

Karen L. Troy, Ph.D.

EDUCATION

BS	Washington University in St. Louis	Biomedical Engineering	1999
BS	Washington University in St. Louis	Systems Science and Mathematics	1999
PhD	University of Iowa, IA	Biomedical Engineering	2003
Dissertation: “ <i>The emu as a model for necrotic femoral head collapse</i> ”			
Advisor: Thomas D. Brown, PhD			

HONORS/AWARDS

Dean’s Honorary Scholarship	1995-1999
NSF Graduate Research Fellowship	1999-2002
American Society of Biomechanics Microstrain Award	2001
American Society of Biomechanics Clinical Biomechanics Award	2002
American Society of Biomechanics Young Scientist Postdoctoral Award	2006
Orthopaedic Research Society New Investigator Recognition Award (NIRA)	2010
Alice L. Jee Memorial Young Investigator Award (IBMS)	2010
American Society of Biomechanics Journal of Biomechanics Award Runner-up	2012
American Society of Biomechanics Clinical Biomechanics Award	2014

PROFESSIONAL SOCIETIES

Tau Beta Pi (<i>Engineering honor society</i>)	1998-present
American Society of Biomechanics	1999-present
Orthopaedic Research Society	2002-present
American Society for Bone and Mineral Research	2010-present

ACADEMIC EMPLOYMENT HISTORY

Associate Professor, Dept. of Biomedical Engineering	7/2016-present	Worcester Polytechnic Institute
Assistant Professor, Dept. of Biomedical Engineering	8/2013-6/2016	Worcester Polytechnic Institute
Assistant Professor, Dept. of Bioengineering	1/2007-7/2013	University of Illinois at Chicago
Assistant Professor, Dept. of Kinesiology and Nutrition	1/2007-7/2013	University of Illinois at Chicago
Postdoctoral Research Fellow, Musculoskeletal Biomechanics Laboratory. <i>Director: Mark D. Grabiner, PhD</i>	2003-2006	University of Illinois at Chicago

CONSULTING

Reed Engineering Consultants Engineers and Scientists Hanover, NH

TEACHING

Skeletal Biomechanics Lab BME3503

Biomechanics BME/ME4504

Special Topics: Advanced Musculoskeletal Biomechanics

Grad. Seminar in Kinesiology and Nutrition

Biomechanics of Musculoskeletal Tissues

Evidence Based Practice

Worcester Polytechnic Institute
Worcester Polytechnic Institute
Worcester Polytechnic Institute
University of Illinois at Chicago
University of Illinois at Chicago
University of Illinois at Chicago

MENTORED STUDENTS

PhD Students:

Ying Fang, MS (2014-present)

Megan Mancuso, (2015-present)

Varun Bhatia (2013. Thesis title: “Loading Induced Bone Adaptation in the Distal Radius of Women: Influence of Mechanical Environment”)

Jessica Longworth (2014. Thesis title: “Biomechanics of manual wheelchair propulsion: the effects of speed and exercise”)

Master’s Students:

Travis Henchie (2015-present)

KaLia Burnette (2014-15)

Henry Nguyen (2014-15)

John Foy (2014-15)

Varun Bhatia (2009. Thesis title: “Short term bone adaptation due to mechanical loading in mouse tibiae”)

Postdoctoral Research Fellows

W. Brent Edwards, PhD (2009-2013)

Joshua E. Johnson, PhD (2013-present)

Tiffany Butler, PhD (2013-2015)

Master’s Thesis Committees:

Stephanie J. Donovan (2006)

Paul M. Fowler (2006)

You-hau Chang (2008)

Idubijes Rojas (2009)

Julie Cain (2011)

Timothy Pollard (2012. Thesis title: “Dentin-composite interfaces: static and viscoelastic properties measured with nanoindentation”)

Jennifer Cooper (2014. Thesis title: “A circumferential stretch bioreactor for mechanical conditioning of smooth muscle rings”)

PhD Thesis Committees:

Valentina Ngai (May, 2010. Thesis title: “Assessment of in vivo gait patterns on wear of total knee replacements”)

Troy Reynolds (December, 2010. Thesis title: “Perspectives of fitness center accessibility between people with disabilities and fitness professionals”)

Kim Nolte (December, 2010. Thesis title: “Evaluation of resistance training equipment using three dimensional musculoskeletal modeling focusing on the biomechanical and anthropometric considerations of the end-user”)
Chris Hurt (December, 2011. Thesis title: “The influence of age on the maintenance of frontal plane dynamic stability”)
Jeremy Crenshaw (December, 2011. Thesis title: “The influence of age on compensatory stepping thresholds”)
Rebecca Bell (May, 2012. Thesis title: “The effects of mechanical loading and ADAMTS5 activity in a tendinopathy model”)

Undergraduate, Senior Design Projects, Major Qualifying Projects (MQP), and Honors Students:

Ryan Rivadello (2007-2008; Honors Capstone Project)
Christine Hofmann (2008-2009; Honors Capstone Project. Awarded Honorable Mention, 2009 Student Research Forum)
Adaeze Chuma-Okorafor and senior design project team members (2007-2008; Senior Design Project/Capstone Project. Awarded Second Place, 2008 Student Research Forum)
Lindsey Graff (2009-2010; Honors Capstone Project. Awarded the 2009 Kabbes award for undergraduate research and 2010 Honors Council Award)
Erika Macias (2010-2012; Honors Capstone Project)
Deepali Darji (2011-2012)
Kristen Frederici (2012-2013; Honors Capstone Project)
Pathik Patel, Harish Chockalingam, Alethea Appavu, Sabarish Chockalingam (2012-2013; Senior Design Project/ Capstone Project.)
Max Ardini, Charity Reed, Amirhossein Farvardin (2013-2014) MQP: Upper Extremity Physical Activity Survey
Marlisa Cardoso, Amy Babeu, Erin LaRoche, Rachael Matty (2013-2014) MQP: Optimizing the MOLLE for the female soldier
Advisor, “A radiolucent loading device for computed tomography” Andrew Galanis (BME), Joshua Philipou (BME), Nicholas Barreto (BME) 2014-15
Advisor, “A Dynamic Elbow Flexion Simulator for Cadaveric Testing of UCL Injury and Reconstruction” Emily Geer (BME), Tessa Hulbert (BME), Alexandra Dustin (BME) 2014-15
Advisor, “Thumb CMC Joint Biomechanics: A Novel Device for Dynamic Splinting” Victoria Fleek (BME), Domenick Mastascusa (BME), Rachel Hesse (BME/ME), Lauren Frank (BME), Samara Garcia (BME) 2014-15
REU student, summer undergraduate student – Tina (summer, 2014)
RET (Research Experiences for Teachers) – Tom Oliva from Worcester Public Schools (summer, 2014).

