

**B. Johan Ivarsson, Ph.D.**  
**Manager**

**Professional Profile**

Dr. Johan Ivarsson is a Manager in Exponent's Biomechanics practice, based at the Test and Engineering Center in Phoenix, Arizona. Dr. Ivarsson focuses on issues involving human injury biomechanics to evaluate the severity and mechanisms of injury in traumatic events. His fields of expertise include injury tolerance of the head and lower extremities, pedestrian safety, and solid mechanics. Dr. Ivarsson's research experience includes studies of head and brain kinematics in response to impact, cadaveric studies for determining the response and tolerance of soft and hard tissue structures under dynamic loading, estimation of pediatric injury tolerances including head, cervical spine, and thorax, and epidemiology of road traffic trauma with emphasis on pedestrian injury.

Prior to joining Exponent, Dr. Ivarsson was a Research Scientist at the Center for Applied Biomechanics at the University of Virginia, where he managed and conducted injury biomechanics research projects.

**Academic Credentials and Professional Honors**

Ph.D., Biomechanical Engineering, Chalmers University of Technology, Sweden, 2002  
M.S., Mechanical Engineering, Chalmers University of Technology, Sweden, 1996

Organizer for the Pedestrian Safety Session at the Annual SAE World Congress, 2005–2009  
Organizer for the Extremity and Pedestrian Injury Biomechanics Session at the 5th World Congress of Biomechanics in Munich, Germany (2006)

**Languages**

Swedish

## **Publications**

Heller MF, Prange MT, Ong KL, Watson HN, Iyer M, Ivarsson BJ, Fisher JL. Injury patterns among special populations involved in pedestrian crashes. Paper 2010-01-1165, Society of Automotive Engineers, 2010.

Prange MT, Heller MF, Watson HN, Iyer M, Ivarsson BJ, Fisher JL. Age effects on injury patterns in pedestrian crashes. Paper 2010-01-1164, Society of Automotive Engineers, 2010.

Raasch CC, Carhart MR, Ivarsson BJ, Lucas SR. Development of lower neck injury assessment reference values based on comparison of ATD and PMHS tests. Paper 2010-01-0140, Society of Automotive Engineers, 2010.

Ivarsson BJ, Genovese D, Crandall JR, Bolton J, Untaroiu C, Bose D. The tolerance of the femoral shaft in combined axial compression and bending loading. *Stapp Car Crash Journal* 2009; 53:251–290.

Heller MF, Watson HN, Ivarsson BJ, Prange MT, Fisher JL. Using national databases to evaluate injury patterns in pedestrian impacts. Paper 2009-01-1209, Society of Automotive Engineers, 2009.

Bose D, Bhalla KS, Untaroiu C, Ivarsson BJ, Crandall JR, Hurwitz S. Injury tolerance and moment response of the knee joint to combined valgus bending and shear loading. *Journal of Biomechanics Engineering* 2008; 130(3).

Ivarsson BJ, Manaswi A, Genovese D, Crandall JR, Hurwitz S, Burke C, Fahkry S. Site, type, and local mechanism of tibial shaft fracture in drivers in frontal automobile crashes. *Forensic Science International* 2008; 175(2–3):186–192.

Untaroiu CD, Ivarsson BJ, Genovese D, Bose D, Crandall JR. Biomechanical injury response of leg subjected to dynamic combined axial and bending loading. *Biomedical Sciences Instrumentation* 2008; 44:141–146.

Untaroiu CD, Shin J, Ivarsson BJ, Crandall JR, Subit D, Takahashi Y, Akiyama A, Kikuchi Y. A study of the pedestrian impact kinematics using finite element dummy models: The corridors and dimensional analysis scaling of upper-body trajectories. *International Journal of Crashworthiness* 2008; 13(5):469–478.

Untaroiu C, Genovese D, Ivarsson BJ, Crandall JR. A finite element analysis of mid-shaft femoral tolerance under combined axial bending loading. *Proceedings, 10<sup>th</sup> International LS-DYNA Users Conference*, 2008.

Bose D, Subit D, Ivarsson BJ, Crandall JR, Takahashi Y, Kikuchi Y, Akiyama A. Biofidelity improvements to the Polar-II pedestrian dummy lower extremity. Paper 2007-01-0757. Society of Automotive Engineers, 2007.

Ivarsson BJ, Crandall JR, Fredriksson F, Burke C, Stadter G, Fakhry S. Pedestrian head impact—What determines the likelihood and location? Proceedings, 20th International Technical Conference on the Enhanced Safety of Vehicles, Paper 07-0373, 2007.

Untaroiu C, Shin J, Ivarsson BJ, Crandall J, Takahashi Y, Akiyama A, Kikuchi Y. Pedestrian kinematics investigation with finite element dummy models based on an anthropometry scaling method. Proceedings, 20th International Technical Conference on the Enhanced Safety of Vehicles, Paper 07-0328, 2007.

Crandall J, Lessley D, Kerrigan J, Ivarsson BJ. Thoracic deformation response of pedestrians resulting from vehicle impact. *International Journal of Crashworthiness* 2006; 11(6):529–539.

