

**SHANNON G KROEKER, MAsc PhD PEng  
BIOMECHANICAL ENGINEER – INJURY BIOMECHANICS GROUP****EDUCATION**

Doctor of Philosophy, Mechanical Engineering, University of Washington, 2010.  
Master of Applied Science, Mechanical Engineering, University of British Columbia, 2005.  
Bachelor of Science, Mechanical Engineering, Queen's University, 2003.

**PROFESSIONAL STATUS**

Professional Engineer, Association of Professional Engineers and Geoscientists of British Columbia (APEGBC),  
Registration No. 38598.

**PROFESSIONAL ASSOCIATIONS**

American Association of Automotive Medicine (AAAM), since 2012.  
Reviewer, International Journal of Crashworthiness, since 2013.  
Reviewer, Journal of Biomechanics, since 2014.

**PROFESSIONAL EXPERIENCE****MEA FORENSIC ENGINEERS & SCIENTISTS, VANCOUVER, BC**

Project Engineer, April 2010 to present  
Assists with technical investigations involving motor vehicle accidents including the determination of collision severity, collision sequence, occupant kinematics, seat belt use and effectiveness, vehicle speed and causes of mechanical failure.

**UNIVERSITY OF WASHINGTON, DEPARTMENT OF MECHANICAL ENGINEERING, SEATTLE, WA**

Research Assistant and PhD Candidate, January 2006 to March 2010  
Experimental design and execution of studies to measure the injury thresholds of the spine and spinal cord in axial tension. Supervised a Senior Bioengineering student completing requirements for design project at the University of Washington.

**CIREN SEATTLE, CRASH INJURY RESEARCH ENGINEERING NETWORK, SEATTLE, WA**

Team Member, May 2008 to March 2010  
Evaluated crash data, medical records, accident scenarios, and evidence to determine mode of injury. The database of accidental and medical evidence was used to answer a variety of research questions.

**UNIVERSITY OF BRITISH COLUMBIA, DEPARTMENT OF MECHANICAL ENGINEERING, VANCOUVER, BC**

Research Assistant and MAsc Candidate, September 2003 to December 2005  
Design and application of instrumentation and equipment to study the properties and behaviour of the spinal cord. Conducted research relevant to the spinal cord including spinal cord properties, in vitro lab experimentation, and development of surrogate spinal cords.

**UNIVERSITY OF LEEDS, LEEDS, UNITED KINGDOM**

Research Assistant, April 2005 to May 2005  
Participated in collaborative research studying the effects of CSF on the biomechanics of impact upon the spinal cord. Conducted research under the supervision of Dr. Richard Hall, in conjunction with a University of Leeds Master student.

**PRINCE OF WALES MEDICAL RESEARCH INSTITUTE, RANDWICK, AUSTRALIA**

Research Assistant, May 2004 to June 2004  
Studied under Dr. Lynne Bilston during Master of Applied Science at UBC. Learned techniques for constructing surrogate cords. Participated in collaborative efforts between the University of New South Wales, AUS, the University of Leeds, UK, and the University of British Columbia, CAN.

**QUEEN'S UNIVERSITY, OCCUPATIONAL BIOMECHANICS LABORATORY, KINGSTON, ON**

Research Assistant, June 2003 to August 2003

Designed a computer model of a backpack for studies in strap pressure for military personnel comfort level using Unigraphics. Assisted in pressure and acceleration data collection of volunteer subjects wearing military backpacks.

**TEACHING EXPERIENCE****UNIVERSITY OF WASHINGTON, DEPARTMENT OF MECHANICAL ENGINEERING, SEATTLE, WA**

Teaching Assistant, January 2006 to May 2006

Responsible for setting up and conducting daily laboratory sessions for Junior year Mechanical Engineering courses: Introduction to System Dynamics and Systems Dynamic Analysis and Design. Graded student laboratory reports and ran recitation sessions. Assisted in invigilation of examinations.