GRANTS AND FUNDING

4/2015-3/2019: “Effects of Ekso-assisted gait training on Bone Health and Quality of Life: A Randomized Clinical Trial” W81XWH-15-2-0078
Submitted to: Department of Defense

Role: Co-Investigator (Institutional Principal Investigator)
Status: funded

4/1/2016-3/31/2018 “*Smoking effects on bone microstructure, mechanical strength, and fracture healing*” F32-AR068839

Submitted to: National Institutes of Health

Role: Primary Mentor

Status: Funded

7/2014-6/2017: “*Skeletal and Clinical Effects of Exoskeleton Assisted Gait*”

Submitted to: Department of Defense W81XWH-14-1-0611

Role: Qualified Collaborator (Institutional Principal Investigator)

Status: funded

8/2013-7/2017: “*Promoting Healing of Tendinopathies Using Therapeutic Mechanobiologic Stimulation for Targeted Removal of Aggrecan-Rich Deposits*” R01 AR063144

Submitted to: The National Institutes of Health

Role: Consultant

Status: funded

9/2012-8/2016: “*A prospective study of human bone adaptation using a novel in-vivo loading model*” R01 AR063691

Submitted to: The National Institutes of Health

Role: Principal Investigator

Status: Funded

11/2010-10/2014: “*Effect of Teriparatide, Vibration and the Combination on Bone Mass and Bone Architecture in Chronic Spinal Cord Injury*” W81XWH-10-1-0951

Submitted to: Department of Defense

PI: Thomas J. Schnitzer

Role: Co-Investigator (Institutional Principal Investigator)

Status: Complete

9/2012-9/2013: “*Risk Assessment in Older Minority Survivors (RAISe)*”

Submitted to: Midwest Roybal Center for Health Promotion and Translation

PI: Patricia Sheean

Role: Collaborator

Status: Complete

9/2011-9/2013: NRSA Postdoctoral Training Grant for W. Brent Edwards “*Changes in proximal tibia fracture strength as a function of time elapsed since spinal cord injury*” F32 AR061964

Submitted to: The National Institutes of Health

PI: W. Brent Edwards

Role: Primary Mentor

Status: Complete

2011-2013: “Assessment of Change in Bone Mass and Bone Architecture in Acute Spinal Cord Injury: Quantitative Computed Tomography (QCT) Analysis”

Submitted to: Merck, Inc. (Investigator Initiated)

Role: Co-Principal Investigator, with Thomas J. Schnitzer

Status: Complete

2010-2012: “A fundamental study of nanoscale material properties of dental composite-tooth interfaces”

Submitted to: The Chancellor’s Discovery Fund for Multidisciplinary Research (UIC)

Role: Co-Principal Investigator, with Carmen Lilly and Ana Bedran-Russo

Status: Complete

2007 – 2012: “Rehabilitation Engineering Research Center on Recreational Technologies and Exercise Physiology Benefiting Persons with Disabilities” H133E070029

Submitted to: The National Institute on Disability and Rehabilitation (NIDR)

PI: James Rimmer

Role: Project Principal Investigator

Status: Complete

12/2004 – 12/2006: NRSA Postdoctoral Training Grant “Finite element modeling of Colles’ Fractures” F32 AG25619

Submitted to: The National Institutes of Health

Role: Principal Investigator

Status: Complete

9/1999 – 8/2002: National Science Foundation Graduate Research Fellowship

Status: Complete

RESEARCH INTERESTS

My research focus is on understanding how forces applied to the musculoskeletal system can influence bone and joint health and function in adult men and women in health and disease. Broadly, my projects address the interaction between mechanical loading environment, bone health, and joint health. Our approach utilizes a combination of computational modeling, medical image analysis, cadaver mechanical testing, and living human subjects in a clinical research setting.

Healthy bone adapts to best resist its habitual mechanical loading environment. When the applied daily mechanical stimulus drops below some minimum threshold, bone loss occurs. Similarly, when the stimulus exceeds some threshold, bone will adapt to become stronger through a combination of increased bone mass and changes to bone geometry that are associated with increased mechanical strength. Our research uses experimental data, image analysis, and subject-specific computational models to accurately quantify:

- the mechanical stimulus applied to bone during specific activities
- three-dimensional changes to bone mass, density, and shape that occur over time
- the mechanical and structural consequences of bone adaptation

We apply this basic toolset to a variety of clinical problems, as well as healthy situations. These include:

- Defining a quantitative input/output relationship between mechanical loading environment and bone adaptation in a healthy skeletal system
- Quantifying bone loss after acute spinal cord injury
- Evaluating treatment outcomes for interventions to improve bone health

CURRENT PROJECTS

- Understand the short and longer-term changes that occur in bone structure when it is exposed to novel mechanical loads
- Development of noninvasive methods to quantify changes to bone strength and structure *in vivo* using CT images and computational modeling
- Develop and evaluate functional loading interventions to enhance bone quality in older women using a multi-scale modeling approach
- Quantify changes in bone microstructure as a result of mechanical-loading physical activity such as running in healthy individuals, or assisted gait in individuals with spinal cord injury

PEER-REVIEWED PUBLICATIONS

1. Silva MJ, **Reed KL**, Robertson DD, Bragdon C, Harris WH, Maloney WJ. Reduced bone stress as predicted by composite beam theory correlates with cortical bone loss following cemented total hip arthroplasty. *Journal of Orthopaedic Research*. 17(4):525-31, 1999 Jul
2. **Reed KL**, Brown TD: Elastic Modulus and Strength of Emu Cortical Bone. *The Iowa Orthopaedic Journal* 21:53-58, 2001.
3. **Reed, K.L.**, Brown, T.D., Conzemius, M.G.: Focal Cryogen Insults for Inducing Segmental Osteonecrosis: Computational and Experimental Assessments of Thermal Fields. *Journal of Biomechanics* 36(9):1317-1326, 2003
4. **Reed, K.L.**, Conzemius M.G., Robinson R.A., Brown, T.D.: Osteocyte-Based Image Analysis for Quantitation of Histologically Apparent Femoral Head Osteonecrosis: Application to an Emu Model. *Computer Methods in Biomechanics and Biomedical Engineering* 7(1):25–32, 2004.
5. **Troy KL**, Grabiner MD. Absence of visual feedback about an obstacle influences lower extremity trajectories during the recovery stepping response. *Experimental Brain Research* 161(3):343-350, 2005
6. **Troy KL**, Grabiner MD. Recovery responses to surrogate slipping tasks differ from responses to actual slips. *Gait and Posture* 24: 441-447, 2006
7. Bareither ML, **Troy KL**, Grabiner MD. Bone mineral density of the proximal femur is not related to dynamic joint loading during locomotion. *Bone* 38:125-129, 2006

