



# American Society of Biomechanics

Stanford University, August 22 - 25

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**Conference at a glance**

[www.stanford.edu/group/asb2007](http://www.stanford.edu/group/asb2007)







# American Society of Biomechanics

Stanford University, August 22 - 25

Dear Friends and Fellow Biomechanists:

Welcome to Stanford University! We are excited to host you and hope that you all have a stimulating conference experience.

Biomechanics research began on the Stanford farm when Leland Stanford took a position on a hotly debated question: whether during a horse's trot, all four hooves were ever off the ground at the same time. Stanford sided with this assertion, and wanted to prove it scientifically. He hired Eadweard Muybridge to settle the issue. Muybridge developed a scheme for instantaneous motion picture capture. Muybridge's technology involved novel methods for photographic processing and a camera trigger developed by Stanford's engineer, John Isaacs. In 1877, Muybridge settled Stanford's question with a single photographic negative showing Stanford's race-horse, Occident, airborne during trot.

This conference marks the 30th anniversary of ASB. The Society was founded in October 1977 by a group of 52 scientists and clinicians (listed later in this program). The mission of ASB — to foster the exchange of ideas among biomechanists working in different disciplines and fields of application, including biological sciences, exercise and sports science, health sciences, ergonomics and human factors, and engineering, and to facilitate the development of biomechanics as a basic and applied science — is still vital today.

Over 450 abstracts were submitted for presentation at the conference. This is the largest number of abstracts ever submitted to an ASB conference. Two or three reviewers read and scored each abstract, and the top-rated abstracts were selected for presentation at the meeting.

Many people have helped prepare for this conference. A special thanks goes to the program committee and the local organizers listed in this program. We also want to thank the Stanford students, fellows, and staff who put in many hours to make the meeting special. You will see these local volunteers wearing their "Cardinal" shirts. Please ask them for help, directions and advice. Kam Morrella and Carolyn Mazenko put forth a huge effort to organize the conference; please thank them when you see them.

We hope you enjoy the conference. Engage in the science... ask 100 questions... go to every poster... meet a new mentor... find an old friend. Maybe even take a walk to Stanford's barn to see the place where Muybridge "stopped time."

Sincerely,

**Scott Delp**

*Conference Co-Chair*

**Chris Jacobs**

*Conference Co-Chair*

**Francisco Valero-Cuevas**

*Program Chair*



## **SOCIAL PROGRAM**

Opening Reception, Wednesday, August 22,  
Clark Center, 5:00-7:30pm

Night on the Town, Thursday, August 23,  
Downtown Palo Alto, 7:00pm-midnight

Conference Dinner, Friday, August 24, Frost  
Amphitheater, Stanford Campus, 6:00-9:00pm

## **CONFERENCE REGISTRATION**

Wednesday, August 22, Clark Center noon-7:00pm

Wednesday, August 22, Governor's Corner dorms  
2:00-7:00pm

Thursday, August 23, Memorial Auditorium Lobby  
8:00am-2:30pm

Friday, August 24, 2007 Memorial Auditorium Lobby  
8:00am-2:30pm

Saturday, August 25 Memorial Auditorium Lobby  
8:00am-noon

## **COMMITTEE MEETINGS**

ASB Executive Committee, Wednesday August 22,  
3:00-5:00pm Clark Center Room S363

ASB Past President's Breakfast, Friday, August 24,  
7:15-8:15am, Green Room, Memorial Auditorium

ASB Executive Committee, Saturday August 25,  
4:00-6:00pm Green Room, Memorial Auditorium

## **INDUSTRIAL EXHIBITS**

Thursday, August 23, Memorial Auditorium Lobby  
8:00am – 6:00pm

Friday, August 24, Memorial Auditorium Lobby  
8:00am – 6:00pm

## **INDUSTRIAL SPONSORS and EXHIBITORS**

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## **Program Committee**

Francisco Valero-Cuevas (Program Chair)

