EDUCATION

MICHIGAN STATE UNIVERSITY
- **PhD,** Engineering Mechanics, 2015

VALPARAISO UNIVERSITY
- **BS,** Mechanical Engineering, 2011

LICENSES & CERTIFICATIONS

- Professional Engineer, State of Michigan
- Aerial Lift Operator

AFFILIATIONS

- American Society of Mechanical Engineers (ASME)
- Society of Automotive Engineers (SAE)
- Tau Beta Pi — Engineering Honor Society

EXPLICO ENGINEERING

KEITH BUTTON, PhD, PE

Biomechanics

PROFESSIONAL PROFILE

Dr. Button's major area of practice involves the scientific investigation of accidents resulting in traumatic injury. He holds a B.S. in Mechanical Engineering from Valparaiso University and a PhD in Engineering Mechanics from Michigan State University.

Dr. Button has published numerous peer-reviewed journal articles and abstracts. His graduate training and research was conducted in the Orthopaedic Biomechanics Laboratories at Michigan State University, which is a joint collaboration with the College of Engineering and the department of Radiology. His research and publications focused on the effect of footwear on the biomechanics and injury tolerance of the lower extremity as well as soft tissue response following traumatic injury. He has presented these scientific findings at biomedical and engineering conferences. More recently, he has performed research on the likelihood of sustaining intervertebral disc injury during a rear-end collision.

AREAS OF EXPERTISE

- Biomechanical Engineering
- Lower Extremity Injury
- Infant Head Injury
- Intervertebral Disc Injury
- Collision Reconstruction

CONTACT INFORMATION

(248) 563-6083 | kbutton@explico.com | explico.com

EXPERIENCE

- **Explico Engineering Company**
  Senior Engineer — 2015-Present
- **Lawrence Technological University**
  Biomedical Engineering Department Adjunct Professor — August 2019-Present
- **Michigan State University**
  Graduate Research Associate — 2012-2015
- **Michigan State University**
  Tutor — 2014-2015
- **Michigan State University**
  Teaching Assistant — 2011
- **Trigon International**
  Mechanical Engineering Intern — 2010

AWARDS AND HONORS

- Fitch H. Beach Outstanding Graduate Research Award Finalist, 2015
- Michigan State College Of Engineering Fellowship, 2011
- Captain, Valparaiso University Cross Country, 2010
- Caterpillar Endowed Scholarship Recipient, 2007 — 2011
- Valparaiso Presidential Scholarship Recipient, 2007 — 2011
- Alumni Heritage Scholarship Recipient, 2007 — 2011

MANUSCRIPT REVIEWER

- Applied Bionics and Biomechanics
- Journal of Biomechanical Engineering
- Computer Methods in Biomechanics and Biomedical Engineering
- Annals of Biomedical Engineering
- Journal of Orthopaedic Research

PRESENTATIONS AND PUBLISHED ABSTRACTS

Button KD, Braman JE, Wei F, Haut RC. (2012) Determination of in vivo dynamic human ankle stiffness under external foot rotation. ASME Summer Bioengineering Conf. Fajardo, Puerto Rico. SBC2012-80373.

Button KD, Wei F, Meyer EG, Fitzsimons K, Haut RC. (2012) Determination of in situ ankle ligament strains in cases of high and medial ankle sprains. ASME Summer Bioengineering Conf. Fajardo, Puerto Rico. SBC2012-80378.

Pauly HM, Larson BE, Button KD, Haut RC, Donahue TL. (2013) Micro-Computed tomography analysis of bone volume following traumatic closed joint injury. Rocky Mountain American Society of Biomechanics Meeting, April, 2013, Estes Park, CO.

Coatney GA, Abraham AC, Button KD, Haut RC, Donahue TL. (2013) P188 efficacy on lapine meniscus preservation following blunt trauma. Rocky Mountain American Society of Biomechanics Meeting, April, 2013, Estes Park, CO.

Fischenich KM, Button KD, Fajardo RS, Decamp CD, Haut RC, Donahue TL. (2013) Mechanical evaluation of menisci following surgical transection of both menisci and anterior cruciate ligament. Rocky Mountain American Society of Biomechanics Meeting, April, 2013, Estes Park, CO.

Fischenich KM, Button KD, Fajardo RS, Haut RC, Donahue TL. (2013) Evaluation of menisci following a traumatic compressive tibiofemoral load. ASME Summer Bioengineering Conf. Sunriver, Oregon. SBC2013-14193.

Button KD, Leikert K, Donahue TL, Haut RC. (2013) Development of a traumatic anterior cruciate ligament and meniscal rupture model to study osteoarthritis. ASME Summer Bioengineering Conf. Sunriver, Oregon. SBC2013-14287.

Button KD, Davison M, Braman JE, Schaefer MC, Haut RC. (2013) Effect of shoe stiffness on injury produced under external rotation of the foot in human cadavers. ASME Summer Bioengineering Conf. Sunriver, Oregon, 2013. SBC2013-14719.