8. Grabiner MD, **Troy KL**. Attention demanding tasks during treadmill walking reduce step width variability in young adults., *Journal of NeuroEngineering and Rehabilitation* (available online) 2005, **2**:25 doi:10.1186/1743-0003-2-25
9. **Troy, KL**, Grabiner, MD, 2007. Off-axis loads cause failure of the distal radius at lower magnitudes than axial loads: a finite element analysis. *Journal of Biomechanics* 2007; 40(8):1670-1675.
10. **Troy KL**, Lundberg JH, Conzemius MG, Brown TD. 2007 "Habitual Hip Joint Activity Level of the Pinned Emu (*Dromaius novaehollandiae*)" *Iowa Orthopaedic Journal* 2007;27:17-23.
11. **Troy KL**, Grabiner MD. Asymmetrical ground impact of the hands after a trip-induced fall: Experimental kinematics and kinetics. *Clinical Biomechanics* 2007; 22:1088-1095
12. Grabiner MD, Donovan S, Bareither ML, Marone JR, Hamstra-Wright KL, Gatts S, **Troy KL**. Trunk kinematics and fall risk of older adults: translating biomechanical results to the clinic. *Journal of Electromyography and Kinesiology*. 2008 Apr;18(2):197-204.
13. Dingwell JB, Robb RT, **Troy KL**, Grabiner MD. Effects of an attention demanding task on dynamic stability during treadmill walking *Journal of NeuroEngineering and Rehabilitation*, 2008 Apr 21;5(1):12
14. **Troy KL**, Donovan SJ, Marone JM, Bareither ML, Grabiner MD. Modifiable performance domain risk-factors associated with slip-related falls. *Gait and Posture*, 2008 Oct;28(3):461-5
15. Bareither ML, Grabiner MD, **Troy KL**. Habitual site-specific upper extremity loading is associated with increased bone mineral of the ultradistal radius in young women. *Journal of Women's Health* 2008 Dec; 17(10) 1577-81
16. **Troy KL**, Donovan SJ, Grabiner MD. Theoretical contribution of the upper extremities to reducing trunk extension following a laboratory-induced slip. *Journal of Biomechanics*, 2009 42(9), p 1339-1344
17. **Troy KL**, Brown TD, Conzemius MG. Contact stress distributions on the femoral head of the emu (*Dromaius novaehollandiae*). *Journal of Biomechanics*, 2009 42(15), p. 2495-500.
18. **Troy KL** Biomechanical validation of upper extremity exercise in wheelchair users: design considerations and improvements in a prototype device *Disability and Rehabilitation: Assistive Technology*, 2011 6(1) p.22-28
19. Edwards WB, **Troy KL**. Number Crunching: How and when will numerical models be used in the clinical setting? *Current Osteoporosis Reports*, 2011 9(1), p.1-3
20. Edwards WB, **Troy KL**, Derrick TR. On the filtering of intersegmental loads during running *Gait and Posture*, 2011 34(3), p.435-8

21. Marone JR, Rosenblatt NJ, **Troy KL**, Grabiner MD. Fear of falling does not alter the kinematics of recovery from an induced trip. *Archives of Physical Medicine and Rehabilitation*, 2011 92(12):2093-5
22. Edwards WB, **Troy KL**. Simulating distal radius fracture strength using biomechanical tests: influence of boundary conditions. *Journal of Biomechanical Engineering*, 2011 133(11): 114501
23. Edwards WB, **Troy KL**. Finite element prediction of surface strain and fracture strength at the distal radius. *Medical Engineering and Physics*, 2012 34(3):290-8
24. Bhatia VA, **Troy KL**. A small-scale mechanical loading and testing device: validation and application to a mouse tibia loading model *Experimental Techniques*, 2012, available online DOI: 10.1111/j.1747-1567.2012.00843.x
25. Edwards WB, **Troy KL**. A linear actuated torsional device to replicate clinically relevant spiral fractures in long bones. *Proceedings of the Institution of Mechanical Engineers, Part H, Journal of Engineering in Medicine*, 2012, 226(9):729-33
26. Grabiner MD, Bareither ML, Gatts S, Marone JR, **Troy KL**. Task-specific training reduces trip-related fall risk in women. *Medicine and Science in Sports and Exercise*, 2012 44(12):2410-4
27. Edwards, W.B., Schnitzer, T.J., & **Troy, K.L.** Bone mineral loss at the hip in acute spinal cord injury. *Osteoporosis International*, 2013 Mar 7. doi: 10.1007/s00198-013-2323-8 [Epub ahead of print]
28. Wang VM, Sandy J, Plaas A, **Troy KL**, Mikecz K. Controlled exercise removes the chondroid matrix and promotes full recovery of Achilles tendon mechanical properties in wild type, but not ADAMTS-KO mice in a novel *in vivo* tendinopathy model. *Journal of Orthopaedic Research*, 2013 Jun 10. doi: 10.1002/jor.22398. [Epub ahead of print]
29. Edwards, W.B., Schnitzer, T.J., **Troy, K.L.** Torsional stiffness and strength of the proximal tibia are better predicted by finite element models than DXA or QCT. *Journal of Biomechanics*, 2013 Jun 21;46(10):1655-62.
30. **Troy K.L.**, Edwards W.B., Bhatia, V.A., Bareither, M.L. An *in vivo* loading model to examine bone adaptation in humans: a pilot study. *Journal of Orthopaedic Research*, 2013 Sep;31(9):1406-13
31. Edwards, W.B., Schnitzer, T.J., **Troy, K.L.** Bone mineral loss at the knee in acute spinal cord injury. *Osteoporosis International*, 2014 Mar;25(3):1005-15
32. Edwards, W.B., Schnitzer, T.J., **Troy, K.L.** The mechanical consequence of actual bone loss and simulated bone recovery in acute spinal cord injury. *Bone* 2013 Dec 17;60C:141-147. doi: 10.1016/j.bone.2013.12.012. [Epub ahead of print]