Art Kuo, Christine Raasch, Darryl Thelen, Jack Dennerlein, James Ashton-Miller, Larry Bonassar, Lena Ting, Max Donelan, Richard Hughes, Rick Lieber, Silvia Blemker, Wendy Murray, Yasin Dhaher, Mont Hubbard, Kai An, Eric Perreault, Glen Niebur, Joseph Crisco

## **Local Organizing Committee**

Christopher Jacobs (Co-chair), Scott Delp (Co-chair)

Dennis Carter, Thomas Andriacchi, Thor Besier, Ellen Kuhl, Marc Levenston, Charles A. Taylor

## **ASB Executive Committee**

President: Kenton Kaufman

Past-President: Ted Gross

President-Elect: Rodger Kram

Secretary/Treasurer: Don Anderson

Secretary/Treasurer-Elect: Paul DeVita

Program Chair: Francisco Valero-Cuevas

Program Chair-Elect: Richard Hughes

Meeting Chair: Scott Delp

Membership Chair: Max Kurz

Education Committee Chair: Steve McCaw

Communications Committee Chair: Andy Karduna

Newsletter Editor: Michelle Sabick

Student Representative: Katie Bieryla

# ASB FOUNDING MEMBERS AND PAST PRESIDENTS

## FOUNDING MEMBERS

Thomas Andriacchi  
 Thomas Armstrong  
 Michael Askew  
 Eugene Bahniuk  
 Barry Bates  
 Richard Brand  
 Albert Burstein  
 David Butler  
 Dennis Carter  
 Don Chaffin  
 Krishnan Chandran  
 Jerome Danoff  
 Dwight Davy  
 Robert Deusinger  
 Roger Enoka  
 F. Gaynor Evans  
 Carl Gans  
 Edward Grood  
 James Hay  
 H.K. Huang  
 Maury Hull  
 Ronald Huston  
 Martha Jack  
 J. Lawrence Katz  
 Jonathan Kofman  
 William Krause  
 Shrawan Kumar  
 Jean Landa Pytel  
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Sally Phillips  
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 Herbert Reynolds  
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 Subrata Saha  
 Albert Schultz  
 Robert Shapiro  
 Gary Soderberg  
 Robert Soutas-Little  
 Christopher Vaughan  
 Stephen Wainwright  
 James Walton  
 Frederick Werner  
 William Whiting  
 Keith Williams  
 Timothy Wright  
 Charles Wunder

## PAST PRESIDENTS

F. Gaynor Evans (1977)  
 Albert Burnstein (1978)  
 James Hay (1980)  
 Stephen Wainwright (1981)  
 Albert Schultz (1982)  
 Doris Miller (1983)  
 Richard Brand (1984)  
 Savio Woo (1985)  
 Peter Cavanagh (1986)  
 Don Chaffin (1987)  
 Malcolm Pope (1988)  
 Roger Enoka (1989)  
 George Rab (1990)  
 Thomas Andriacchi (1991)  
 Ronald Zernicke (1992)  
 Thomas Brown (1993)  
 Philip Martin (1994)  
 Kai An (1995)  
 Robert Gregor (1996)  
 Mark Grabiner (1997)  
 Bruce Martin (1998)  
 Melissa Gross (1999)  
 James Ashton Miller (2000)  
 Andrew Biewener (2001)  
 Joan Bechtold (2002)  
 Walter Herzog (2003)  
 Trey Crisco (2004)  
 Ted Gross (2005)  
 Kenton Kaufman (2006 – )

