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Benjamin Elkin PhD PEng

Principal, Senior Biomechanical Engineer

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expertise

- Injury Biomechanics

areas of specialization

- Injury causation and potential
- Brain injury and concussion
- Motor vehicle collision injuries
- Seat belt effectiveness
- Helmet effectiveness
- Slips, trips and falls
- Sports injuries

As a senior biomechanical engineer in MEA Forensic's Toronto office, Dr. Ben Elkin investigates injuries in motor vehicle collisions, slip/trip and fall incidents, and sporting activities. He assesses the causal relationship between an event and an injury by comparing forces applied to the body in an incident to the mechanism and threshold for injury. Ben is actively involved in research projects at MEA, including studies of brain injury and the science of slips and falls.

Ben has a Bachelor's degree in Engineering Science from the University of Toronto, and a Master's degree and a Doctorate in Biomedical Engineering with a focus on Biomechanics from Columbia University. His PhD research focused on the biomechanics of brain injury. He tested brain tissue to determine its mechanical properties, describe how the brain responds to head impacts, and estimate injury tolerances. Ben has continued to study brain injury at MEA, focusing on the response of the brain to head impacts and other indirect exposures that have been associated with concussions. This research may ultimately help detect and prevent concussions in sport, motor vehicle collisions, and falls.

Registered as a professional engineer, Ben's role as an expert is to "aid the court" and assist with the understanding of technical aspects of a case. Ben believes that "an expert must present well-supported findings in a way that clarifies technical issues in a case, not make them more complex". He strives to communicate his findings clearly and succinctly.

Ben currently chairs the ASTM F13.40 Research Subcommittee on Pedestrian/Walkway Safety and Footwear. Before that, he served three terms (6 years) as Chair of the ASTM F13 Committee. He is working to improve the protocols for friction measurement devices called tribometers. Insurance and legal questions about slip and fall accidents often center on the slipperiness of the floor, so having a reliable way to measure friction is important. Ben also hopes that his slip and fall research will improve walkway safety.

education

Doctor of Philosophy with Distinction, Biomedical Engineering, Columbia University, New York, NY, 2010.

Master of Science, Biomedical Engineering, Columbia University, New York, NY, 2006.

Bachelor of Applied Science with Honours, Engineering Science: Biomedical Option, University of Toronto, Toronto, ON, 2003.

professional status

Professional Engineer, Professional Engineers of Ontario, 2014.

professional associations

Chairman, ASTM F13 Committee on Pedestrian/Walkway Safety and Footwear

National Neurotrauma Society

International Research Council on Biomechanics of Injury (IRCOBI), Scientific Review Committee

professional experience

MEA Forensic Engineers & Scientists
Biomechanical Engineer, October 2012 to Present

Conducts biomechanical analyses to assess injury causation in cases involving automobile collisions, slip/trip and fall, and sports injuries.

Booz Allen Hamilton, Rockville, MD
Associate, Brain and Behavioral Health Team, October 2010 to September 2012

Subject matter expert in traumatic brain injury (TBI) for the US Department of Defense. Performed scientific literature analysis, supported clinical guidance development, and facilitated expert workgroups. Primary author on several literature reviews including “Explosive Blast and Brain Injury: Current Research and Future Directions” and “Visual Disturbances following TBI”.

Columbia University, Department of Biomedical Engineering, New York, NY
Graduate Research Assistant, Neurotrauma and Repair Laboratory, September 2004 to May 2010
Thesis: Biomechanics and Biological Consequences of Traumatic Brain Injury (TBI)

Characterized the region- and age-dependence of high rate viscoelastic mechanical properties of the brain to improve our understanding of brain injury biomechanics. Examined the biological response of rat brain to precisely controlled injuries which simulate the deformations experienced during TBI in vivo to generate tolerance criteria for the living brain. Identified novel therapeutic targets by describing new mechanisms of brain edema.

Columbia University, Columbia Technology Ventures, New York, NY
Graduate Fellow, October 2008 to September 2010

Conducted commercial assessments of technologies developed at Columbia University, performed market analysis, identified potential licensees, and mentored new fellows.

University of Toronto, Toronto, ON
Research Assistant, Dr. C. R. Ethier’s Biomechanics Research Laboratory, Department of Mechanical and Industrial Engineering, May 2003 to August 2004

Developed a novel implantable drainage valve for the treatment of intractable glaucoma. Designed implantable prototypes (using 3D CAD software), selected and sourced materials, oversaw manufacture, performed in vitro and in vivo tests of the implantable prototype, and assessed it in vivo performance.