**UNIVERSITY OF BRITISH COLUMBIA, DEPARTMENT OF MECHANICAL ENGINEERING, VANCOUVER, BC**

Teaching Assistant, September 2003 to April 2005

Responsible for instructing an undergraduate engineering lab course and computer course as well as the lab portion for a fourth year mechanical vibrations course. In charge of lab set up, instruction, and marking of final lab reports.

**QUEEN'S UNIVERISTY, DEPARTMENT OF MECHANICAL ENGINEERING, KINGSTON, ON**

Project Manager, September 2002 to April 2003

Ran a design project for teams of undergraduate engineering students. Acted as an advisor and evaluator for each of the eight teams.

**SCIENCE QUEST AT QUEEN'S UNIVERSITY, DEPARTMENT OF APPLIED SCIENCE, KINGSTON, ON**

Director, October 2001 to October 2002

Ran the applied science engineering summer camp. Responsible for various activities such as hiring, training, writing grant applications, financial management, curriculum development, in class teaching, writing final reports, and overall business management.

**RESEARCH ACTIVITIES****IMMATURE CERVICAL SPINE TESTING, APPLIED BIOMECHANICS LABORATORY, UNIVERSITY OF WASHINGTON, SEATTLE, WA.**

Sponsor: NHTSA

Research Assistant, September 2007 to August 2008

Prepared in vitro cervical baboon spines for testing. Designed testing protocol and managed testing to measure the kinematics of the cervical spine in flexion-extension, axial rotation, lateral bending, and in combined loading.

**PAEDIATRIC WINDOW FALLS PILOT STUDY, APPLIED BIOMECHANICS LABORATORY, UNIVERSITY OF WASHINGTON, SEATTLE, WA.**

Sponsor: Harborview Injury Prevention &amp; Research Center, Seattle, WA.

Engineer, March 2009 to May 2009

Equipment and instrumentation was designed and developed to replicate a 3 year old child applying pressure to a window screen and to measure the applied forces. The results from this study will be used to propose window screen design modifications in order to prevent children from falling through window screens.

**ON GOING INTRA-MURAL PROJECTS**

Helmet performance: currently studying the impact attenuation performance of bicycle helmets over wide range of impact severities.

**GRANT AWARDS**

AAAM Endowment Student Grant, \$10,000, January 2008 to December 2009. Cervical Spinal Cord Injury due to Axial Tension: Age Effects

Louis and Katherine Marsh Fellowship Endowment, \$9083, September 2006 to June 2007.

**PUBLICATIONS**

(Maiden Name: Reed)

**PEER-REVIEWED JOURNALS**

Kroeker SG, Ching RP, (2013). Coupling between the spinal cord and cervical vertebral column under tensile loading. *Journal of Biomechanics*, 46(4):779-9.

Kroeker SG, Morley PL, Jones CF, Bilston LE, Cripton PA (2009). The Development of an Improved Physical Surrogate Model of the Human Spinal Cord -- Tension and Transverse Compression, *Journal of Biomechanics*, 42(7): 878-83.

Jones CF, Kroeker SG, Cripton PA, Hall RM (2008). The effect of cerebrospinal fluid on the biomechanics of spinal cord: an ex vivo bovine model using bovine and physical surrogate spinal cord. *Spine* 33 (17): E580-588.

**PEER-REVIEWED CONFERENCE PROCEEDINGS**

Ising KW, Droll JA, Kroeker SG, D'Addario PM, Goulet JF (2012). Driver-related delay in emergency braking response to a laterally-incurring hazard. *Proceedings of the Human Factors & Ergonomics Society 56<sup>th</sup> Annual Meeting*.

Kroeker SG, Ching RP (2009). Cervical Spinal Cord Injury as a Result of Axial Tension, AAAM 53<sup>rd</sup> Annual Scientific Conference, Baltimore, MD, October 4-7, 2009.

Kroeker SG, Ching RP (2009). Cervical Spinal Cord Injury: A Relationship Between Column and Cord Strains in Tension-Extension Injuries, *Neurotrauma 2009*, Santa Barbara, CA, September 7-11, 2009.

