DEAN BIOMECHANICS
FORENSIC & DESIGN ENGINEERING

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KEITH STOLWORTHY, PH.D., P.E.

Biomechanics & Accident Reconstruction Expert | dks@DeanBio.com

Dr. Stolworthy understands the mechanical performance of biological tissue (e.g., how the body moves and breaks) and applies this in the analysis of injury-causing events and the design of biomechanical devices. He has served as an expert witness on hundreds of cases involving vehicle accidents (including front, rear, and side collisions; roll-overs, occupant ejections; and motorcycle crashes); slips, trips, and falls; projectiles and falling objects; workplace accidents; medical devices and consumer product failures; and other injury-causing events. He has designed, built, and programmed devices for the treatment and research/evaluation of diagnosed injuries/conditions. Dr. Stolworthy has taught engineering principles of statics, mechanics, materials, and dynamics; designed and built patented technology for a robotic foot-orthotic device; created a robotic spinal-motion simulator, researched exoskeleton designs and emerging technologies, and published research regarding spine biomechanics; tested and designed orthopedic medical devices; and pioneered the large-animal alpaca model for studying human low back pain. Dr. Stolworthy regularly works with other engineers, medical doctors, veterinarians, and clinicians of various disciplines, as he continues with research, design, and development of new conservative- and surgical-treatment technologies; he has publications in top biomechanics journals and presented at various conferences addressing basic and applied biomechanics and orthopedics; he is a member of several professional organizations and also serves as a technical reviewer for multiple biomechanics journals. Dr. Stolworthy is also a certified walkway safety auditor and was the Director of Operations of a Walkway Management Group franchise in Las Vegas, consulting on floor safety, cleaning, and treatment solutions.

Dr. Stolworthy received bachelor's, master's, and doctorate degrees in Mechanical Engineering from Brigham Young University and was a postdoctoral researcher at Vanderbilt University. In addition to his professional and educational experience, Dr. Stolworthy has years of personal experience with rigid medical equipment (e.g., wheelchairs, orthotic braces, and crutches/canes/walkers), physical rehabilitation, and physical and occupational therapy, due to his personal experience with learning to walk again with chronic paralysis. Dr. Stolworthy continues applying and growing his knowledge of human biomechanics and mechanical engineering principles as he provides consulting services for medical device design and offers expert testimony for injury causation, vehicle accident reconstruction, product design, and mechanical failure analysis.

Specialized Professional Competence

Biomechanics (Injury Causation, Occupant Kinematics, Human Gait & Perception/Reaction, Orthopedics, Medical Devices), Accident Reconstruction (Vehicle Mechanics & Dynamics, Slip/Trip/Fall Analysis, Walkway Safety Inspection & Analysis), Product Design & Mechanical Analysis, Photogrammetry, and Video Surveillance Analysis

Professional Experience

Principal Engineer, Dean Biomechanics, LLC, 2019 – *present*
Owner, Director of Operations, WMG Nevada, 2021 – *2023*
Sr. Managing Engineer, Delta V Biomechanics, Inc., 2018 – 2019
Consulting Engineer, Independent, 2011 – 2019
Postdoctoral Fellow, Vanderbilt University, 2017 – 2018
Sr. Biomechanical Engineer, Rimkus Consulting Group, 2015 – 2017
Sr. Research & Development Engineer, Action Target, Inc., 2013 – 2015
Graduate Research Assistant, BYU Applied Biomechanics Engineering Laboratory, 2008 – 2015
Graduate Teaching & Research Assistant, BYU College of Engineering 2007 - 2013
Laborer, GS Construction, 1998 – 2003

Education

Ph.D. Mechanical Engineering (Biomechanics/Design emphasis), Brigham Young University (Provo, UT)
M.S. Mechanical Engineering (Biomechanics/Robotics/Design emphasis), Brigham Young University (Provo, UT)
B.S. Mechanical Engineering, (Medical emphasis, Business minor) Brigham Young University (Provo, UT)

Professional Memberships

Association for the Advancement of Automotive Medicine (AAAM) – Professional Member

Society of Automotive Engineers (SAE) – Professional Member

American Society of Mechanical Engineers (ASME) – Professional Member

Wearable Robotics Association (WearRA) – Professional Member

Orthopaedic Research Society (ORS) – Associate Member

Professional Certifications

Professional Engineer (PE): National Council of Examiners for Engineering and Surveying (NCEES) Record ID: 15-268-27

