



John Gardiner PhD PE

Principal, Senior Biomechanical Engineer

contact

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expertise

Injury Biomechanics

areas of specialization

Injury mechanism

Injury causation

Medical device failure

Sports injuries

Slip and fall incidents

Dr. John Gardiner is a principal and senior biomechanical engineer at MEA Forensic. He joined the firm in 2002 and leads the Biomechanics Group in the Los Angeles office. John is responsible for conducting reconstruction and biomechanical analyses of a variety of events including automobile collisions, falls, sports injuries, and shootings. “As an expert,” he says, “my role is to determine how injuries happen, whether better safety equipment could have prevented or mitigated an injury or whether an injury makes sense in light of the available evidence.” He is involved in MEA’s ongoing research into helmets, slip and fall mechanics, and shoulder biomechanics.

John holds a Bachelor’s degree in Mechanical Engineering from the University of Minnesota and a Doctorate in Bioengineering from the University of Utah. His PhD research focused on the mechanical role of ligaments in the human knee. John worked in an orthopedic laboratory and used computer modeling and cadaver testing to study joint mechanics.

Using engineering principles and data from the scientific literature, John is able to reconstruct a wide variety of event types, analyze the associated motions and forces, and assesses injury. Clients look to him for a thorough, unbiased investigation of the injuries in question. John is often called upon to provide testimony as an expert witness. “My role is to provide answers for my clients and, ultimately, for the court,” he says.

To understand the science of biomechanics one must understand the relationship between force and movement, so it is only fitting that John is an ardent and accomplished runner. He races at the local and national level and has won national championships at the master’s level in cross country and road racing.

education

Doctor of Philosophy, Bioengineering, University of Utah, 2002.

Bachelor of Science, Mechanical Engineering, University of Minnesota, 1995.

professional status

Registered Professional Engineer, State of California, January 2005. License M33048.

professional associations

Society of Automotive Engineers (SAE), since 2003.

American Society of Biomechanics (ASB), since 2002.

Orthopaedic Research Society (ORS), since 2002.

American Society of Mechanical Engineers (ASME), since 1995.

professional experience

MEA Forensic Engineers & Scientists

Principal, Senior Biomechanical Engineer, 2002 to Present

Conduct accident reconstruction and biomechanical analyses of a variety of events including automobile collisions, slip/trip and fall, and sports injuries. Perform analyses to assess product failure and function in medical device and other fields. Prepare written reports and provide expert testimony.

University of Utah, Salt Lake City, UT

Research Associate, 1995 to 2002

Developed and validated finite element (FE) models of the human knee joint which included surface reconstruction from medical image data, FE mesh generation using TrueGrid, nonlinear FE analysis using NIKE3D and model validation with experimental data. Measured structural and material properties of human tissue. Presented work at scientific meetings and published results.

Self Employed Consultant

Finite Element Analysis Engineer, 1996 to 2002

Performed FE analyses for design optimization and failure analysis. Analyzed a variety of products, primarily in the medical device industry, including coronary stents, total knee and hip replacements and spinal fusion devices.

University of Pittsburgh, Department of Orthopedic Surgery

Visiting Research Associate, 1999

Measured forces in knee ligaments with a force-moment control robot.

Boston Scientific Scimed

Engineering Intern, 1993 to 1995

Designed, built, and tested prototype balloon angioplasty catheters. Implemented quality assurance testing of manufactured catheters.

3M

Technical Aide, 1992 to 1993

Performed quality control testing and analysis of a variety of 3M products including pressure sensitive adhesives, filters, and insulation products.

research activities

Measured the impact performance characteristics of various styles of motorcycle helmets using a custom-designed drop tower. Helmets were tested at a range of impact severities and performance was quantified as headform linear acceleration.

Studied the mechanics of the medial collateral ligament (MCL) of the human knee during valgus loading. A combination of experimental and computational methods were utilized that allowed subject-specific finite element models to be created for a series of cadaveric knees. Models were used to predict the stress/strain distribution throughout the MCL as a function of passive flexion and valgus loading. Results were used to indicate specific regions of the MCL that would be most vulnerable to injury under particular loading conditions. This research was funded through the National Institutes of Health and the Whitaker Foundation Biomedical Research and Transition Grants.