33. **Troy, K.L.**, Munce, T.A., Longworth, J.A. An exercise trial targeting posterior shoulder strength in manual wheelchair users: pilot results and lessons learned. *Disability and Rehabilitation: Assistive Technology*, in press
34. Edwards, W.B., Schnitzer, T.J., **Troy K.L.** Reduction in proximal femoral strength in patients with acute spinal cord injury *Journal of Bone and Mineral Research*, 2014 Sep;29(9):2074-9
35. Pollard T, Lilley C.M., **Troy K.L.**, Monaghan P., Bedran-Russo A. Effect of surface roughness and force on the elastic modulus of dentin-resin composite interface layers. *Dental Materials Research*, in revision
36. Bhatia, V.A., Edwards, W.B., **Troy K.L.** Predicting surface strains at the human distal radius during an *in vivo* loading task – Finite element model validation and application. *Journal of Biomechanics*, 2014 Aug 22;47(11):2759-65
37. McPherson, J.G., Edwards, W.B., Prasad, A., **Troy, K.L.**, Griffith, J.W., Schnitzer, T.J. Dual energy x-ray absorptiometry of the knee in spinal cord injury: methodology and correlation with quantitative computed tomography. *Spinal Cord*, 2014 Nov;52(11):821-5
38. Bhatia V.A., Edwards W.B., Johnson, J.E., **Troy K.L.** Short-Term Bone Formation is Greatest within High Strain Regions of the Human Distal Radius: a Prospective Pilot Study. *J. Biomech. Eng.*, 2015 Jan 1;137(1)
39. Braunschweig, C.A., Shean, P.M., Peterson, S.J., Perez, S.G., Freels, S., Troy, K.L., Ajanaku, F.C., Patel, A., Sclamberg, J.S., Wang, Z. Exploitation of diagnostic computed tomography scans to assess the impact of nutritional support on body composition changes in respiratory failure patients. *Journal of Parenteral and Enteral Nutrition*, 2014 Sep;38(7):880-5
40. Shean, P.M., Peterson, S.J., Perez, S.G., Troy, K.L., Patel, A., Sclamberg, J.S., Ajanaku, F.C., Braunschweig, C.A. The prevalence of sarcopenia in patients with respiratory failure classified as normally nourished using subjective global assessment and computed tomography. *Journal of Parenteral and Enteral Nutrition*, 2014 Sep;38(7):873-9
41. McPherson, J.G., Edwards, W.B., Prasad, A., Troy, K.L., Griffith, J.W., Schnitzer, T.J. Dual energy x-ray absorptiometry of the knee in spinal cord injury: methodology and correlation with quantitative computed tomography. *Spinal Cord*, 2014 Nov;52(11):821-5
42. Grabiner, M.D., Crenshaw, J., Hurt, C.P., Rosenblatt, N.J., Troy K.L. Exercise-based fall prevention: can you be a bit more specific? *Exercise Sports Science Reviews*, 2014 Oct;42(4):161-8. doi: 10.1249/JES.0000000000000023
43. Shean PM, Peterson SJ, Perez SG, Troy KL, Patel A, Sclamberg JS, Ajanaku FC, Braunschweig CA. Response to Dr Khursheed Jeejeebhoy. *JPEN J Parenter Enteral Nutr.* 2015 Mar;39(3):271-2.

44. Sheean P, Liang H, Schiffer L, Arroyo C, Troy K, Stolley M. Assessing the prevalence of compromised bone health among overweight and obese African-American breast cancer survivors: a case-control study. *J Cancer Surviv.* 2015 Mar 29.
45. Troy KL, Morse LR. Measurement of bone: Diagnosis of SCI-induced osteoporosis and fracture risk prediction. *Topics in Spinal Cord Injury and Rehabilitation* 2015; 21(4):267-274
46. Edwards WB, Simonian N, Troy KL, Schnitzer TJ. Reduction in torsional stiffness and strength at the proximal tibia as a function of time since spinal cord injury. *Journal of Bone and Mineral Research* 2015; Aug;30(8):1422-30

INVITED PUBLICATIONS

1. **Reed-Troy KL**, Grabiner MD. Neuromuscular and biomechanical elements of postural equilibrium. in Gait Disorders Evaluation and Management eds. Hausdorff JM and Alexander NB. Taylor and Francis Group, Boca Raton, FL 2005 p. 101-115

INVITED PRESENTATIONS

1. Faculty presenter, **Fall Prevention and Balance: A Rehabilitation Challenge and Opportunity: Prevention, Risk Assessment, and Interventions**, Rehabilitation Institute of Chicago, August 5-6 2004
2. Faculty presenter, **Fall Prevention & Balance: An Interdisciplinary Approach**, Rehabilitation Institute of Chicago, April 21-22, 2005
3. Research Seminar, **Putting the Brakes on Breaks: Aging, falls, and fractures**, Clemson University Dept. of Bioengineering, December 10, 2005
4. Departmental Seminar, **Putting the Brakes on Breaks: Aging, falls, and fractures**, University of Michigan Division of Kinesiology, January 6, 2006
5. Aging Initiative Speaker Series, **Stumbling onto a Solution: Trips and Slips in the Superannuated**, University of Illinois, Urbana-Champaign, March 6, 2006
6. Departmental Seminar, **It's all in the wrist: Understanding fall-related fractures**, University of Illinois at Chicago Department of Bioengineering, September 22, 2006
7. **Fall-related fractures and other topics of impact**, Midwest Connective Tissue Workshop at Rush University, October 20-21, 2006
8. Departmental Seminar, **Building Better Bones**, University of Illinois Medical Center, Department of Endocrinology, March 15, 2007
9. Departmental Seminar, **Forcing yourself to have Stronger Bones**, Rush University Department of Anatomy and Cell Biology, December 18, 2009