Ottawa Heart Institute/WorldHeart Corporation, Ottawa, ON
Summer Intern, Cardiovascular Devices Division, Summer 2001

Assisted the clinical engineer with patient visits, device testing, and data analysis. Supported the development of data acquisition software for testing WorldHeart's HeartSaver left ventricular assist device.

research activities

Ben has tested rat, pig and human brain tissue to determine its mechanical properties, describe how the brain responds to head impacts and estimate injury tolerances.

Ben's current research focuses on the response of the brain to direct head impact and indirect exposures associated with concussion. This research can ultimately help detect and prevent concussions in sport, motor vehicle collisions and falls.

Ben also conducts research on the biomechanics of fall incidents, as well as methods to measure the slip resistance of flooring. As a member of the ASTM F13 Committee on Pedestrian/Walkway Safety and Footwear, Ben uses the results of his research to help develop technical standards for improving walkway safety.

awards

Natural Sciences and Engineering Research Council (NSERC) Postgraduate Scholarship (PGS), 2008 – 2010

Conference Travel Awards: National Neurotrauma Society and ASME USNCTAM Conferences, 2010

Oral Presentation Award: Northeast Bioengineering Conference, New York, New York, 2010.

Oral Presentation Award: STAPP Car Crash Conference, San Diego, California, 2007.

Outstanding TA award: School of Engineering and Applied Science, Columbia University, 2006.

publications

A Top-of-Flight Defect Affects Foot Placement on Subsequent Stair Treads During Descent

Contaminant film thickness affects walkway friction measurements

Quantifying the uncertainty in tribometer measurements on walkway surfaces

Variability of friction measurements using three common walkway tribometers

Variability of walkway tribometer measurements

The effect of contaminant film thickness on slip resistance

Brain tissue strains vary with head impact location: A possible explanation for increased concussion risk in struck versus striking football players

Whiplash injury or concussion? A possible biomechanical explanation for concussion symptoms in some individuals following a rear-end collision

lectures & presentations

April 5, 2018 – Biomechanics of brain injury. Guest Lecture for MME 9650: Impact Biomechanics, Western University, London, ON.

June 15, 2017 – Precision and repeatability in tribometer calibration and validation. Slips, Trips, and Falls International Conference,

Toronto, ON.

June 13, 2017 – Biomechanics & injury causation. Crash Course: Life of a Claim GTA Edition, Toronto, ON.

May 2, 2017 – Anatomy of a fall: accident reconstruction and lessons learned. Partners in Prevention 2017 Health & Safety Conference & Trade Show, Mississauga, ON.

April 27, 2017 – Minor damage doesn't mean minor injury: A biomechanical perspective. Ontario Trial Lawyers Association Spring Conference, Toronto, On.

March 7, 2017 – Biomechanics of brain injury. Guest Lecture for MIE 439: Introductory Biomechanics, University of Toronto, Toronto, ON.

June 3, 2016 – Accident Reconstruction & Investigation, Ontario Municipal Health & Safety Representatives Association Education Day, Mississauga, ON.

March 2, 2016 – Biomechanics of brain injury. Guest Lecture for MIE 439: Introductory Biomechanics, University of Toronto, Toronto, ON.

November 8, 2015 – Effect of Impact Location on Brain Tissue Strain in Football Helmet Impacts. 43rd International Workshop on Human Subjects for Biomechanical Research, New Orleans, LA.

June 2, 2015 – Injury Causation. Life of a Claim Seminar, Kitchener, ON.

April 28, 2015 – Anatomy of a fall: accident reconstruction and lessons learned. Workplace Safety & Prevention Services, Partners in Prevention 2015: Health & Safety Conference & Trade Show, Mississauga, ON.

March 26, 2015 – Injury Biomechanics. Canadian Defence Lawyers, Insurance Defence for Law Clerks, Toronto, ON.

March 4, 2015 – Biomechanics of brain injury. Guest Lecture for MIE 439: Introductory Biomechanics, University of Toronto, Toronto, ON.

July 6, 2014 – Impact location affects brain strain in football helmet impacts. World Congress of Biomechanics, Boston, MA.

February 7, 2012 – Visual dysfunction following traumatic brain injury. Joint expert working group of the Defense Centers of Excellence for Psychological Health & Traumatic Brain Injury and the Vision Center of Excellence, Arlington, VA.

November 2, 2011 – Vestibular disturbances: Traumatic brain injury and dizziness. Defense Centers of Excellence for Psychological Health & Traumatic Brain Injury expert working group, Silver Spring, MD.

July 1, 2010 – Age- and region-dependent mechanical properties of the rat brain for use in computational modeling of TBI. 16th US National Congress on Theoretical and Applied Mechanics, State College, Pennsylvania.

March 28, 2010 – Chondroitin sulfate proteoglycans contribute to brain tissue swelling behavior. Northeast Bioengineering Conference. New York, New York.