**BOOK CHAPTERS**

Cripton PA, Kroeker SG, Saari A (2006). Musculature Actuation and Biomechanics of the Spine, in *SPINE Technology Handbook*. Kurtz SM, Edidin AA, Ed. Elsevier Academic Press, USA.

**ABSTRACTS/POSTERS**

Kroeker SG, Bonin SJ, DeMarco AL, Good CA, Siegmund GP (2014). Does age affect the impact properties of helmet foam liners? *World Congress of Biomechanics*, Boston, MA, July 6-11, 2014.

Kroeker SG, Ching RP (2009). Cervical Spine and Spinal Cord Coupling in Tension, *Proceedings of the 5<sup>th</sup> Annual Northwest Biomechanics Symposium*, Pullman, WA, June 5-6, 2009.

Kroeker SG, Jochim JM, Ching RP (2008). A Histological Analysis of Spinal Cord Injury In Vitro, *Proceedings of the 4<sup>th</sup> Annual Northwest Biomechanics Symposium*, Boise, ID, May 9-10, 2008.

Kroeker SG, Jochim JM, Ching RP (2007). Cervical Spinal Cord Injury due to Axial Tension, *Proceedings of the 3<sup>rd</sup> Annual Northwest Biomechanics Symposium*, Eugene, OR, May 18-19, 2007.

Reed SG, Morley PL, Cripton PA (2006). The Viscoelastic Properties of a Surrogate Human Spinal Cord, *Proceedings of the Canadian Medical and Biological Engineering Conference*, Vancouver, BC, June 1-3, 2006.

Jones CF, Reed SG, Cripton PA, Hall RM (2006). The effect of cerebrospinal Fluid on Spinal Cord Deformation in an in vitro Burst Fracture Model, *Proceedings of the 2<sup>nd</sup> Annual Ohio Injury Biomechanics Symposium*, Columbus, OH. May 17-19, 2006 (10 page manuscript in proceedings).

Jones CF, Reed SG, Cripton PA, Hall RM (2006). High speed transverse compression of an in vitro spinal cord/cerebrospinal fluid model, *Proceedings of the 2<sup>nd</sup> Annual Northwest Biomechanics Symposium*, Vancouver, BC, May 12-13, 2006.

Reed SG, Jones C, Hall RM, Cripton PA (2005). An In vitro analysis of the behaviour of the bovine and surrogate spinal cords in dynamic transverse compression, *Proceedings of the International Collaboration on Repair Discoveries (ICORD) Annual Research Meeting*, October 17, 2005.

Reed SG, Bilston LE, Morley PL, Cripton PA (2005). The Human Spinal Cord: Preliminary results for An Improved Physical Model. *2005 Summer Bioengineering Conference*, Vail, CO, 2005.

Reed SG, Bilston LE, Morley P, Rankine R, Cripton PA (2005). A Biofidelic Elastomeric Surrogate for the Human Spinal Cord. *Proceedings of the 2005 Northwest Biomechanics Symposium*, Seattle, WA, May 13-14, 2005.

Nelson T, Greaves C, Reed SG, Rankine R, Cripton PA (2005). In Vivo Spinal Cord Material Properties: An Indentation Approach. *Proceedings of the 2005 Northwest Biomechanics Symposium*, Seattle, WA, May 13-14, 2005.

Reed SG, Bilston LE, Morley PL, Crompton PA (2004). The Human Spinal Cord: An Improved Physical Model. 5<sup>th</sup> Alberta BME Conference, Banff, AB.

Saari A, Reed SG, Crompton PA (2004). A Least Squares Approach to Calculating Angular Acceleration and Velocity Using Accelerometry. Proceedings of the 5<sup>th</sup> Alberta Biomedical Engineering Conference, Banff, AB, October 22-24, 2004.

Reed SG, Bilston LE, Morley PL, Crompton PA (2004). The Human Spinal Cord: An Improved Physical Model. Alberta Provincial CIHR Training Program in Bone and Joint Health, Banff.