10. Faculty Presenter, **Osteoporosis: Boning up on the Latest Evidence**, Annual Primary Care Meeting at Dartmouth College, October 7-8, 2010
11. Northwestern University Bone Health and Osteoporosis Program (NUBOP), **Microstrains and Mega-Pascals: Using Engineering Principals to Design Osteogenic Exercises**, Chicago, IL, January 5, 2011
12. Departmental Seminar, **Building Better Bones through Biomechanics**, Rensselaer Polytechnic Institute, Troy, NY May 21, 2011
13. Faculty Presenter, **Trip and... Fall? A Biomechanics Perspective on Fall Avoidance**, Falls Prevention Conference, Northern New England Geriatric Education Center, Hanover, NH. June 25, 2012
14. Departmental Seminar, **Physical Activity and Bone Health: A Biomechanics Perspective**, Department of Physical Therapy, University of Illinois at Chicago, September 20, 2012
15. American Medical Association Wellness Program, **Putting your best foot forward: What gait analysis teaches us about health and disease**, Chicago, IL October 10, 2012
16. American Association for Physical Medicine and Rehabilitation 2012 Annual Meeting, Workshop titled, **Bone health in persons with spinal cord injury**, Atlanta, GA. November 16, 2012
17. Departmental Seminar, **“Quantifying the input/output relationship between in vivo mechanical loads and bone adaptation in women”** Department of Biomedical Engineering, Worcester Polytechnic Institute, Worcester, MA. Feb 21, 2013
18. Keynote Address, **Computational assessments of bone strength: What insights can models provide?**, Society for Experimental Mechanics, 3rd Symposium on the mechanics of biological systems and materials, Lombard, IL, June 3, 2013
19. Keynote Address, **Fall Prevention** Vermont Geriatric Education Conference, Burlington, VT, April 9, 2013
20. Faculty Presenter, **“Function of the Mature Skeleton and Application of Wolff’s Law”** for University of Illinois at Chicago Department of Orthopaedic Surgery course titled, **“Pathophysiologic Background of Orthopaedic Disorders”**. Chicago, IL, April 28, 2013
21. Departmental Seminar, **“Quantifying the input/output relationship between in vivo mechanical loads and bone adaptation in women”**, Department of Biomedical Engineering, Washington University in St. Louis, St. Louis, MO, April 5, 2013
22. Departmental Seminar, **“Quantifying the input/output relationship between in vivo mechanical loads and bone adaptation in women”**, Department of Anatomy and Cell Biology, Rush University Medical Center, Chicago, IL May 6, 2013

23. American Spinal Injury Association 2013 Annual Meeting, Workshop titled, “**Mechanical Loading and Bone Strength: Boning up on the Latest Evidence**”, Chicago IL May 8, 2013
24. Departmental Seminar, “**Developing a mechanism-based approach to physical activity interventions for bone health: What advice should I give to my mother?**”, Department of Kinesiology, University of Massachusetts, Amherst, MA February 18, 2014
25. Departmental Seminar, “**Subject-specific computational models in the clinic: developing mechanics-based outcomes to assess bone health**”, Department of Mechanical Engineering, Clarkson University, Potsdam, NY March 28, 2014
26. Faculty presenter, **Mechanical Consequences of Bone Loss After Spinal Cord Injury**, Rehabilitation Institute of Chicago, June 25-27, 2014
27. Presenter in the American Society of Biomechanics Symposium on Subject-specific modeling, **Individual variations in bone mechanical strain environment: implications for osteogenic exercise** *World Congress of Biomechanics*, Boston, MA; July 6-11, 2014
28. Grand Rounds, **That which throws the stone foresees the bone: physical activity and bone strength**, Department of Pathology, University of Minnesota Medical School, September 10, 2014
29. Seminar, **What’s going on inside your bones? Mechanical insights into bone adaptation**, Bouxsein Lab, Harvard Center for Advanced Orthopaedic Studies, December 13, 2014
30. 8. Seminar, “**What’s going on inside your bones? Linking what we do to how our bones adapt**”, Endocrine Fellows group, Massachusetts General Hospital, May 1, 2015

POSTERS AND PRESENTATIONS

1. **Reed K.L.**, Brown T.D., Conzemius M.G.: Temperature Fields Surrounding a New Instrument for a Cryogenically-Induced Osteonecrosis Animal Model. *Proceedings of the 2000 Annual ARCO Meeting and International Symposium*, p. 13
2. **Reed K.L.**, Brown T.D.: Elastic, Yield, and Ultimate properties of Emu Cortical Bone, *Proceedings of the 4th Combined Meeting of the Orthopaedic Research Societies of The U.S.A., Canada, Europe, and Japan*, pp.35-36, 2001
3. **Reed K.L.**, Brown T.D., Conzemius M.G.: Design and Evaluation of a Cryogenic Probe to Induce Osteonecrosis in a Precise Location. *Proceedings of the 25th Annual Conference of the American Society of Biomechanics*, p.19, 2001
4. **Reed K.L.**, Brown T.D.: Elastic, Yield, and Ultimate Properties of Emu Cortical Bone. *Proceedings of the 25th Annual Conference of the American Society of Biomechanics*, p.73-74, 2001

5. **Reed K.L.**, Brown T.D., Conzemius M.G.: Design and Evaluation of a Cryogenic Probe to Induce Osteonecrosis in a Precise Location. *Proceedings of the 25th Annual Conference of the American Society of Biomechanics*, p.19, 2001.
6. **Reed K.L.**, Robinson R.A., Conzemius M.G., Brown T.D.: An Algorithm to Quantify Segmental Lesions in Necrotic Femoral Heads, *Proceedings of the 10th Annual Symposium on Computational Methods in Orthopaedic Biomechanics*, p.24, 2002.
7. **Reed K.L.**, Brown T.D., Conzemius M.G.: Thermal Finite Element Analysis of Osteocyte Kill Zones Achieved with a Cryo-Insult Probe. *Proceedings of the IV World Congress of Biomechanics*, p. 457, 2002.
8. **Reed K.L.**, Robinson R.A., Conzemius M.G., Brown T.D.: An Algorithm to Quantify Segmental Lesions in Necrotic Femoral Heads. *Proceedings of the IV World Congress of Biomechanics*, p. 469, 2002.
9. **Reed, K.L.**, Robinson, R.A., Conzemius, M.G., Brown, T.D.: An Algorithm to Quantify Segmental Lesions in Necrotic Femoral Head. *Transactions of the 49th Annual Meeting of the Orthopaedic Research Society*, p. 0151, 2003.
10. **Reed, K.L.**, Brown, T.D., Conzemius, M.G.: Thermal Finite Element Analysis of Experimental Osteonecrosis Lesions Achieved with a Cryo-Insult Probe. *Transactions of the 49th Annual Meeting of the Orthopaedic Research Society*, p. 0154, 2003.
11. **Reed, K.L.**, Brown, T.D.: Determination of Contact Stress Distributions on Emu Femoral Heads. *Transactions of the 49th Annual Meeting of the Orthopaedic Research Society*, p. 0429, 2003.
12. Brown, TD, **Reed, KL**, Conzemius, MG “Modeling Approaches in Hip Joint Biomechanics: The Emu as an Animal Model of Femoral Head Necrosis.” *Proceedings of the International Society of Biomechanics IXI Congress*, Dunedin, New Zealand, July 6–11, 2003.
13. **Reed, KL**, Conzemius, MG, Brown, TD. “Determination of Contact Stress Distributions on Emu Femoral Heads.” *Proceedings of the 27th Annual Meeting of the American Society of Biomechanics*, Toledo, Ohio, September 25–27, 2003, p. 10.
14. **Troy, KL**, Gavin CG, Grabiner MD. “Wrist kinematics and kinetics during ground impact following a fall” *Proceedings of the 28th Annual Meeting of the American Society of Biomechanics*. September, 2004. Portland, OR
15. **Troy, KL**, Grabiner MD. “The presence of an obstacle influences the stepping response during simulated and real trips” *Proceedings of the 28th Annual Meeting of the American Society of Biomechanics*. September, 2004. Portland, OR

