch, A. Van Den Kroonenberg, AC Courtney, TA McMahon. Bone 18(1) Supplement, 1996

Age related differences in post-yield damage in human cortical bone – experiment and model. Amy C. Courtney, Wilson C. Hayes, and Lorna J. Gibson. J. Biomechanics 29(11):1463-1471, 1996

Age-related reductions in the strength of the femur tested in a fall-loading configuration. Amy C. Courtney, Edward F. Wachtel, Elizabeth R. Myers, Wilson C. Hayes. Journal of Bone and Joint Surgery 77-A(3):387-396, 1995

Effects of loading rate on strength of the proximal femur. A.C. Courtney, E.F. Wachtel, E.R. Myers, W.C. Hayes. Calcified Tissue International 55:53-58, 1994

The effects of test environment and cyclic stretching on the failure properties of human patellar tendons. Roger C. Haut, Amy C. Powlison (Courtney) J. Orthopaedic Research 8:532-540, 1990

Distinguishing the effects of aging on bone density and biomechanics in macaca fascicularis. Chen M. C., Courtney A.C., Davis B.L. Proceedings 44th Annual Meeting, Orthopaedic Research Society, March 16-19, 1998

Posty-Yield testing of bone to assess susceptibility to damage. Courtney AC, Hayes WC, Gibson LJ. 23rd Annual Meeting of the Society for Biomaterials April 30-May 4, 1997

Biomechanical data – how should they be displayed? Brian L. Davis and Amy C. Courtney International Society for Biomechanics Newsletter 1995

Age-related reductions in the strength of the femur tested in a fall loading configuration. A.C. Courtney, E.F. Wachtel, E.R. Myers and W.C. Hayes. 40th Annual Meeting, Orthopaedic Research Society, 188:32, 1994

Strength of the femur increased at a high rate of loading simulating a fall on the hip. A.C. Courtney, E.F. Wachtel, E.R. Myers, N.M. Cummings, W.C. Hayes. 40th Annual Meeting, Orthopaedic Research Society, p. 527, 1994

Ultrasonic and densitometric properties of the calcaneus correlate with in vitro hip fracture loads. ML Bouxsein, AC Courtney, WC Hayes. 40th Annual Meeting, Orthopaedic Research Society, p. 525, 1994

Multiple angle and anteroposterior dual energy x-ray absorptiometry predict femoral strength in vitro. A.C. Courtney, E.R. Myers, E.F. Wachtel, W.C. Hayes. J. Bone Mineral Research 8(Suppl. 1):S350, 1993

Bone mineral density of the calcaneus predicts hip fracture strength in vitro. ML Bouxsein, ER Myers, AC Courtney, WC Hayes. J. Bone Mineral Research 8(Suppl. 1):S255, 1993

Order of irradiation and lyophilization on the strength of patellar tendon allografts. R.C. Haut, A.C. Powlison (Courtney). 35th Annual Meeting, Orthopaedic Research Society p. 514, 1989

Some effects of donor age and sex on the mechanical properties of patellar tendon graft tissues. R.C. Haut, A.C. Powlison (Courtney), G.W. Rutherford, and J.R. Kateley 1988 Winter Annual Meeting of the American Society of Mechanical Engineers Nov. 26-Dec. 2, 1988