# SCIENTIFIC SESSIONS

## Thursday, August 23, 2007

- Podium 1: Motor Control I  
Chair: Eric Perreault  
Memorial Auditorium 9:45 - 11:00 AM  
Thursday, August 23, 2007
- Podium 2: Methods I  
Chair: Steve Piazza  
Annenberg Auditorium 9:45 - 11:00 AM  
Thursday, August 23, 2007
- Podium 3: Bone I  
Chair: Glen Niebur  
Cubberley Auditorium 9:45 - 11:00 AM  
Thursday, August 23, 2007
- Podium 4: Aging I  
Chair: James Ashton-Miller  
Memorial Auditorium 11:15 AM - 12:30 PM  
Thursday, August 23, 2007
- Podium 5: Computational Biomechanics I  
Chair: Richard Hughes  
Annenberg Auditorium 11:15 AM - 12:30 PM  
Thursday, August 23, 2007
- Podium 6: Ergonomics and Occ. Biomech. I  
Chair: Devin Jindrich  
Cubberley Auditorium 11:15 AM - 12:30 PM  
Thursday, August 23, 2007
- Podium 7: Walking  
Chair: Clay Anderson  
Memorial Auditorium 1:45 - 3:00 PM  
Thursday, August 23, 2007
- Podium 8: Injury  
Chair: Jack Dennerlein  
Annenberg Auditorium 1:45 - 3:00 PM  
Thursday, August 23, 2007
- Podium 9: Sports I  
Chair: Mont Hubbard  
Cubberley Auditorium 1:45 - 3:00 PM  
Thursday, August 23, 2007
- Podium 10: Running  
Chair: Rick Neptune  
Memorial Auditorium 3:15 - 4:30 PM  
Thursday, August 23, 2007
- Podium 11: Upper Extremity  
Chair: Wendy Murray  
Annenberg Auditorium 3:15 - 4:30 PM  
Thursday, August 23, 2007

- Podium 12: Tendon and Ligament  
Chair: Zachary Domire  
Cubberley Auditorium 3:15 - 4:30 PM  
Thursday, August 23, 2007

## Friday, August 24, 2007

- Podium 13: Locomotion Energetics  
Chair: Young-Hui Chang  
Memorial Auditorium 9:45 - 11:00 AM  
Friday, August 24, 2007
- Podium 14: Hand  
Chair: Zong-Ming Li  
Annenberg Auditorium 9:45 - 11:00 AM  
Friday, August 24, 2007
- Podium 15: Knee  
Chair: Heidi-Lynn Ploeg  
Cubberley Auditorium 9:45 - 11:00 AM  
Friday, August 24, 2007
- Podium 16: Comparative Biomechanics  
Chair: Andrew Biewener  
Memorial Auditorium 11:15 AM - 12:30 PM  
Friday, August 24, 2007
- Podium 17: Muscle Mechanics  
Chair: Silvia Blemker  
Annenberg Auditorium 11:15 AM - 12:30 PM  
Friday, August 24, 2007
- Podium 18: Rehabilitation I  
Chair: Yasin Dhaher  
Cubberley Auditorium 11:15 AM - 12:30 PM  
Friday, August 24, 2007
- Podium 19: Neurorehabilitation  
Chair: David Reinkensmeyer  
Memorial Auditorium 1:45 - 3:00 PM  
Friday, August 24, 2007
- Podium 20: Motor units  
Chair: Rick Lieber  
Annenberg Auditorium 1:45 - 3:00 PM  
Friday, August 24, 2007
- Podium 21: Ergonomics and Occ. Biomech. II  
Chair: Joseph Crisco  
Cubberley Auditorium 1:45 - 3:00 PM  
Friday, August 24, 2007
- Podium 22: Neuromechanics  
Chair: Jonathan Dingwell  
Memorial Auditorium 3:15 - 4:30 PM  
Friday, August 24, 2007

Podium 23: Muscle  
 Chair: Kevin Keenan  
 Annenberg Auditorium 3:15 - 4:30 PM  
 Friday, August 24, 2007

Podium 24: Rehabilitation II  
 Chair: Matt Tresch  
 Cubberley Auditorium 3:15 - 4:30 PM  
 Friday, August 24, 2007

**Saturday, August 25, 2007**

Podium 25: Aging II  
 Chair: Darryl Thelen  
 Memorial Auditorium 9:45 - 11:00 AM  
 Saturday, August 25, 2007

Podium 26: Computational Biomechanics II  
 Chair: Veronica Santos  
 Annenberg Auditorium 9:45 - 11:00 AM  
 Saturday, August 25, 2007

Podium 27: Sports II  
 Chair: Alison Sheets  
 Cubberley Auditorium 9:45 - 11:00 AM  
 Saturday, August 25, 2007