16. **Troy, KL**, Gavin CG, Grabiner MD. “The effect of hand position on wrist kinematics at landing from a forward fall from a kneeling position” *Proceedings of the 28th Annual Meeting of the American Society of Biomechanics*. September, 2004. Portland, OR
17. Gavin CG, **Troy, KL**, Grabiner MD. “Quantification of upper extremity motion during a trip-induced fall in older adults” *Proceedings of the 28th Annual Meeting of the American Society of Biomechanics*. September, 2004. Portland, OR
18. **Reed-Troy, KL**, Gavin, CG, Grabiner, M.D. “Wrist kinematics and kinetics during ground impact following a fall” *Transactions of the 51st Annual Meeting of the Orthopaedic Research Society*, p. 601A, 2005
19. Bareither ML, **Reed-Troy KL**, Grabiner MD. “Bone mineral density of the proximal femur is not related to dynamic joint loading during locomotion” *Proceedings of the 29th Annual Meeting of the American Society of Biomechanics* Cleveland, OH; 2005
20. **Reed-Troy KL**, Grabiner MD. “Recovery responses to surrogate slips are different than actual slips” *Proceedings of the 29th Annual Meeting of the American Society of Biomechanics* Cleveland, OH; 2005
21. **Reed-Troy KL**, Grabiner MD. “Wrist kinetics during impact are affected by hand symmetry” *Proceedings of the 29th Annual Meeting of the American Society of Biomechanics* Cleveland, OH; 2005
22. Hamstra-Wright KL, **Reed-Troy KL**, Grabiner MD "Skill Acquisition occurs during fall-preventive motor response training" *Proceedings of the 29th Annual Meeting of the American Society of Biomechanics* Cleveland, OH; 2005
23. **Troy KL**, Grabiner MD. “Development and validation of a contact model to simulate Colles’ fractures” *Transactions of the 52nd Annual Meeting of the Orthopaedic Research Society*, March 19-22, 2006 (poster)
24. **Troy KL**, Donovan SJ, Marone JR, Bareither ML, Grabiner MD. “Concurrent control of multiple segments is required to avoid falling due to a slip” *World Congress of Biomechanics* Munich, Germany, 2006 (*invited*)
25. **Troy KL**, Grabiner MD. “Achievable changes in bone mineral density influence predicted distal radius fracture load” *World Congress of Biomechanics* Munich, Germany, 2006 (*invited*)
26. Fowler PM, **Troy KL**, Grabiner MD. “Mid-swing kinematic trunk states predict step width” *World Congress of Biomechanics* Munich, Germany, 2006 (*invited*)
27. Chu JJ, **Troy KL**, Fowler PM, Jessiman AW, Greenwald RM, Grabiner MD. “Validation of measuring basic stride kinematics from a treadmill with embedded pressure sensing” *World Congress of Biomechanics* Munich, Germany, 2006 (poster)

28. Bareither ML, **Troy KL**, Grabiner MD. “Increased radial bone mineral density in young women – a result of axial loading?” *14th Annual Congress on Women’s Health* Hilton Head, SC, 2006 (poster)
29. **Troy KL**, Grabiner MD “Off-axis loads cause failure of the distal radius at lower magnitudes than axial loads: a finite element analysis” *Proceedings of the 30th Annual Meeting of the American Society of Biomechanics* Blacksburg, VA; 2006
30. **Troy KL**, Grabiner MD “Off-axis loads cause failure of the distal radius at lower magnitudes than axial loads: a finite element analysis” *Transactions of the 53rd Annual Meeting of the Orthopaedic Research Society*, February 11-14, 2007 (poster)
31. **Troy KL**, Donovan SJ, Grabiner MD “Lateral falls after a slip are affected by medial/lateral slipping foot displacement” *Proceedings of the 31st Annual Meeting of the American Society of Biomechanics* Stanford, CA; 2007
32. Donovan SJ, **Troy KL**, Grabiner MD “Rapid shoulder flexion after a slip may assist fall avoidance” *Proceedings of the 31st Annual Meeting of the American Society of Biomechanics* Stanford, CA; 2007
33. **Troy KL**, Grabiner MD “Mechanical loading of the distal radius causes a temporary decrease in BMC in young women” *Transactions of the 54th Annual Meeting of the Orthopaedic Research Society*, March 2-5, 2008 (poster)
34. **Troy KL**, Donovan SJ, Grabiner MD “Theoretical contribution of the upper extremities to reducing trunk extension following a laboratory-induced slip” *Transactions of the 55th Annual Meeting of the Orthopaedic Research Society*, February 22-25, 2009 (poster)
35. Bhatia VA, **Troy KL** “Mechanical loading causes an acute and temporary decrease in the stiffness of mouse tibiae” *Proceedings of the 33rd Annual Meeting of the American Society of Biomechanics* State College, PA; 2009
36. Hofmann CN, **Troy KL** “Biomechanical evaluation and redesign of an accessory unit for exercise in manual wheelchair users” *Proceedings of the 33rd Annual Meeting of the American Society of Biomechanics* State College, PA; 2009
37. Bhatia VA, **Troy KL** “Mechanical loading causes an acute and temporary decrease in the BMC and stiffness of mouse tibiae” *Transactions of the 56th Annual Meeting of the Orthopaedic Research Society*, March 6-10, 2010 (poster)
38. **Troy KL**, Edwards, WB “A human model of bone adaptation: response to short term mechanical loading” *Transactions of the 56th Annual Meeting of the Orthopaedic Research Society*, March 6-10, 2010 (poster)

