

ME DEPARTMENTAL SEMINAR

Friday, March 7, 2008

10:30 – 11:30 AM

2211 GG Brown

Professor Hugh Herr
Massachusetts Institute of Technology
Cambridge, MA

The Importance of Neuromechanical Limb Models in the Design of Leg Prostheses and Orthoses

A long-standing goal in rehabilitation science is to apply neuromechanical principles of human movement to the development of highly functional prostheses and orthoses. Critical to this effort is the development of actuator technologies that behave like muscle, device architectures that resemble the bodies own musculoskeletal design, and control methodologies that exploit principles of biological movement. In this lecture, I discuss how agonist-antagonist actuation, polyarticular limb architecture, and reflex behaviors can result in quiet, stable, and economical legged mechanisms for walking and running. Neuromechanical models are presented to examine the importance of limb morphology and neural control on locomotory performance. These models are then used to motivate design strategies for prosthetic and orthotic mechanisms.

Short Bio

Hugh Herr is Associate Professor within MIT's Program of Media Arts and Sciences, and The Harvard-MIT Division of Health Sciences and Technology. His primary research objective is to apply principles of biomechanics and neural control to guide the designs of wearable robotic systems for human rehabilitation and physical augmentation. In the area of human augmentation, Professor Herr has employed cross bridge models of skeletal muscle to the design and optimization of a new class of human-powered mechanisms that amplify endurance for cyclic anaerobic activities. He has also built elastic shoes that increase metabolic economy for running, and leg exoskeletons for walking load-carrying augmentation. In the area of assistive technology, Professor Herr's group has developed powered orthotic and prosthetic mechanisms for use as assistive interventions in the treatment of leg disabilities caused by amputation, stroke, cerebral palsy, and multiple sclerosis.