Podium 28: Motor Control II  
 Chair: Boris Prilutsky  
 Memorial Auditorium 11:15 AM - 12:30 PM  
 Saturday, August 25, 2007

Podium 29: Methods II  
 Chair: Li-Shan Chou  
 Annenberg Auditorium 11:15 AM - 12:30 PM  
 Saturday, August 25, 2007

Podium 30: Bone II  
 Chair: Katherine Boyer  
 Cubberley Auditorium 11:15 AM - 12:30 PM  
 Saturday, August 25, 2007

**Thursday, August 23, 2007**

Poster 1: Skeletal Tissue  
 Memorial Auditorium 4:30 - 6:15 PM  
 Thursday, August 23, 2007

Poster 2: Aging  
 Memorial Auditorium 4:30 - 6:15 PM  
 Thursday, August 23, 2007

Poster 3: Motor Control  
 Memorial Auditorium 4:30 - 6:15 PM  
 Thursday, August 23, 2007

Poster 4: Injury  
 Memorial Auditorium 4:30 - 6:15 PM  
 Thursday, August 23, 2007

**Friday, August 24, 2007**

Poster 5: Rehabilitation  
 Memorial Auditorium 4:30 - 6:15 PM  
 Friday, August 24, 2007

Poster 6: Computational Biomechanics  
 Memorial Auditorium 4:30 - 6:15 PM  
 Friday, August 24, 2007

Poster 7: Muscle  
 Memorial Auditorium 4:30 - 6:15 PM  
 Friday, August 24, 2007

Poster 8: Sports  
 Memorial Auditorium 4:30 - 6:15 PM  
 Friday, August 24, 2007

Poster 9: Locomotion  
 Memorial Auditorium 4:30 - 6:15 PM  
 Friday, August 24, 2007

Poster 10: Manipulation  
 Memorial Auditorium 4:30 - 6:15 PM  
 Friday, August 24, 2007

# PLENARY SESSIONS AND TUTORIALS

**Wednesday August 22, 2007**

**1:00 – 3:00 PM**

**Tutorial 1: Biomechanical Modeling and Simulation**

**Clark Center Auditorium**

*Faculty: Scott Delp, Stanford University*

Computational models provide a framework for exploring the biomechanics and neural control of movement. In recent years, simulations of human and animal movement have become widely used to explore a range of basic scientific questions, study the mechanisms of various diseases, and assist in the design of medical devices. This tutorial will provide an introduction to musculoskeletal modeling and the application of simulations in the study of movement. Specifically, the tutorial will:

- motivate the use of simulations in studies of human and animal movement,
- review the components of a simulation, including models of muscle-tendon mechanics, musculoskeletal geometry, skeletal dynamics, and neural control,
- provide examples of simulations that have provided insight into important scientific questions and clinical problems,
- discuss some of the limitations of current simulations and suggest future research directions.

**Wednesday August 22, 2007**

**3:00 – 5:00 PM**

**Tutorial 2: Molecular Biology in Biomechanics**

**Clark Center Auditorium**

*Faculty: Rick Lieber, University of California at San Diego*

The scientific community has experienced a virtual explosion in applications of molecular biological methods to the fields of medicine, biotechnology, computing and engineering. All of the highest scientific impact papers from 1994-to date used molecular biology to understand transduction of information by cells. These papers could justifiably be considered within the purview of biomechanics. In this tutorial, the basic tenets of molecular biology will be presented including basic cell structure and the flow of information from DNA to RNA to proteins. The most common methods used to study cells and tissues will be reviewed including gene cloning, sequencing, blotting methods and the use of reverse transcription (RT) and the polymerase chain reaction (PCR). Finally, application of these methods will be illustrated using examples of vascular, muscle and ligament cell response to mechanical signals provided by applications of exercise, strain fields and temperature. The main point of this presentation is to demonstrate that molecular biological methods provide powerful tools for studying tissue response, but the careful mechanical characterization of cells, receptors and even isolated proteins remain within the area of expertise we know as biomechanics. This is a field on which we all should have great impact.

