mea forensic
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Stephanie Bonin PhD PE

Principal, Senior Biomechanical Engineer

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expertise

Injury Biomechanics

Dr. Stephanie Bonin is a senior biomechanical engineer in the Injury Biomechanics Group. She works in MEA Forensic's Los Angeles office. Stephanie analyzes injuries in cases involving automobile collisions, brain injuries, helmet protection, slip and falls, and workplace accidents. "I take a scientific, methodical approach," she says, "providing clients with the information they need to understand their case."

Stephanie holds Bachelor's degrees in Physiology and Engineering Mechanics, a Master's degree in Mechanical Engineering from Michigan State University, and a Doctorate in Industrial Engineering, with a focus on Injury Biomechanics, from the University of Miami. Her PhD thesis focused on motorcycle helmets. She developed a method for determining impact speed and the potential for brain injury from damage to a helmet. Before joining MEA, Stephanie worked as an ergonomic engineer, in a clinical gait laboratory, and in the safety restraint and medical device industries.

Stephanie is registered as a professional engineer in California and has testified as an expert witness in court and is able to explain complex concepts in a manner that juries can understand. "I see my role as an assistant or educator to the trier of fact, helping them to make an informed decision," she says.

Stephanie has recently performed testing on bicycle helmets to understand the effect a helmet's anti-rotation system on concussion risk, and she is currently preparing for an upcoming study on equestrian helmets that are impacted against real-world equestrian surfaces. The ultimate goal is to provide data than can help design more effective helmets. "I'm a rider," she says, "so my interest in this is both scientific and personal."

education

Doctor of Philosophy, Industrial Engineering, University of Miami, 2017.

Master of Science, Mechanical Engineering, Michigan State University, 2001.

Bachelor of Science, Engineering Mechanics, Michigan State University, 1997.

Bachelor of Science, Physiology, Michigan State University, 1997.

professional status

Registered Professional Engineer, State of California, since 2017. License Number 38652.

Past Certified Playground Safety Inspector.

Past Certified Child Safety Passenger Technician.

professional associations

ASTM International F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, voting committee member, since 2015.

Chair of the ASTM Equestrian Helmet Task Group, since 2019.

Association for the Advancement of Automotive Medicine, since 2017; Policy Committee Member 2017-2022.

American Society of Mechanical Engineers, since 2013.

Gait and Clinical Movement Analysis Society, since 2011.

professional experience

MEA Forensic Engineers & Scientists
January 2012 to present | Principal, Senior Biomechanical Engineer since 2018

Performs biomechanical evaluations to determine the relationship between applied forces and injury mechanisms in automobile collisions, pedestrian impacts, motorcycle and cycling collisions, slip/trip and fall incidents, sports injuries, and workplace accidents. Assesses the effectiveness of protective equipment, including seat belts and helmets, in preventing or mitigating injury. Conducts research on motorcycle helmet performance using cadaver heads and instrumented headforms, with a focus on head impact response and injury potential. Investigates bicycle helmet performance when impacted above, below, and on the certification test line, and conducts research on the performance of anti-rotation technologies during helmeted head impacts.

Institute for Mobility and Longevity, Jupiter, FL
Biomechanist, 2009 to 2012

Evaluated of the efficacy of the 3D Knee ® implant by coordinating, leading and reporting on a 5-year follow-up study for device manufacturer, observed surgeries and followed patients by monitoring clinical outcome measures, conducted and reported on clinical gait analyses using 3-D motion capture.

Pratt & Whitney, East Hartford, CT
Ergonomic Engineer, 2005 to 2009

Assessed operator/equipment interfaces and implemented manufacturing solutions to reduce ergonomic risk factors. Led the integration of ergonomics into the design control process, collaborating across business units and technical disciplines to drive process improvements. Conducted ergonomic risk assessments and injury investigations, developing actionable recommendations

to mitigate workplace injuries. Delivered ergonomic training to operations staff and supported the rollout of a work-fit program aimed at improving employee well-being and injury prevention and contributed to the development of return-to-work protocols. Completed two years of coursework in a Doctor of Physical Therapy (DPT) program, enhancing clinical insight into musculoskeletal function and rehabilitation.