Henary B, Ivarsson BJ, Crandall J. The influence of age on the morbidity and mortality of pedestrian victims. *Traffic Injury Prevention* 2006; 7(2):182–190.

Ivarsson BJ, Crandall J, Okamoto M. Influence of age related stature on the frequency of body region injury and overall injury severity in child pedestrian casualties. *Traffic Injury Prevention* 2006; 7(3):290–298.

Subit D, Ivarsson BJ, Kikuchi Y, Takahashi Y, Crandall J. The influence of pelvis design on the lateral pelvic impact response of the Polar-II pedestrian dummy. Paper 2006-01-0682. Society of Automotive Engineers, 2006.

van Dommelen J, Minary M, Ivarsson BJ, Millington S, Raut M, Kerrigan J, Crandall J, Diduch D. Nonlinear viscoelastic behavior of human knee ligaments subjected to complex loading histories. *Annals of Biomedical Engineering* 2006; 34(6):1008–1018.

Ivarsson BJ, Kerrigan J, Lessley D, Drinkwater D, Kam C, Murphy D, Crandall J, Kent R. Dynamic response corridors of the human thigh and leg in non-midpoint three-point bending. pp. 193–204. In: *Transactions Journal of Passenger Cars – Mechanical Systems*, 2005.

Ivarsson BJ, Longhitano D, Henary B, Crandall J. Significance of adult pedestrian torso injury. Proceedings, The Association for the Advancement of Automotive Medicine 2005; 49:263–277.

Kam C, Kerrigan J, Meissner M, Drinkwater C, Murphy D, Bolton J, Arregui C, Kendall R, Ivarsson BJ, Crandall J, Deng B, Wang J, Kerkeling C, Hahn W. Design of a full-scale impact system for analysis of vehicle pedestrian collisions. pp. 2268–2282. In: *Transactions Journal of Passenger Cars – Mechanical Systems*, 2005.

Kerrigan J, Kam C, Drinkwater C, Murphy D, Bose D, Ivarsson BJ, Crandall J. Kinematic comparison of the Polar-II and PMHS in pedestrian impact tests with a sport-utility vehicle. Proceedings, International IRCOBI Conference on the Biomechanics of Impact, 2005.

Longhitano D, Burke C, Bean J, Watts D, Fakhry S, Meissner M, Ivarsson BJ, Sherwood C, Crandall J, Takahashi Y, Kadotani Y, Hitchcock R, Kinoshita Y. Application of the CIREN

methodology to the study of pedestrian crash injuries. Proceedings, 19th International Technical Conference on the Enhanced Safety of Vehicles, Paper 05-0404, 2005.

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Longhitano D, Ivarsson BJ, Henary B, Crandall J. Torso injury trends for pedestrians struck by cars and LTVs. Proceedings, 19th International Technical Conference on the Enhanced Safety of Vehicles, Paper 05-0411, 2005.

Takahashi Y, Kikuchi Y, Okamoto M, Akiyama A, Ivarsson BJ, Bose D, Subit D, Shin J, Crandall J. Biofidelity evaluation for the knee and leg of the Polar pedestrian dummy. Proceedings, 19th International Technical Conference on the Enhanced Safety of Vehicles, Paper 05-0280, 2005.

van Dommelen J, Ivarsson BJ, Jolandan, M, Millington S, Raut M, Kerrigan J, Crandall J, Diduch, D, Takahashi Y. Characterization of the rate-dependent mechanical properties and failure of human knee ligaments. pp. 80–90. In: Transactions Journal of Passenger – Mechanical Systems, 2005.

van Dommelen J, Minary M, Ivarsson BJ, Millington S, Raut M, Kerrigan J, Crandall J, Diduch D. Pedestrian injuries: Viscoelastic properties of human knee ligaments at high loading rates. *Traffic Injury Prevention* 2005; 6(3):278–287.

Ivarsson BJ, Crandall J, Longhitano D, Okamoto M. Lateral injury criteria for the 6-year-old pedestrian. Part I: Criteria for the head, neck, thorax, abdomen and pelvis. Paper 2004-01-0323. Society of Automotive Engineers, 2004.

Ivarsson BJ, Crandall J, Longhitano D, Okamoto M. Lateral injury criteria for the 6-year-old pedestrian. Part II: Criteria for the upper and lower extremities. Paper 2004-01-1755. Society of Automotive Engineers, 2004.

Ivarsson BJ, Lessley D, Bhalla K, Kerrigan J, Crandall J, Kent R. Dynamic response corridors and injury thresholds of the pedestrian lower extremities. Proceedings, International IRCOBI Conference on the Biomechanics of Impact, 2004.

Kerrigan J, Drinkwater D, Kam C, Murphy D, Ivarsson BJ, Crandall J. Tolerance of the human leg and thigh in dynamic lateral-medial 3-point bending. *Int J Crashworthiness* 2004; 9(6):607–623.

Miller T, Zaloshnja E, Lawrence B, Crandall J, Ivarsson BJ, Finkelstein A, Corso S. Pedestrian and pedalcyclist injury costs in the United States by age and injury severity. Proceedings, The Association for the Advancement of Automotive Medicine 2004; 48:265–284.