39. **Troy KL**, Bhatia VA “Mechanical loading stimulates localized bone adaptation in the mouse tibia” *International Bone and Mineral Society Sun Valley Workshop on Musculoskeletal Biology*, August 1-4, 2010 (poster)
40. Bhatia VA, **Troy KL** “Mechanical loading of the mouse tibia stimulates localized bone adaptation” *Proceedings of the 34th Annual Meeting of the American Society of Biomechanics* Providence, RI; 2010
41. **Troy KL**, Edwards WB “Relationships between dual energy x-ray absorptiometry (DXA) and computed tomography (CT) measures of bone and their ability to predict fracture load” *Proceedings of the 34th Annual Meeting of the American Society of Biomechanics* Providence, RI; 2010 (poster)
42. Edwards WB, **Troy KL** “Changes in cross-sectional stress at the distal radius following short-term mechanical loading” *Proceedings of the 34th Annual Meeting of the American Society of Biomechanics* Providence, RI; 2010 (poster)
43. Edwards WB, **Troy KL** “Finite element prediction of surface strain and failure load at the distal radius using simplified boundary conditions” *Proceedings of the 34th Annual Meeting of the American Society of Biomechanics* Providence, RI; 2010
44. Bhatia VA, **Troy KL** “Alendronate diminishes the short term, localized effects of mechanical loading in the tibiae of female C57BL/6 mice” *Transactions of the 57th Annual Meeting of the Orthopaedic Research Society*, January 13-16, 2011
45. Edwards WB, **Troy KL** “Finite Element Prediction of Distal Radius Fracture Strength: Validation and Application to a Short-Term Mechanical Loading Intervention” *Transactions of the 57th Annual Meeting of the Orthopaedic Research Society*, January 13-16, 2011 (poster)
46. Edwards WB, **Troy KL** “Determinants of finite element predicted fracture strength of the distal radius” *19th Annual Symposium on Computational Methods in Orthopaedic Biomechanics*, January 12, 2011
47. Pollard T, Lilley C, Bedran-Russo A, **Troy KL**, Monaghan P “Effect of force and roughness on the elastic modulus of the resin/dentin interface” *ASME Applied mechanics and materials conference*, May 31-June 2, 2011
48. Longworth, J, **Troy KL** “Kinematic variability of the trunk is related to shoulder variability during wheelchair propulsion” *Proceedings of the 35th Annual Meeting of the American Society of Biomechanics* Long Beach, CA; 2011
49. Edwards WB, **Troy KL** “Short term mechanical loading increases trabecular bone mineral content and moments of inertia in the radius of young women” *Proceedings of the 35th Annual Meeting of the American Society of Biomechanics* Long Beach, CA; 2011

50. **Troy KL**, Edwards WB “Translating the strain stimulus equation from animals to humans” *Proceedings of the American Society for Bone and Mineral Research* San Diego, CA; 2011
51. Bhatia, VA, Edwards WB, **Troy KL** “Effect of image resolution on the accuracy of trabecular morphology and the convergence behavior of micro-CT finite element models of mouse bone” *58th Annual Meeting of the Orthopaedic Research Society*, San Francisco, CA; 2012
52. Edwards WB, Barkema D, Schnitzer TJ, **Troy KL** “The Mechanical Consequence of Acute Bone Loss Following Spinal Cord Injury” *58th Annual Meeting of the Orthopaedic Research Society*, San Francisco, CA; 2012
53. Peterson SJ, **Troy KL**, Braunschweig CL “Use of computed tomography (CT) to evaluate the impact of calories received on body composition changes in obese and non-obese ICU patients” *2012 Annual Meeting of the Obesity Society*, San Antonio, TX; 2012
54. **Troy KL**, Bhatia VA, Edwards WB “Compressive loading of the distal radius improves bone structure in young women” *Proceedings of the 36th Annual Meeting of the American Society of Biomechanics*, Gainesville, FL; 2012 (award finalist)
55. Bhatia VA, Edwards WB, **Troy KL** “Repeatability of image registration and segmentation procedures for CT scans of the human distal radius” *Proceedings of the 36th Annual Meeting of the American Society of Biomechanics*, Gainesville, FL; 2012
56. Edwards WB and **Troy KL** “A linear actuated torsional device to replicate clinically relevant spiral fractures in long bone” *Proceedings of the 36th Annual Meeting of the American Society of Biomechanics*, Gainesville, FL; 2012
57. Edwards WB and **Troy KL** “DXA derived measures of bone mineral can reliably predict mechanical behavior of proximal tibias loaded in torsion” *Proceedings of the 36th Annual Meeting of the American Society of Biomechanics*, Gainesville, FL; 2012
58. Longworth JA and **Troy KL** “Shoulder pain does not affect kinematic variability during wheelchair propulsion” *Proceedings of the 36th Annual Meeting of the American Society of Biomechanics*, Gainesville, FL; 2012
59. **Troy KL** Bhatia VA, Edwards WB “Muscle volume does not affect the osteogenic response to compressive loading in the distal radius of young women” *Proceedings of the American Society for Bone and Mineral Research* Minneapolis, MN; 2012 (plenary session award)
60. Edwards WB, Schnitzer TJ, **Troy KL** “Bone mineral loss at the hip in acute spinal cord injury” *Proceedings of the American Society for Bone and Mineral Research* Minneapolis, MN; 2012