Repair Development Engineer, 2005 to 2007
Developed technical data and conducted structural analysis of turbine airfoils, conducted root cause and corrective action investigations interfaced with global repair operations, conducted structural analysis with crack-growth prediction software and ANSYS, worked across multiple engineering disciplines including metallurgy and durability

Doctor's Research Group, Inc., Plymouth, CT
Product Development Engineer, 2001 to 2002

Developed dental devices from concept to manufacturing including design, prototyping, vendor sourcing, patent reviews, supported 510(k) and patent submissions, established assembly processes, observed surgical procedures, provided training, and integrated surgeon feedback into designs, responded to technical inquiries from surgeons.

McPhail Equine Performance Center: Performed three-dimensional modeling and analysis of the equine temporomandibular joint, conducted gait analysis of performance horses including kinematic, kinetic, and electromyographic data collection.

College of Veterinary Medicine, Laboratory for Comparative Orthopaedic Research: Performed finite element and photoelastic stress analysis of equine hooves in-vitro.

Biomechanics Evaluation Laboratory, Department of Engineering Mechanics: Patient preparation, kinematic, kinetic, and electromyographic data collection.

Veterinary Assistant – College of Veterinary Medicine, Equine Hospital, 1999: Provided routine services to equine hospital patients, assisted with examinations, rehabilitation, and surgeries.
Michigan State University, East Lansing, MI
Research Assistant, 1997 to 2001

Breed Technologies, Sterling Heights, MI
Seat Belt and System Performance Engineer, 1997 to 1998

Modeled the biomechanical response of passengers in order to design safety restraint systems, experimentally verified simulations, and incorporated a rear-center retractor into Chrysler 300M vehicles.

Equestrian Experience
Trainer and competitor in dressage and eventing disciplines, 1990 to present.

Assess saddle fit on horse and rider performance.

publications

The Effect of MIPS, Headform Condition, and Impact Orientation on Headform Kinematics Across a Range of Impact Speeds During Oblique Bicycle Helmet Impacts

Density Variation in the Expanded Polystyrene Foam of Bicycle Helmets and Its Influence on Impact Performance

Impact Performance of Certified Bicycle Helmets Below, On and Above the Test Line

Substandard impact performance of common bicycle helmets

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

Laboratory validation of two wearable sensor systems for measuring head impact severity in football players

Age does not affect the material properties of expanded polystyrene liners in field-used bicycle helmets

lectures & presentations

September 14, 2023 – Equestrian fall and head impact characteristics. International Research Council of Biomechanics of Injury Conference, Cambridge, UK.

March 25, 2023 – Biomechanics of equestrian protective equipment: Helmets and body protectors. Norton Sports Medicine Symposium, Louisville, KY.

March 24, 2023 – Biomechanics of brain injuries & helmet protection. Norton Sports Medicine Symposium, Louisville, KY.

April 14, 2021 – Motorcycle accident reconstruction & helmet analysis, MEA Webinar Series.

February 8, 2021 – Helmet safety and concussions – how is your helmet working for you? Ontario Hunter Jumper Association webinar.

July 29, 2020 – Helmets and the biomechanics of head injury, MEA Webinar Series.

October 17, 2019 – Injury biomechanics in personal injury cases. MEA Seminar, Los Angeles, CA.

October 16, 2019 – Injury biomechanics in personal injury cases. MEA Seminar, Riverside, CA.

April 23, 2019 – How helmets protect your head, Horse Industry Safety Summit, University of Kentucky, Lexington, KY.

April 5-6, 2019 – Brain injury biomechanics, TBI Med Legal Conference, San Diego, CA.

November 8, 2018 – The Effect of Hair and Football Helmet Fit on Headform Kinematics – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Washington D.C.

February 24, 2018 – Assessing concussion risk: What your Biomechanical Expert should know – TBI Medlegal Conference, San Diego, CA.

November 15, 2017 – Expanded polystyrene (EPS) foam density varies within and between bicycle helmets – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment and Facilities, Atlanta, GA.