Fischenich KM, Coatney GA, Haverkamp J, Button KD, DeCamp C, Haut RC, Haut Donahue TL. (2013) Meniscal glycosaminoglycan coverage twelve weeks post injury in two models of knee joint injury. 11th World Congress of the International Cartilage Repair Society, Sept. 15-18, 2013, Izmir, Turkey.

Button KD, Steibel JP, Karcher DM, Haut RC. (2014) A non-invasive method to predict laying hen bone mechanical properties. Poultry Science Association Annual Meeting. Christi, Texas. PSA-161.

Button KD, Davison M, Braman JE, Schaefer MC, Haut RC. (2014) Investigating the effects of shoe stiffness on ankle injury risk using computational models. 7th World Congress in Biomechanics. Boston, MA. 14-IS-2161-WCB.

Button KD, Leikert KM, DeCamp CD, Donahue TL, Haut RC. (2014) Comparison of a traumatic ACL rupture and modified transection model to study osteoarthritis. 7th World Congress in Biomechanics. Boston, MA. 14-A-1633-WCB

Donahue TL, Fischenich KM, Coatney G, Pauly H, Button KD, Haut RC. (2014) Two new experimental models of post-traumatic knee joint injury. 7th World Congress in Biomechanics. Boston, MA. 14-IS-2706-WCB.

Fischenich KM, Button KD, Fajardo RS, Decamp CD, Haut RC, Donahue TL. (2014) A longitudinal comparison of mechanical changes of the menisci in two models of posttraumatic osteoarthritis of the knee. 7th World Congress in Biomechanics. Boston, MA. 14-A-1696-WCB.

Pauly HM, Larson BE, Button KD, DeCamp CD, Haut RC, Donahue TL. (2014) Micro-computed tomography comparison of trabecular bone changes in rabbits following surgical transection of anterior cruciate ligament and menisci or traumatic impact to the tibiofemoral joint. 60th Annual Meeting of the Orthopaedic Research Society. March 15-18, 2014. New Orleans, LA.

Button KD, Rossman SM, Weaver BT, Rundell SA. (2016). Cervical spine forces and disc herniation risk during standardized rear-end impact testing. 2016 Summer Biomechanics, Bioengineering and Biotransport Conference. June 29-July 2, 2016. National Harbor, MD. Poster #258.

Sproule D, Rossman SM, Button KD, Rundell SA. (2018) Simulation of Occupant Kinematics in Low-Speed Lateral Collisions using Articulated Total Body. 8th World Congress in Biomechanics. Dublin. #4252.

Rossman SM, Sproule D, Button KD, Rundell SA. (2018) Intervertebral Disc Herniation Risk During Low-Speed Lateral Collisions. 8th World Congress in Biomechanics. Dublin. #4390.

Sproule D, Rossman SM, Button KD, Rundell SA. (2018) Simulation of Occupant Kinematics in Low-Speed Lateral Collisions using Articulated Total Body. 2018 American Society of Biomechanics Conference. #427.

Rossman SM, Sproule D, Button KD, Rundell SA. (2018) Intervertebral Disc Herniation Risk During Low-Speed Lateral Collisions. 2018 American Society of Biomechanics Conference. #429.

Button KD, Davison MD, Weaver BT, Rundell SA (2018) Inertial Loading of the Pediatric Head Exceeds Neck Injury Tolerance Prior to Head Injury Tolerance. 2018 American Society of Biomechanics Conference. #418.

Sproule D, Rossman S, Snyder P, Button KD, Weaver B, Rundell S. Biomechanical Analysis of a Low Speed Rear-End Collision Using a Subject-Specific MADYMO Simulation. XXVII Congress of the International Society of Biomechanics held in conjunction with the 43rd Annual Meeting of the American Society of Biomechanics, 2019.

Sproule D, Rossman S, Snyder P, Button KD, Weaver B, Rundell S. Subject-Specific MADYMO Analysis of a Low Speed Rear-End Collision. Summer Biomechanics, Bioengineering and Biotransport Conference, 2019.

Demma Dr, Button KD, Kappler EH, Rossman SM, Rundell SA (2021). A Strategy for Validating the Kinematics of a Vehicle-Specific MADYMO Model of a Low-Speed Rear-End Collision. Summer Biomechanics, Bioengineering, and Biotransport Conference. #239.

PEER REVIEWED MANUSCRIPTS

Dutcheshen N, Maerz T, Rabban P, Haut RC, Button KD, Baker KC, Guettler J. (2012) The acute effect of bipolar radiofrequency energy thermal chondroplasty on intrinsic biomechanical properties and thickness of chondromalacic human articular cartilage. Journal of Biomechanical Engineering. 134(8):081007.

Meyer EG, Wei F, Button KD, Haut RC. (2012) Determination of ankle ligament strain using a rigid body computational model for sports injury scenarios. Proceedings-International Research Council on the Biomechanics of Injury. 277-288.

Button KD, Wei F, Meyer EG, Haut RC. (2012) Specimen-specific computational models of ankle sprains produced in a laboratory setting. Journal of Biomechanical Engineering. 135(4), 041001.

Button KD, Braman JE, Wei F, Haut RC. (2013) A method of determining in vivo dynamic human ankle stiffness under external foot rotation. Journal of Sports Engineering and Technology. 228(2), 120-124.