- UT (DOPL)#7355130-2202 | NV (BPELS)#031274 | CA (BOPELSG)#M41676

Certified Walkway Safety Auditor: University of North Texas

English XL Tribometrist (CXLT): Excel Tribometers, LLC: Certificate #1703654

Fellowships & Grants

Vanderbilt University, Academic Pathways Fellowship, 2017 – 2018

Brigham Young University, Mechanical Engineering Graduate Research Fellowship, 2014 – 2015

Brigham Young University, Research Assistantship, 2009 – 2013

Brigham Young University, Academic Scholarship, 2006 – 2009

Teaching

Advanced Dynamics of Mechanical Systems; Brigham Young University, Teaching Assistant: 2011, 2013

Mechanical System Design Fundamentals; Brigham Young University, Teaching Assistant: 2011, 2012

Dynamic System Modeling and Analysis; Brigham Young University, Teaching Assistant: 2009, 2011

Material Science, Brigham Young University; Teaching Assistant: 2009, 2010

Engineering Mechanics—Statics; Brigham Young University, Teaching Assistant: 2007

Design Patents

Brent Johnson, Ken Hardman, Leslie Johnson, Caleb Waugh, Jonathan Woahn, Tyson Triplett, Eric Radford, Keith Stolworthy, Karl M. Taylor, Brad Hyatt, Jeffrey Webster, James Kearl, David Matsumura. "Three Dimensional Variable Forming Apparatus and Methods of Use Thereof," US2009/0273109A1; Iterations, Inc.

Keith Stolworthy, Darren Wall. "Dust Containment Unit Manifold," US20160209057A1; Action Target, Inc.

Scientific/Technical Reviewer

Journal of Biomechanical Engineering – Since 2017

Journal of Engineering in Medicine – Since 2019

American Society of Mechanical Engineers – Since 2018

Academia – Since 2021

Selected Publications and Presentations

Yandell, Matthew; Lamers, Erik; Stolworthy, D Keith; Zelik, Karl (2018) "Mechanized Clothing: A Wearable Robot for Every Home." Wearable Robotics Association Annual Meeting.

Stolworthy, D Keith (2017) "Mechanical Medicine for the Injured Spine" Academic Pathways Symposium, Vanderbilt University.

Stolworthy, D Keith; Bowden, Anton E; Roeder, Beverly L; Robinson, Todd F; Holland, Jacob G; Christensen, S Loyd; Beatty, Amanda M; Bridgewater, Laura C; Eggett, Dennis L; Wendel, John D; Stiegar-Vanegas, Susanne M; Taylor, Melody D (2015) "MRI Evaluation of Spontaneous Intervertebral Disc Degeneration in the Alpaca Cervical Spine," Journal of Orthopaedic Research.

Stolworthy, D Keith; Fullwood, R Amy; Merrell, Tyler M; Bridgewater, Laura C; Bowden, Anton E (2015) "Biomechanical Analysis of the Camelid Cervical IVD," Journal of Orthopaedic Translation.

Stolworthy, D Keith; Fullwood, Rebecca A; Merrell, Tyler M; Bowden, Anton E; Bridgewater, Laura (2013) "Mechanical Parallels of a Camelid Cervical Spine Model of Lumbar Disc Degeneration." Philadelphia Spine Research Symposium.

Anderson, Brady; Merrell, A Jake; Fullwood, David T; Bowden, Anton E; Stolworthy, D Keith; Bilodeau, Adam (2013) "Self-sensing Materials: Applications of a piezo-electric foam sensing material" Emerging Ideas in Biomedical Research.

Christensen, Loyd; Holland, Jacob G; Fullwood, R. Amy; Stolworthy, Dean K; Bowden, Anton E; Robinson, Todd F; Bridgewater, Laura C (2013) "Development of an alpaca disc culture system for the study of intervertebral disc degeneration" Emerging Ideas in Biomedical Research.

Fullwood, Rebecca A; Stolworthy, D Keith; Bowden, Anton E; Bridgewater, Laura (2013) "Alpaca Cervical Spine Anatomy, Shape, Size, AF/NP-Ratio." Emerging Ideas in Biomedical Research.

Merrell, A Jake; Fullwood, David T; Bowden, Anton E; Remington, Taylor D; Stolworthy, D Keith; Bilodeau, Adam (2013) "Applications of Nano-composite Piezo-electric Foam Sensors." Proceedings of the ASME 2013 Conference on Smart Materials, Adaptive Structures and Intelligent Systems.