**Thursday August 23, 2007**

**8:30 – 9:30 AM**

**Plenary Session: Singing, breathing and wing waving**

**Biomechanics of vocal behavior in birds**

**Memorial Auditorium**

*Franz Goller: University of Utah*

In birds as in humans, sound production involves coordinated activity of two main motor systems, vocal muscles and respiratory muscles. The vocal organ of songbirds, the syrinx, contains two independent sound generators, each controlled by six muscles. Although the major functional roles of these syringeal muscles are documented, the biomechanics of the vocal organ are not well understood. As an example, I will discuss the evidence for direct muscular control of sound frequency and gating of airflow. Singing also involves drastic changes to breathing patterns, including rapid switching between expiration and inspiration. I will discuss the avian respiratory system and its contributions to song production, including fine control of the driving pressure for phonation. In addition, some visual displays affect respiratory mechanics and their simultaneous performance with song must require complex coordination of these multi-modal displays.

**Friday August 24, 2007**

**8:30 – 9:30 AM**

**Plenary Session: Single Molecule Measurements of**

**Motor Proteins, In vitro and In vivo**

**Memorial Auditorium**

*Paul Selvin: University of Illinois*

The standard diffraction limit of light is about 250 nm, meaning that you cannot “resolve” objects closer than this distance. Despite this, we have come up with a method to measure 1.5 nm in 1-500 msec, using a technique we call Fluorescence Imaging with One Nanometer Accuracy (FIONA). We have chosen to study molecular motors, which are involved in moving things around within the cell, both in purified systems, and inside living cells. There has been a question as to whether molecular motors move things in an “inchworm” fashion, or in a “hand-over-hand” fashion (i.e. by “walking”.) We have definitively determined that myosin, and kinesin, two important motors, walk in a “hand-over-hand” manner in purified systems. In living cells (that is, in *Drosophila*, or fruit fly cells), we have seen cargos being moved by individual “conventional” kinesin and dynein. We find that both kinesin and dynein move cargo 8 nm per ATP. Amazingly, these two molecular motors do not engage in a tug-of-war, but appear to be cooperative, taking turns hauling the cargo.



**Saturday August 25, 2007****8:30 – 9:30 AM****Plenary Session: Borelli Award Lecture****Lessons in skeletal muscle design and plasticity****Memorial Auditorium***Richard Lieber: University of California at San Diego*

Skeletal muscles represent a classic biological example of a structure-function relationship. As such, muscle mechanical and muscle physiological studies over the past 100 years have exploited tools that permit comparison between structure and function. In this lecture, I will review some of our findings based on “fancy” as well as “simple” tools. The key concept to be conveyed is that science progresses by asking great questions and using whatever tool is appropriate to answer that question. If the tool does not exist, make it! If it does, use it! I would argue that the converse approach (having a tool and looking for a question) is not as fruitful. Biomechanists are uniquely positioned in the scientific community to have high impact by asking the right questions and applying the right tools.

**Saturday August 25, 2007****1:45 – 1:50 PM****Plenary Session:****Announcement of Awards:****Microstrain Award****Journal of Biomechanics Award****Clinical Biomechanics Award****Memorial Auditorium****Saturday August 25, 2007****1:50 – 2:05 PM****Plenary Session: Pre-Doctoral Young Scientist Award****Biofidelity requirements for the focus headform for the prediction of eye injuries****Memorial Auditorium***Eric Kennedy: Virginia Tech-Wake Forest University*

In recent military action the rate of eye injuries has dramatically increased compared to historical trends. In order to assess the capability of protective equipment in preventing these injuries, a new advanced headform has been developed that can predict eye injury from impact events. Biofidelic response requirements for the synthetic eye and orbit were defined based on experimental impact tests on post-mortem human eyes, for both force-deflection response as well as eye injury criteria. The Facial and Ocular Countermeasures Safety (FOCUS) headform will be used to reduce both eye and facial injuries for military troops, as well as sports participants and victims of motor vehicle accidents.