Fischenich KM, Button KD, Decamp CD, Haut RC, Donahue TL. (2014) Evaluation of meniscal mechanics and proteoglycan content in a modified ACL transection model for osteoarthritis. Journal of Biomechanical Engineering. 136(7), 071001. *Editors' Choice Paper for 2014*

Fischenich KM, Button KD, Coatney GA, Fajardo RS, Leikert KM, Haut RC, Donahue TL. (2014) Chronic changes in the articular cartilage and meniscus following traumatic impact to the lapine knee. Journal of Biomechanics. 48 (2), 246-253.

Button KD, Braman JE, Davison MA, Wei F, Schaeffer MC, Haut RC. (2014) Rotational stiffness of American football shoes affects ankle biomechanics and injury severity. Journal of Biomechanical Engineering. 137(6), 061004.

Wheatley BB, Fischenich KM, Button KD, Haut RC, Haut Donahue TL. (2015) An optimized transversely isotropic, hyper-poro-viscoelastic finite element model of the meniscus to evaluate mechanical degradation. Journal of Biomechanics. doi:10.1016/j.jbiomech.2015.02.028.

Coatney GA, Abraham AC, Fischenich KM, Button KD, Haut RC, Haut Donahue TL. (2014) Efficacy of P188 on lapine meniscus preservation following blunt trauma. Journal of the Mechanical Behavior of Biomedical Materials. 47: 57-64.

Pauly HM, Larson BE, Coatney GA, Button KD, DeCamp CE, Fajardo RS, Haut RC, Haut Donahue TL. (2015) Assessment of cortical and trabecular bone changes in two models of post-traumatic osteoarthritis. Journal of Orthopaedic Research. 33(12), 1835-1845.

Button KD, Braman JE, Davison MA, Wei F, Haut RC. (2014) Unlocking the talus by eversion limits medial ankle injury risk during external rotation. Journal of Biomechanics. 48(13), 3724-3727.

Fischenich KM, Button KD, Fajardo RS, DeCamp CE, Haut RC, Haut Donahue TL. (2015) A study of acute and chronic tissue changes in surgical and traumatically-induced experimental models of knee joint injury using magnetic resonance imaging. Journal of Magnetic Resonance. Osteoarthritis and Cartilage. DOI: 10.1016/j.joca.2016.10.010

Button KD, Thornton PA, Braman JE, Wei F, Haut RC. (2015) The effect of rotational stiffness on ankle tibiocalcaneal motion and ligament strain during external rotation. Journal of Sports Engineering and Technology DOI: 10.1177/1754337115623886.

Fischenich KM, Button KD, DeCamp CE, Haut RC, Haut Donahue TL. (2016) Comparison of two models of post-traumatic osteoarthritis; temporal degradation of articular cartilage and menisci. Journal of Orthopaedic Research DOI: 10.1002/jor.23275

FORMAL PRESENTATIONS

Determination of in situ ankle ligament strains in cases of high and medial ankle sprains. ASME Summer Bioengineering Conf. June 25, 2012. Fajardo, Puerto Rico.

Development of a traumatic anterior cruciate ligament and meniscal rupture model to study osteoarthritis. ASME Summer Bioengineering Conf. June 29, 2013. Sunriver, Oregon.

Investigating the effects of shoe stiffness on ankle injury risk using computational models. 7th World Congress in Biomechanics. July 11, 2014. Boston, Massachusetts. (Invited Paper)

PROFESSIONAL DEVELOPMENT

- **Michigan State University Highway Safety Traffic Programs**

  A1-9: Accident Reconstruction

- **Michigan State University**

  Neural Basis of Human Movement
  - Neural basis of sensorimotor control, investigating cortical and subcortical structure/function relationships in healthy humans, and in individuals with movement disorders.

  Experimental Design and Data Analysis
  - Practical application of statistical principles to the design of experiments and analysis of experimental data in biomedical sciences.

  Biomedical Imaging Methods
  - Overview of biomedical imaging techniques from theory to application, with emphasis on health care and research.

- **Society of Automotive Engineers**
  Applying Automotive EDR Data to Traffic Crash Reconstruction — April 2020

- **VCrash Americas, Inc.**
  Virtual Crash Live Classroom Training Course — December 2018

PROFESSIONAL SERVICE

- Guest Lecturer, Forensic Biomechanics, Lawrence Technological University, 2017.
- Guest Lecturer, Introduction to Biomedical Engineering, Lawrence Technological University, 2017
- Guest Lecturer, Engineering Applications in Orthopaedics, Lawrence Technological University, 2017
- Guest Lecturer, Engineering Applications in Orthopaedics, Lawrence Technological University, 2016
- Guest Lecturer, Engineering Applications in Orthopaedics, Lawrence Technological University, 2015
- Guest Lecturer, Engineering Applications in Orthopaedics, Lawrence Technological University, 2014
- Judge, University Undergraduate Research and Arts Forum, Michigan State University, 2012
- Mentor, University Undergraduate Research and Arts Forum, Michigan State University, 2011
- Judge, University Undergraduate Research and Arts Forum, Michigan State University, 2011