November 30, 2009 – Brain injury biomechanics. Invited Lecture at Cooper Union, New York, NY

October 29, 2007 – Region-specific tolerance criteria for the living brain. 51st STAPP Car Crash Conference, San Diego, California.

August 2, 2006 – Local mechanical properties of the rat hippocampus measured by AFM indentation: Implications for traumatic brain injury. 5th World Congress of Biomechanics. Munich, Germany.

training and professional development

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

February 3-December 8, 2021 – Building Code Technical Webinar Series, RSM Building Consultants, Online.

September 11, 2019 – Standard First Aid & CPR/AED Level C (Blended) certification, Canadian Red Cross, Toronto, ON.

June 26-27, 2019 – Forensic Video Analysis WorkflowTraining, iNPUT-ACE, Toronto, ON.

June 3, 2019 – ASTM Committee Meeting – F13 Pedestrian/Walkway Safety and Footwear, Denver, CO.

January 28, 2019 – ASTM Committee Meeting – F13 Pedestrian/Walkway Safety and Footwear, Houston, TX.

August 11-16, 2018 – The 3rd Joint Symposium of the International and National Neurotrauma Societies and AANS/CNS Section on Neurotrauma and Critical Care, Toronto, ON.

June 24, 2018 – ASTM Standards Development Meetings of Committee F13 – Pedestrian/Walkway Safety and Footwear, San Diego, CA.

June 21-23, 2018 – ASTM F13 Tribometer Workshop, University of Southern California, Los Angeles, CA.

January 22, 2018 – ASTM Standards Development Meetings of Committee F13 – Pedestrian/Walkway Safety and Footwear, New Orleans, LA.

November 2, 2017 – Certified XL Tribometrist (CXLT) Certification Program. Excel Tribometers, Baltimore, MD.

July 31, 2017 – Working at Heights – Fundamentals of Fall Prevention. Infrastructure Health & Safety Association, Toronto, ON.

June 15-16, 2017 – Slips, Trips, and Falls International Conference, Toronto, ON.

June 14, 2017 – ASTM Standards Development Meetings of Committee F13 – Pedestrian/Walkway Safety and Footwear, Toronto, ON.

October 23, 2016 – Organ Imaging Review – Musculoskeletal , University of Toronto, Toronto, ON.

October 17, 2016 – “Ergonomics-informed, Forensic Approaches to Falls Related to Built Environments” half-day workshop as part of Association of Canadian Ergonomists conference, Niagara Falls, Canada.

September 14-16, 2016 – International Research Council on the Biomechanics of Injury (IRCOBI) conference, Malaga, Spain.

September 13, 2016 – IRCOBI Pre-conference Workshop on Crash Reconstruction, Malaga, Spain.

June 27-28, 2016 – ASTM Standards Development Meetings of Committee F13 – Pedestrian/Walkway Safety and Footwear, Chicago, IL.

January 25-26, 2016 – ASTM Standards Development Meetings of Committee F13 – Pedestrian/Walkway Safety and Footwear, San Antonio, TX.

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.

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

January 26-27, 2015 – ASTM Standards Development Meetings of Committee F13 – Pedestrian/Walkway Safety and Footwear, New Orleans, LA.

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

November 11-13, 2013 – 58th STAPP Car Crash Conference, Orlando, FL.

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

February 19-21, 2013 – PC Crash Online Training Courses, MEA Forensic, Richmond, BC.

October 29-31, 2012 – 56th STAPP Car Crash Conference, Savannah, GA.

October 28, 2012 – 40th International Workshop on Human Subjects for Biomechanical Research, Savannah, GA.

July 22-25, 2012 – National Neurotrauma Symposium, Phoenix, AZ.

August 22-24, 2011 – 5th Annual Defense and Veterans Brain Injury Center (DVBIC) Conference, National Harbor, MD.

July 10-13, 2011 – National Neurotrauma Symposium, Hollywood, FL.

June 27 – July 2, 2010 – 16th US National Congress of Theoretical and Applied Mechanics, State College, PA.

June 16-19, 2010 – ASME Summer Bioengineering Conference, Naples, FL.

June 14-17, 2010 – National Neurotrauma Symposium, Las Vegas, NV.

March 26-28, 2010 – 36th Annual Northeast Bioengineering Conference, New York, NY.

January 12 – April 6, 2010 – Idea to IPO: The Technology Venture, Certificate course, New York Academy of Sciences, New York,

NY.

September 7-11, 2009 – Joint Symposium of the International and National Neurotrauma Societies, Santa Barbara, CA.

July 27-30, 2008 – National Neurotrauma Symposium, Orlando, FL.

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

July 29 – August 4, 2006 – 5th World Congress of Biomechanics, Munich, Germany.

September 28 – October 1, 2005 – Biomedical Engineering Society Annual Meeting, Baltimore, MD.