Stolworthy, D Keith; Fullwood, Rebecca A; Merrell, Tyler M; Bowden, Anton E; Bridgewater, Laura (2013) "Mechanical Parallels of a Camelid Cervical Spine Model of Lumbar Disc Degeneration." Philadelphia Spine Research Symposium.

Merrell, A Jake; Remington, Taylor D; Stolworthy, D Keith; McArthur, Daniel; Bilodeau, Adam; Fullwood, David T; Bowden, Anton E; Hansen, Nathan (2013) "Applications of Quantum Nano-composite Piezoresistive Foam Sensors," American Society of Mechanical Engineer (ASME) Conference on Smart Materials, Adaptive Structures, and Intelligent Systems.

Remington, Taylor D; Merrell, A Jake; Stolworthy, D Keith; Fullwood, David T; Hansen, Nathan (2013) "Biomechanical Applications of Nano-Composite Strain Gauges," Annual Meeting of the Society for the Advancement of Material and Process Engineering.

Stolworthy, D Keith; Bowden, Anton E (2013) "Biomechanical Investigation of Llamas and Alpacas as Potential Animal Models for the Human Spine," Transactions of the Orthopaedic Research Society.

Bowden, Anton E; Howell, Larry L; Stolworthy, D Keith (2012) "A Compliant Mechanism Approach to Restoring the Lumbar Spine." Philadelphia Spine Research Symposium.

Zirbel, Shannon A; Stolworthy, D Keith; Howell, Larry L; Bowden, Anton E (2012) "Intervertebral Disc Degeneration Alters Lumbar Spine Segmental Stiffness in All Modes of Loading under a Compressive Follower Load," The Spine Journal.

Stolworthy, D Keith; Zirbel, Shannon A; Howell, Larry L; Samuels, Marina; Bowden, Anton E (2012) "Characterization and Prediction of Rate-dependent Flexibility in Lumbar Spine Biomechanics at Room and Body Temperature." The Spine Journal - Vol. 14, Issue 5, pp. 789-798.

Zirbel, Shannon A; Stolworthy, D Keith; Howell, Larry L; and Bowden, Anton E (2012) "A Standardized Representation of Spinal Quality of Motion, Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine.

Stolworthy, D Keith; Zirbel, Shannon A; Howell, Larry L; Bowden, Anton E (2012) "Predicting rate-dependent lumbar spine biomechanics: range of motion, neutral zone, stiffness, and hysteresis," Transactions of the Orthopaedic Research Society.

Stolworthy, D Keith; Zirbel, Shannon A; Bowden, Anton E; Howell, Larry L (2012) "Non-intuitive changes in spine biomechanical response with testing temperature and compressive load," Transactions of the Orthopaedic Research Society.

Stolworthy, D Keith; Zirbel, Shannon A; Howell, Larry L; Bowden, Anton E (2011) "A Predictive Model of Rate-Dependent Spinal Segment Biomechanics," New Horizons in Intervertebral Disc Research; Philadelphia Spine Research Symposium.

Zirbel, Shannon A; Stolworthy, D Keith; Howell, Larry L; Bowden, Anton E (2011) "Intervertebral Disc Degeneration Alters Lumbar Spine Segmental Stiffness in All Modes of Loading Under a Compressive Follower Load," New Horizons in Intervertebral Disc Research, Philadelphia Spine Research Symposium.

Stolworthy, D Keith; Zirbel, Shannon A; Samuels, Marina; Bowden, Anton E; Howell, Larry L (2011) "Increased Loading Rate Decreases Hysteresis and ROM in the Human Lumbar Spine," Proceedings of the Orthopaedic Research Society.

Stolworthy, D Keith; Zirbel, Shannon A; Bowden, Anton E; Howell, Larry L (2011) "Non-intuitive Changes in Spine Biomechanical Response with Testing Temperature and Compressive Load Effects," Proceedings of the 7th Annual Utah Biomedical Engineering Conference.

Stolworthy, D Keith; Zirbel, Shannon A; Howell, Larry L; Bowden, Anton E (2010) "Effects of Temperature and Bending Rate on Biomechanical Analysis of the Human Lumbar Spine," Proceedings of the Mountain West Bioengineering Conference.

Zirbel, Shannon A; Stolworthy, D Keith; Dodgen, Eric; Bowden, Anton E; Howell, LL (2010) "Intervertebral disc degeneration alters lumbar spine segmental stiffness in all modes of loading under a compressive follower load," Proceedings of the Mountain West Bioengineering Conference.

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