61. Bhatia VA, Edwards WB, **Troy KL** “Predicting bone adaptation at the human distal radius using cadaveric specimens and the Daily Strain Stimulus theory” *59th Annual Meeting of the Orthopaedic Research Society*, San Antonio, TX; 2013
62. Edwards WB, Schnitzer TJ, **Troy KL** “Computed tomography based finite element models can accurately predict stiffness and strength of proximal tibiae loaded in torsion” *59th Annual Meeting of the Orthopaedic Research Society*, San Antonio, TX; 2013
63. Longworth JA, **Troy KL** “A familiarization protocol for wheelchair propulsion” *Proceedings of the 36th Annual Meeting of the American Society of Biomechanics*, Omaha, NE; 2013
64. Edwards WB, **Troy KL**, Schnitzer TJ “Reductions in proximal tibial fracture strength in acute spinal cord injury” *Annual meeting of the American Spinal Injury Association*, Chicago, IL; 2013
65. Edwards WB, Schnitzer TJ, **Troy KL** “The mechanical consequence of actual bone loss and simulated recover in acute spinal cord injury” *Proceedings of the 36th Annual Meeting of the American Society of Biomechanics*, Omaha, NE; 2013
66. Bhatia VA, Edwards WB, **Troy KL** “Finite element prediction of periosteal strain at the human distal radius during a targeted loading task” *Proceedings of the 36th Annual Meeting of the American Society of Biomechanics*, Omaha, NE; 2013
67. Edwards WB, Schnitzer TJ, **Troy KL** “Changes in fracture strength as a function of time since spinal cord injury” *Proceedings of the American Society for Bone and Mineral Research* Baltimore, MD; 2013
68. **Troy KL**, Johnson B, Bareither ML “Physically active women have denser bones and may be less responsive to a mechanical loading intervention” *Proceedings of the American Society for Bone and Mineral Research* Baltimore, MD; 2013
69. Sheean P, Shiffer L, Arroyo C, **Troy, K**, Stolley M. “Vitamin D deficiency and healthy bones in African American breast cancer survivors” *Annual meeting of the American Institute for Cancer Research*, Bethesda, MD; 2013
70. Prasad A, Edwards WB, Marks J, **Troy KL**, Schnitzer TJ “Correlation of DXA and QCT Imaging at the Knee in Adults with Spinal Cord” *Annual meeting of the American Spinal Injury Association*, San Antonio, TX; May 14-17, 2014
71. Johnson JE, **Troy KL** “Higher strains in extension than flexion might partially explain the mechanism of distal radius fractures” *World Congress of Biomechanics*, Boston, MA; July 6-11, 2014

72. Edwards WB, Schnitzer TJ, Troy KL “Reductions in proximal femur strength in patients with acute spinal cord injury” *World Congress of Biomechanics*, Boston, MA; July 6-11, 2014 (Clinical Biomechanics Award Winner)
73. Edwards WB, Simonian N, **Troy KL**, Schnitzer TJ “Changes in proximal tibia bone mineral as a function of time since spinal cord injury” *Annual Meeting of the American Society for Bone and Mineral Research*, Houston, TX; September 12-15, 2014
74. Butler TA, Schnitzer TJ, **Troy KL** “Increased marrow adipose tissue following spinal cord injury” *Annual Meeting of the American Society for Bone and Mineral Research*, Houston, TX; September 12-15, 2014
75. Johnson JE, **Troy KL** “A multiscale approach for the simultaneous analysis of continuum and micro-FE models” *Annual Meeting of the Biomedical Engineering Society*, San Antonio, TX; October 22-24, 2014
76. Johnson JE, **Troy KL** “Application and validation of multiscale modeling to the distal radius” *Annual meeting of the Orthopaedic Research Society*, Las Vegas, NV; March 28-30
77. Best, A., Holt B, Hamill J, **Troy K** “Trabecular bone structure in forefoot and rearfoot endurance runners: implications for interpreting fossil hominin morphology” *Annual Meeting of the Paleoanthropology Society*, San Fransisco, CA; April 14-15, 2015

SERVICE (PROFESSIONAL ORGANIZATIONS)

American Society of Biomechanics:

2007-present Abstract reviewer
 2007-2008 Education Committee member
 2012 Program Committee member
 2013-2016 Treasurer

Orthopaedic Research Society:

2008-2009, 2015 Abstract reviewer
 2016-18 New Investigator Mentorship Committee Member

LANGUAGES

English (native)
 German (good reading, some writing, good conversational)
 French (some reading, some writing, limited conversational)

REVIEWING

Journals: ASME Journal of Biomechanical Engineering, Experimental Gerontology, Ergonomics, Journal of Applied Biomechanics, Journal of Biomechanics, Journal of Bone and Joint Surgery, Journal of the Mechanical Behavior of Biomedical Materials, Journal of Neuroengineering and Rehabilitation, Journal of Sports Science, Clinical Biomechanics, Human Factors, Human Factors and Ergonomics, Human Movement Science, Medicine in Science,

Sports and Exercise, PLOSone, Osteoporosis International, BMC Musculoskeletal Disorders, Bioinspired, Biomimetic, and Nanobiomaterials, WIREs Systems Biology and Medicine
Awards: American Society of Biomechanics reviewer for student Grant-In-Aid, Predoctoral Awards, Clinical Biomechanics and Microstrain Awards, Rehabilitation Engineering Society of North America Student Scientific Competition
Abstracts: Annual meetings of the Orthopaedic Research Society, American Society of Biomechanics
Grants: National Research Council of Canada, Austrian Science Fund, NASA Musculoskeletal Alterations Panel (*ad hoc*)

POPULAR MEDIA HIGHLIGHTS

“Emu research could help fight Bo Jackson disorder” *Des Moines Register* [Associated Press] by Chuck Schoffner, May 25, 2001

Stiff, 2003, by Mary Roach. Page 137

“Slip and Fall”, interview by Giannifer Fields, broadcast on “Eight-forty-eight”, *Chicago Public Radio WBEZ 91.5* February 16, 2005

“The cure for clumsiness?” broadcast on “The Daily Planet”, *Discovery Channel Canada* April 4, 2005

“Falling Study is a Trip” by Julie Deardorff, *The Chicago Tribune*, section 13 “Q”, pg 7. June 12, 2005

“It’s all in the wrist: AHS researcher creates ‘virtual wrist’ to study, prevent wrist fractures” *AHS Magazine* Fall/Winter 2005

“Slip science: Labs research how to prevent falls” by Malcolm Ritter, Associated Press. Published in USA-Today May 17, 2007 Section: Technology, Science & Space

“Slipping for Science” broadcast on ABC Nightly News *Healthbeat* section, Chicago, IL December 20, 2007

“The Science Behind Elderly Falling, Slipping: Researchers Study How The Elderly Fall in Order to Teach Them How to Fall Better” broadcast on Good Morning America May 13, 2009