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## FACULTY NEWS

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### James A. Ashton-Miller, PhD, Honored by the American Society of Biomechanics



**James Ashton-Miller, PHD**, the Albert Schultz Collegiate Research Professor and Distinguished Research Scientist in the Departments of Mechanical Engineering, Biomedical Engineering and a Research Professor at the Institute of Gerontology in the Department of Internal Medicine, was honored in August, 2009 with the Borelli Award by the American Society of Biomechanics at its annual meeting. This is the most prestigious honor given by the American Society of Biomechanics and recognizes outstanding career accomplishment. It is awarded annually to an investigator who has conducted exemplary research in any area of biomechanics. The award is named after Giovanni Alfonso Borelli (1608-1679), a professor of mathematics from Naples, Italy, who is considered to be the father of modern biomechanics. Borelli's publications *De Motu Animalium I* and *De Motu Animalium II* detail numerous propositions on the movements of the limbs of man and animals.

The Borelli Award selection is based on originality, quality and depth of the research and the relevance of this work to the field of biomechanics. Dr. Ashton-Miller's early work addressed spine biomechanics, more specifically the pathomechanics of idiopathic scoliosis, low back and neck pain. This work included rediscovering the Hofmann ligaments, first described in the 19th century and then forgotten, and recognizing their significance in helping to explain why a lumbar disc protrusion can cause sciatica in one person but not another, and why sciatic symptoms often improve over the day. More recently, his work has combined computer simulations and experiments to obtain insights into the mechanisms underlying unintentional injuries in the population, so that they can better be prevented in the first place. His students and colleagues from obstetrics and gynecology have used MR imaging to identify which pelvic floor muscles can be injured during vaginal birth and the main risk factors for these injuries. They invented instrumentation to measure how much these injuries affect pelvic floor muscle function, then used computer simulations to demonstrate how and why these injuries occur, and why they can cause genital organ prolapse, a common cause of surgery in older women. In studying falls in the elderly he and his student proposed and tested a novel hypothesis that the brain uses an internal model of the body's interaction with its environment to detect the loss of balance as the instant when the magnitude of internal model-predicted and actual body accelerations diverge appreciably. He and his colleagues from geriatrics, physical medicine, physiology and neuropsychology have quantified how advancing age affects how humans negotiate obstacles and cross irregular surfaces in the presence and absence of divided attention, the significant gender differences in the ability of elderly to safely recover from a fall, how different forms of training affect leg strength and power, and have used computer models to predict optimal strategies for healthy elderly to break falls without injury. Lastly, he and colleagues from orthopedic surgery and physical medicine are studying the mechanisms of sports injuries in children and adults. One example is research identifying the mechanisms that cause rupture of the knee's anterior cruciate ligament during pivoting and landing maneuvers.

Professor Ashton-Miller directs the Biomechanics Research Laboratory and is Associate Director of the Bone and Joint Injury Prevention and Rehabilitation Center at the University of Michigan. He has authored over 170 peer-reviewed papers, 15 book chapters and mentored 23 doctoral theses. He and his students have received over a dozen national and international awards for their research. He has served on NIH study sections, was

elected president of the American Society of Biomechanics in 2001, served as Meeting Chair for the 4th North American Congress of Biomechanics held at the University of Michigan in 2008, and serves on the NCAA Baseball Research Panel.

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