Quantified the mechanical response of MCL samples to large deformation simple shear loading under both quasi-static and rate-dependent loading conditions. Developed a nonlinear parameter estimation technique utilizing finite element simulations of individual material tests to estimate material coefficients for a three-dimensional material model. Results indicated that shear stiffness increases with shear strain. This research was funded through the National Institutes of Health and the Whitaker Foundation Biomedical Research and Transition Grants.

Assisted in the development and validation of a finite element model of the inferior glenohumeral ligament of the human shoulder. The model was used to understand the mechanical function of capsular structures of the human shoulder during a clinical exam and to develop experimental and analytical tools to study capsular injury and repair. This project was a collaborative effort involving the University of Pittsburgh and the University of Utah through funding provided by the Whitaker Foundation.

publications

The effect of motorcycle helmet fit on predicting head impact kinematics from residual liner crush

Dynamic response and residual helmet liner crush using cadaver heads and standard headforms

The impact response of traditional and BMX-style bicycle helmets at different impact severities

lectures & presentations

July 31-August 4, 2019 – International/American Society of Biomechanics Annual Meeting, Calgary, AB.

July 8-12, 2018 – 8th World Congress of Biomechanics, Dublin, Ireland.

June 2017 – Accident Reconstruction and Injury Biomechanics. CAARS Quarterly Meeting. Roseville, CA.

May 2017 – Accident Reconstruction and Injury Biomechanics. CAARS Quarterly Meeting. Santa Ana, CA.

May 2011 – Premises Liability: Slips, Trips, and Falls. Combined Claims Conference. Long Beach, CA.

April 2011 – Biomechanics of Helmet Use and Effectiveness. Orange County Traffic Investigators Association. Irvine, CA.

June 2010 – Slips, Trips, and Falls. OC-RIMS Meeting, Orange, CA.

September 2009 – Biomechanics of Auto Accidents. CAALA Annual Convention. Las Vegas, NV.

October 2008 – Use of Biomechanics in Fraud Investigation. California District Attorneys Association Insurance Fraud Seminar. Anaheim, CA.

September 2006 – Mock trial. CAALA Annual Convention. Las Vegas, NV.

September 27, 1999 – Structure and function of ligaments and tendons. Guest lecture, Bioengineering 1101 – Introduction to

Bioengineering. University of Utah, Salt Lake City, UT.

May 27, 1997 – Finite element modeling of joint mechanics. Guest lecture, Mechanical Engineering 646 – Advanced Finite Element Methods. University of Utah, Salt Lake City, UT.

April 10, 1997 – Computational modeling of the knee joint. Orthopedic Sports Medicine Fellowship Training Seminar. The Orthopedic Specialty Hospital, Salt Lake City, UT.

February 11, 1997 – Mechanical testing of ligaments. Orthopedic Sports Medicine Fellowship Training Seminar. The Orthopedic Specialty Hospital, Salt Lake City, UT.

training and professional development

March 22–25, 2021 – INPUT-ACE Video Evidence Symposium 2021, Online.

October 15-18, 2017 – Association for the Advancement of Automotive Medicine Annual Conference, Las Vegas, NV.

July 6, 2015 – Building Code Overview, Ontario Society of Professional Engineers, Mississauga, ON.

June 1, 2015 – Rail Safety Training Course, Los Angeles County Metropolitan Transportation Authority, Los Angeles, CA.

November 10-12, 2014 – 58th Stapp Car Crash Conference, San Diego, CA.

November 9, 2014 – 42nd International Workshop on Human Subjects for Biomechanical Research, San Diego, CA.

July 6-11, 2014 – 7th World Congress of Biomechanics, Boston, MA.

June 26-29, 2013 – ASME Summer Bioengineering Conference, Sunriver, OR.

August 10-13, 2011 – 35th Annual Meeting of the American Society of Biomechanics, Long Beach, CA.

January 13-16, 2011 – Orthopaedic Research Society Annual Meeting, Long Beach, CA.

January 12, 2011 – 19th Annual Symposium on Computational Methods in Orthopaedic Biomechanics, Long Beach, CA.

November 3-5, 2010 – 54th Stapp Car Crash Conference, Phoenix, AZ.

November 2, 2010 – 38th International Workshop on Human Subjects for Biomechanical Research, Phoenix, AZ.

