

Anne K. Gutmann, Ph.D.

University of Idaho
Department of Biological Sciences
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Education

Ph.D. Medical Science, focus in biomechanics University of Calgary, 2011

Advisor: John Bertram

Dissertation: 'Human hopping: A model for understanding the mechanics and energetics of bouncing gaits'
- studied how energy optimization and mechanical and physiological constraints influence gait parameter selection in bouncing gaits using a combination of experimental testing and modeling

M.S. Theoretical & Applied Mechanics, focus in biomechanics Cornell University, 2007

Advisor: Andy Ruina

Thesis: 'Constrained optimization in human running'

- studied how testing conditions and energy optimization influence gait parameter selection in running by analyzing experimental data using constrained optimization analysis

Graduate Certificate Science Illustration University of California, Santa Cruz, 2007

Supervisor: Eric Filo

Internship at 'The Wild Center: Natural History Museum of the Adirondacks'

- illustrated panels for green technology displays in the 'Bio-Building'

B.S. Materials Science & B.A. Physics, magna cum laude Alfred University, 2001

Advisor: Steven Pilgrim

Honors Thesis: 'Effect of Nickel Content on the Transition Temperature of $\text{Pb}((\text{Mg}_{1-x}\text{Ni}_x)_{1/3}\text{Ta}_{2/3})\text{O}_3$ '

- studied how chemical composition changes the electrical properties of a ferroelectric material

Research Interests

I am interested in understanding how energy optimization and mechanical and physiological constraints affect movement control and peak performance. I am also interested in applying these principles to sports performance, rehabilitation, and prosthetic/orthotic design.

Research Experience

Post-doctoral Research Fellow University of Idaho, 2011-current

Supervisor: Craig McGowan

- use experimental testing and detailed musculoskeletal modeling to determine the role of individual muscles in humans and kangaroo rats

Graduate Research Assistant

University of Calgary, 2007-2011

Supervisor: John Matyas

- designed and built custom forceplate system and wrote custom data acquisition and analysis software for canine arthritis study

Undergraduate Research

1998-2002

- worked with the LIGA (x-ray lithography) group to improve the fabrication process for sintered ceramic and metallic micromachine components (Sandia National Laboratories, 2002)
- designed and implemented new techniques for measuring the properties of magnetic fluids (National Institute for Standards & Technology, 2001)
- analyzed calcium spiking patterns in liver cells (Lehigh University, 2000)
- created a standardized rating scale for glass fining (Alfred University, 1998)

Teaching & Supervisory Experience

Supervisor for Undergraduate Research Student

University of Calgary, 2008

- supervised and mentored an undergraduate student developing a method for quantitatively assessing the balance of Parkinson's disease patients using forceplates to track the center of pressure

Teaching Assistant

Alfred University, Cornell University & University of Calgary, 1998-2004, 2008

- collaborated with course organizer and guest lecturers to design assignments for a graduate physiology modeling course
- conducted review sessions, supervised labs, and tutored individual students for undergraduate mechanics and electricity & magnetism classes

Science Camp Counselor

Cornell University & University of Calgary, 2003-2004, 2010

- taught middle school students problem solving skills and the principles of the scientific method while guiding them through hands-on science activities

Skills

- proficient in programming in Labview and Matlab for real-time feedback, data collection, and data analysis applications
- comfortable using and troubleshooting force plates, motion capture systems, EMG systems, and metabolic carts
- experienced in designing and building strain gauge-based force sensors including force plates
- proficient using the Adobe Creative Suite (Photoshop, Illustrator, InDesign, Flash, AfterEffects)
- skilled in creating scientific visuals (www.annegutmann.com)

Honors & Awards

NSF Graduate Research Fellowship (National Science Foundation, 2003-2007)

GE Faculty for the Future Fellowship (General Electric Corporation, 2002)

SUNY Chancellor's Award, academic excellence (State University of New York, 2002)
Natasha Goldowski Renner Award, excellence in physics (Alfred University, 2001)
M.A. Tuttle Award, athlete scholar (Alfred University, 2001)
National Merit Scholar, academic excellence (National Merit Corporation, 1997-2002)

Professional Affiliations

International Society of Biomechanics
Society of Integrative & Comparative Biology
Guild of Natural Science Illustrators

Journal Articles

Bertram, J.E.A., & Gutmann, A.K. (2009). Motions of the running horse and cheetah revisited: fundamental mechanics of the transverse and rotary gallop. *J. R. Soc. Interface*. 6: 549-559.