Ivarsson BJ, Viano D, Lövsund P, Parnaik Y. Head kinematics in mini-sled tests of foam padding: Relevance of linear responses from free motion headform (FMH) testing to head angular acceleration. *Journal of Biomechanics Engineering* 2003; 125(4):523–532.

Kerrigan J, Ivarsson BJ, Bose D, Madeley N, Millington S, Bhalla K, Crandall J. Rate sensitive constitutive and failure properties of human knee collateral ligaments. *Proceedings, International IRCOBI Conference on the Biomechanics of Impact*, 2003.

Okamoto M, Takahashi Y, Mori F, Hitosugi M, Madeley J, Ivarsson BJ, Crandall J. Development of finite element model for child pedestrian protection. *Proceedings, 18th International Technical Conference on the Enhanced Safety of Vehicles*, Paper 151, 2003.

van Rooij L, Bhalla K, Meissner M, Ivarsson BJ, Crandall J, Longhitano D, Takahashi Y, Kikuchi Y. Pedestrian crash reconstruction using multi-body modeling with geometrically detailed validated, vehicle models and advanced pedestrian injury criteria. *Proceedings, 18th International Technical Conference on the Enhanced Safety of Vehicles*, Paper 468, 2003.

Woods W, Sherwood C, Ivarsson BJ, Crandall J Orzechowski K, Eichelberger M. A review of pediatric pedestrian injuries at a level I trauma center. *Proceedings, 18th International Technical Conference on the Enhanced Safety of Vehicles*, 2003.

Ivarsson BJ, Viano D, Lövsund P. Influence of the lateral ventricles and irregular skull base on brain kinematics during sagittal plane head rotation. *Journal of Biomechanics Engineering* 2002; 124(4):422–431.

Bradshaw D, Ivarsson BJ, Morfey C, Viano D. Simulation of acute subdural hematoma and diffuse axonal injury in coronal head impact. *Journal of Biomechanics* 2001; 34(1):85–94.

Ivarsson BJ, Viano D, Lövsund P. Influence of the anterior and middle cranial fossae on brain kinematics during sagittal plane head rotation. *J Crash Prevention Injury Control* 2001; 2(4):271–287.

Ivarsson BJ, Viano D, Lövsund P, Aldman B. Strain relief from the cerebral ventricles during head impact: Experimental studies on natural protection of the brain. *Journal of Biomechanics* 2000; 33(2):181–189.

### **Published Abstracts**

Richards D, Ivarsson BJ, Scher I, Thomas R. Modern hockey equipment and its relationship to head injuries. Extended abstract presented at the Biennial Meeting of the International Symposium on Safety in Ice Hockey, Denver, CO, 2008.

Minary M, van Dommelen J, Ivarsson BJ, Darvish K, Crandall J. The influence of age on the tensile properties of the porcine collateral knee ligaments. *ASME 2005 Summer Bioengineering Conference*, Vail, CO, 2005.

Millington S, Darvish K, Ivarsson BJ, McVey R, Anderson D. Biomechanics and modelling of multi-level cervical spine corpectomy constructs under axial and torsional loading. Trans. 5th Combined Meeting on the Orthopaedic Research Societies of Canada, USA, Japan, and Europe, Banff, Canada, 2004.

Bose D, Kerrigan J, Ivarsson BJ, Madeley N, Millington S, Bhalla K, Crandall J. Non-contact area measurement techniques for cross-sectional properties of soft tissues. ASME International Mechanical Engineering Congress and Exposition, 2003.

Ivarsson BJ, Viano D, Lövsund P, Aldman B. The strain relieving function of the cerebral lateral ventricles during rotational acceleration of the head – An experimental study with physical models. Proceedings, Third World Congress of Biomechanics, Sapporo, Japan, 1998.

### **Book Chapters**

Ivarsson BJ, Okamoto M, Takahashi Y. Material and structural properties of the pediatric pelvis and extremities. Invited chapter, Pediatric Injury Biomechanics Data Archive and Textbook, 2010, in press.

Kent R, Ivarsson BJ, Maltese M. Experimental injury biomechanics of the pediatric thorax and abdomen. Invited chapter, Pediatric Injury Biomechanics Data Archive and Textbook, 2010, in press.

Ivarsson BJ, Crandall J, Hall G, Pilkey W. Biomechanics. In: The CRC Handbook of Mechanical Engineering, Second Edition. Kreith F and Goswami Y (eds), CRC Press, Boca Raton, FL, 2003.

### **Academic Appointments**

- Research Scientist (Research Faculty Appointment) Center for Applied Biomechanics, University of Virginia, 2004–2007
- Postdoctoral Research Associate (Research Faculty Appointment), Center for Applied Biomechanics, University of Virginia, 2002–2004

### **Peer Reviewer**

- *Journal of Biomechanics*
- *Journal of Neurotrauma*
- *Biomechanics and Modeling in Mechanobiology*
- SAE World Congress
- Association for Advancement of Automotive Medicine—AAAM
- IUTAM Symposium
- *Traffic Injury Prevention*