November 2009 – 53rd Stapp Car Crash Conference, Savannah, Georgia.

November 10, 2008 – Crash Data Retrieval Technician Course, Laguna Hills, CA.

November 3-5, 2008 – 52nd Stapp Car Crash Conference, San Antonio, TX.

January 20-22, 2008 – World Congress on Neck Pain, Los Angeles, CA.

October 29-31, 2007 – 51st Stapp Car Crash Conference, San Diego, CA.

October 28, 2007 – 35th International Workshop on Human Subjects for Biomechanical Research, San Diego, CA.

February 11-14, 2007 – 53rd Annual Meeting of the Orthopaedic Research Society, San Diego, CA.

February 10, 2007 – 15th Annual Symposium on Computational Methods in Orthopaedic Biomechanics, San Diego, CA. Co-moderator of session on spine biomechanics.

November 6-8, 2006 – 50th Stapp Car Crash Conference, Dearborn, MI.

November 5, 2006 – 34th International Workshop on Human Subjects for Biomechanical Research, Dearborn, MI.

September 19-21, 2005 – The Role of Warnings and Instructions, Madison, WI.

February 25-26, 2005 – International Whiplash Trauma Congress, Breckenridge, CO.

November 11-12, 2004 – SAE Seminar – Occupant and Vehicle Kinematics in Rollovers, Troy, MI.

August 20-22, 2004 – CRASH 2004 – Human subjects crash testing and scientific conference, San Diego, CA.

March 22-23, 2004 – SAE Seminar – The role of the seat in rear crash safety, Davis, CA.

October 26, 2003 – 31st Annual International Workshop on Human Subjects for Biomechanical Research, San Diego, CA.

July 28, 2003 – Means of Egress Seminar, Los Angeles Basin Chapter of ICC, Alhambra, CA.

June 29, 2003 – Tribometer Workshop, sponsored by the ASTM Committee F-13 on Pedestrian/Walkway Safety and Footwear, Pasadena, CA.

June 28, 2003 – Biomechanics of Slips and Falls, ASTM F13, Pasadena, CA.

March 28-29, 2003 – Southern California Conference on Biomechanics, Malibu, CA.

November 11-13, 2002 – 46th Stapp Car Crash Conference, Ponte Vedra Beach, FL.

November 10, 2002 – 30th Annual International Workshop on Human Subjects for Biomechanical Research, Ponte Vedra Beach, FL.

September 29, 2002 – Association for the Advancement of Automotive Medicine Biomechanics of Impact Seminar, Tempe, AZ.

August 4-9, 2002 – 4th World Congress of Biomechanics, Calgary, AB.

February 10-13, 2002 – 48th Annual Meeting of the Orthopaedic Research Society, Dallas, TX.

June 27-July 1, 2001 – ASME Summer Bioengineering Conference, Snowbird, UT.

March 12-15, 2000 – 46th Annual Meeting of the Orthopaedic Research Society, Orlando, FL.

March 11, 2000 – 8th Annual Symposium on Computational Methods in Orthopaedic Biomechanics, Lake Buena Vista, FL.

March 11, 2000 – 1st International Symposium on Ligaments and Tendons, Lake Buena Vista, FL.

June 16-20, 1999 – ASME Summer Bioengineering Conference, Big Sky, MT.

February 1-4, 1999 – 45th Annual Meeting of the Orthopaedic Research Society, Anaheim, CA.

January 31, 1999 – 7th Annual Symposium on Computational Methods in Orthopaedic Biomechanics, University of California at Irvine Medical Center, Orange, CA.

March 16-19, 1998 – 44th Annual Meeting of the Orthopaedic Research Society, New Orleans, LA.

March 15, 1998 – 6th Annual Symposium on Computational Methods in Orthopaedic Biomechanics, Tulane University, New Orleans, LA.

June 11-15, 1997 – ASME Summer Bioengineering Conference, Sun River, OR.

February 9-12, 1997 – 42nd Annual Meeting of the Orthopaedic Research Society, San Francisco, CA.

February 8, 1997 – 5th Annual Symposium on Computational Methods in Orthopaedic Biomechanics, University of California at Berkeley, Berkeley, CA.

November 12-17, 1995 – ASME Winter Annual Meeting, San Francisco, CA.