Gutmann, A. K., Jacobi, B., Butcher, M., & Bertram, J.E.A., (2006). Constrained optimization in human running. *J. Exp. Biol.* 209: 622-632.

Morales, A.M., Pritchumani, R., Garino, T.J., Gutmann, A.K., & Domeier, L.A. (2005). Fabrication of ceramic microstructures via microcasting of nanoparticulate slurry. *J. Am. Cer. Soc.* 88: 570-578.

Morales, A.M., Garino, T.J., Boyce, B.L., Domeier, L.A., Gutmann, A.K., & McLean, D.E. (2003). Micromolding and sintering of nanoparticle preforms. *Proc. SPIE*, 4979: 430-439.

Submitted

Gutmann, A.K., & Bertram, J.E.A. (2012). The metabolic cost of human hopping. *J. Appl. Physiol.*

Gutmann, A.K., & Bertram, J.E.A. (2012). Energetics of running and hopping: two perspectives, one solution. *Biol. Letters*.

Gutmann, A.K., & Bertram, J.E.A. (2012). Determining the limit to hopping performance. *J. R. Soc. Interface*.

In Preparation

Gutmann, A.K., Lee, D.V., & McGowan, C.P. (2012). Collision dynamics in wallabies and kangaroo rats.

Books Chapters & Illustrations

Gutmann, A.K. & Bertram, J.E.A. (2012). Muscles as actuators. In *Understanding Mammalian Locomotion: Concepts and Applications*. Edited by Bertram, J.E.A. (submitted)

Denny, M. & McFadzean, A., Illustrated by Gutmann, A.K. (2011) *Engineering Animals: How Life Works*. Harvard University Press: Cambridge, MA.

Presentations

Gutmann, A.K. & Bertram, J.E.A. (2012). Hop height and frequency selection in human hopping. Annual Meeting of the Rocky Mountain Chapter of the American Society of Biomechanics, Boise, ID.

Gutmann, A.K. (2012). A mechanical basis for bilateral deficit and facilitation. Annual Meeting of the Society for Integrative and Comparative Biology, Charleston, NC.

Gutmann, A.K., & Bertram, J.E.A. (2010). Explaining the $1/t_c$ relation to locomotion cost in terms of constrained optimization *or* How metabolic cost rate can appear to both increase and decrease with time of force application. Annual Meeting of the Society for Integrative and Comparative Biology, Seattle, WA.

Gutmann, A.K., Bertram, J.E.A., & Ruina, A. (2009). Metabolic cost of human hopping: Linking mechanics & physiology of locomotion. Annual Meeting of the Society for Integrative and Comparative Biology, Boston, MA.

Gutmann, A.K. (2008). One plus one does not equal two: The surprising mechanics of one-legged hopping. Alberta Motor Control Meeting, Kananaskis, AB, Canada.

Gutmann, A.K., Hulliger, M., & Bertram, J.E.A. (2007). Testing the theory of constrained optimization in normal and deafferented cats. Alberta Motor Control Meeting, Kananaskis, AB, Canada.

Bertram, J.E.A. & Gutmann, A.K. (2006) . Constrained optimization of gait: integrating cost and control. 5th World Congress of Biomechanics, Munich, Germany.

Gutmann, A.K. & Bertram, J.E.A. (2004). Constrained Optimization: A different view of walking control. Alberta Motor Control Meeting, Kananaskis, AB, Canada.

Gutmann, A.K. & Pilgrim, S.M. (2002). The effect of nickel content on the transition temperature of Pb $((\text{Mg}_{1-x}\text{Ni}_x)_{1/3}\text{Ta}_{2/3})\text{O}_3$. International Joint Conference on the Application of Ferroelectrics (IFFF), Nara, Japan.

Invited Seminars

Gutmann, A.K. (2004). Constrained optimization in human hopping. Human Performance Laboratory, University of Calgary, Calgary, AB, Canada.