November 13, 2014 – A Comparison of Cadaver Heads and Standard Headforms in Helmet Testing – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment and Facilities, New Orleans, LA.

November 9, 2014 – A Comparison of Cadaver Heads and Standard Headforms in Helmet Testing – 42nd International Workshop on Human Subjects for Biomechanical Research, San Diego, CA.

training and professional development

May 7-9, 2024 – ASTM Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Philadelphia, PA.

November 8-10, 2023 – ASTM Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Washington, DC.

May 9-11, 2023 – ASTM Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Denver, CO.

November 2-4, 2022 – ASTM Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, New Orleans, LA.

September 13-16, 2022 – International Research Council on Biomechanics of Injury Conference, Porto, Portugal.

May 18-19, 2022 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces,

and Facilities: helmets and headgear, Seattle, WA.

September 24-26, 2021 – TBI Med Legal Conference, San Diego, California.

September 8-10, 2021 – International Research Council on the Biomechanics of Injury, Online.

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

November 6-7, 2019 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Houston, TX.

September 11-13, 2019 – International Research Council on Biomechanics of Injury, Florence, Italy.

September 10, 2019 – Workshops on Virtual Testing and Open-Source Human Body Models AND Powered Two Wheelers (PTW), Florence, Italy.

November 15, 2018 – Principles of Dynamic Data Collection, DTS Training, Seal Beach, CA.

November 7-8, 2018 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment and Facilities, Washington D.C.

September 26-29, 2018 – NHTSA National Standardized Child Passenger Safety Training, Pomona, CA.

September 12-14, 2018 – International Research Council on Biomechanics of Injury Conference, Athens, Greece.

November 15-17, 2017 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Atlanta, GA.

November 7-8, 2017 – Playground Safety Inspector Certification Course. Riverside, CA.

September 13-15, 2017 – International Research Council on Biomechanics of Injury, Antwerp, Belgium.

September 12, 2017 – Workshop on Safety of Automated Vehicles, Antwerp, Belgium.

September 14-16, 2016 – International Research Council on Biomechanics of Injury, Malaga, Spain.

September 13, 2016 – Workshop on Crash Reconstruction, Malaga, Spain.

May 3-4, 2016 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, San Antonio, TX.

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

November 18-19, 2015 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Tampa, FL.

November 9-11, 2015 – 59th Stapp Car Crash Conference, New Orleans, LA.

November 8, 2015 – 43rd International Workshop on Human Subjects for Biomechanical Research, New Orleans, LA.

September 9-11 – International Research Council on Biomechanics of Injury Conference, Lyon, France.

May 20-21, 2015 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Anaheim, CA.

November 13, 2014 – ASTM Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, New Orleans, LA.

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 6-9, 2014 – 7th World Congress of Biomechanics, Boston, MA.

June 9-10, 2014 – Commanding Presence Workshop, Toronto, ON.

November 13-15, 2013 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment, Playing Surfaces, and Facilities: helmets and headgear, Jacksonville, FL.

November 11-13, 2013 – 57th Stapp Car Crash Conference, Orlando, FL.

November 10, 2013 – 41st International Workshop on Human Subjects for Biomechanical Research, Orlando, FL.

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

November 14-16, 2012 – ASTM International Standards Development Meeting of Committee F08 – Sports Equipment and Facilities, Atlanta, GA.

November 13, 2012 – ASTM International Symposium on the Mechanism of Concussion in Sports, Atlanta, GA.

January 7-8, 2012 – National Academy of Forensic Engineers bi-annual meeting, Miami, FL.

November 15-17, 2011 – MADYMO Introductory Course, Livonia, MI.

April 26-29, 2011 – Gait and Clinical Movement Analysis Society Annual Meeting, Bethesda, MD.

August 5-9, 2008 – North American Congress on Biomechanics, Ann Arbor, MI.

May 28-31, 2008 – Clinical Gain Analysis: A Focus on Interpretation. Connecticut Children's Medical Center, Hartford, Connecticut.

Mach 19-22, 2006 – 52nd Annual Meeting of the Orthopaedic Research Society, Chicago, IL.