Reed SG, Bilston LE, Morley PL, Crompton PA (2004). The Human Spinal Cord: An Improved Physical Model. ICORD Annual Research Meeting, Vancouver, BC.

## **LECTURES AND PRESENTATIONS**

Kroeker SG, Ching RP (2009). Cervical Spinal Cord Injury as a Result of Axial Tension, AAAM 53<sup>rd</sup> Annual Scientific Conference, Baltimore, MD, October 4-7, 2009.

Kroeker SG, Ching RP (2009). Cervical Spinal Cord Injury: A Relationship Between Column and Cord Strains in Tension-Extension Injuries, Neurotrauma 2009, Santa Barbara, CA, September 7-11, 2009.

Kroeker SG, Ching RP (2009). Cervical Spine and Spinal Cord Coupling in Tension, Proceedings of the 5<sup>th</sup> Annual Northwest Biomechanics Symposium, Pullman, WA, June 5-6, 2009.

Kroeker SG, Jochim JM, Ching RP. A Histological Analysis of Spinal Cord Injury In Vitro, Proceedings of the 4<sup>th</sup> Annual Northwest Biomechanics Symposium, Boise, ID, May 9-10, 2008.

Kroeker SG (2008). Panel discussion regarding engineering topics surrounding pediatric window falls. Community Forum: Understanding and Preventing Paediatric Window Falls. Harborview Medical Center. Seattle, WA, October 23, 2008.

Reed SG (2005). The Human Spinal Cord: An Improved Physical Model. Tissue Engineering Laboratory, University of Leeds, Leeds, UK. April 27, 2005.

## **TRAINING AND PROFESSIONAL DEVELOPMENT**

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

September 22-25, 2013 - AAAM 57th Annual Scientific Conference, Quebec City, Quebec, Canada.

October 14-17, 2012 - AAAM 56th Annual Scientific Conference, Seattle, WA.

July 12, 2012 - The Pathophysiology of Traumatic Brain Injury, Vancouver, BC.

November 7-9, 2011 - 55th Stapp Car Crash Conference, Detroit, MI.

November 2011 - International Workshop on Human Subject for Biomechanical Research, Detroit, MI.

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.

October 2010 - Motorcycle Skills Course, JIBC, New Westminster, BC.

August 2010 - Expert Scripting with PC-Crash, MEA Forensic, Vancouver, BC.

August 2010 - PC-Crash Essentials, MEA Forensic, Vancouver, BC

August 2010 - Expert Animation with PC-Crash, MEA Forensic, Vancouver, BC.

June 2010 - The Tire as a Vehicle Component and Tire and Wheel Safety, Dr. Joseph D. Walter, Richmond, BC.

October 4-7, 2009 - AAAM 53rd Annual Scientific Conference, Baltimore, MD.

September 7-11, 2009 - The 27th Annual National Neurotrauma Symposium, Santa Barbara, CA.

June 5-6, 2009 - Proceedings of the 5th Annual Northwest Biomechanics Symposium, Pullman, WA.

May 9-10, 2008 - Proceedings of the 4th Annual Northwest Biomechanics Symposium, Boise, ID.

June 1-3, 2006 - Proceedings of the Canadian Medical and Biological Engineering Conference, Vancouver, BC.

October 17, 2005 - Proceedings of the 3rd International Collaboration on Repair Discoveries (ICORD) Annual Research Meeting, Vancouver, BC.

June 23 – 25, 2005 - 2005 Summer Bioengineering Conference, Vail, CO.

October 22-24, 2004 - 5th Alberta Biomedical Engineering Conference, Banff, AB.

October 25-26, 2004 - Alberta Provincial CIHR Training Program in Bone and Joint Health, Banff, AB.

October 18, 2004 – Proceedings of the 2nd International Collaboration on Repair Discoveries (ICORD) Annual Research Meeting, Vancouver, BC.

\*08/06/14

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