**Saturday August 25, 2007****2:05– 2:20 PM****Plenary Session: Post-Doctoral Young Scientist Award****The effect of collagen fibres on permeability of articular cartilage****Memorial Auditorium***Salvatore Federico: University of Calgary*

The macroscopic, physico-mechanical properties of soft tissue depend on the tissue microstructure. For articular cartilage, several microstructural models have been proposed to account for the effect of collagen fibres on the elastic properties. In contrast, collagen fibres have been neglected in any considerations regarding permeability, as permeability has been considered to be dependent exclusively on the proteoglycan part of the extracellular matrix. However, early experimental results (Maroudas and Bullough, 1968, *Nature* 219) suggest that the depth-dependence of the permeability cannot be explained in terms of proteoglycans alone, and that collagen fibres may significantly affect cartilage permeability.

In this work, we show that the collagen fibril network introduces local anisotropies in articular cartilage. In particular, permeability is shown to be lower orthogonal compared to longitudinal to the fibre. At the global level, the anisotropy of permeability depends on the directional distribution of the fibres.

We used this result to explain why cartilage axial permeability is lower in the superficial zone compared to the middle and deep zones, where the fibres are orthogonal to the cartilage axial direction (i.e., parallel to the articular surface) These results are in good agreement with the experimental findings of Maroudas and Bullough (1968) which could not be explained with previous theoretical models. All results specifically found here for articular cartilage can be used for any fibre reinforced soft tissue.

**Saturday August 25, 2007****2:20 – 3:20 PM****Plenary Session: James Hay Lecture Memorial Auditorium****Paradigm Shifts for Impact Forces and Foot Control***Benno M. Nigg: University of Calgary*

The conventional paradigms used for running shoes (cushioning and foot control) are currently challenged since impact force peaks during heel-toe running are not different for soft or hard materials, subjects that are or are not exposed to impact activities have the same frequency of short or long term injuries, bone showed bio-positive effects as a result to impact loading, and foot pronation can not be used as a predictor for injuries. Thus new paradigms are proposed, the paradigm for muscle tuning (impact forces produce soft tissue vibrations, which are dampened through muscle activity) and the paradigm for instability (unstable shoes are effective in training the small muscles and improving general stability).

## SCIENTIFIC SESSIONS: Podium

*Author lists are in alphabetical order*

**Thursday, August 23, 2007**

**9:45 - 11:00 AM**

### Podium 1: Motor Control I

#### Memorial Auditorium

*Chair: Eric Perreault*

**9:45 Goal equivalent control of variability in human walking**

Joseph Cusumano, Jonathan Dingwell, Michelle Garel

Corresponding Author: Jonathan Dingwell  
*University of Texas*

**10:00 Low dimensional motor control and muscle synergies**

Max Berniker, Emilio Bizzi, Matthew Tresch

Corresponding Author: Max Berniker

*Northwestern University*

**10:15 The transition between muscle coordination patterns is context dependent**

Sherry L. Backus, Kevin Keenan, Robert V. McNamara III, Flor Alicia Medina, Stanley Song, Carolyn Price, Francisco Valero-Cuevas Madhusudhan Venkadesan,

Corresponding Author: Flor Medina  
*Cornell University & The University of Southern California*

**10:30 Can electromyography asymmetries during gait be explained by limb dominance?**

Matthew Seeley, Robert Shapiro, Brian Umberger

Corresponding Author: Matthew Seeley

*Brigham Young University*

**10:45 Swing phase interruption in a slip: active or passive response?**

Rakie Cham

Corresponding Author: Rakie Cham

*University of Pittsburgh*

**Thursday, August 23, 2007**

**9:45 - 11:00 AM**

### Podium 2: Methods I

#### Annenberg Auditorium

*Chair: Steve Piazza*

**9:45 Posturographic analysis is possible without ground reaction forces measurement through markerless motion capture**

Thomas Andriacchi, Stefano Corazza

Corresponding Author: Stefano Corazza

*Stanford University*

**10:00 Procrustes analysis applied to relative motion plots of locomotor patterns in sprint**

Leslie Decker, Francoise Natta, Sabine Renous

Corresponding Author: Leslie Decker

*University of Nebraska-Omaha*

**10:15 Estimation of hip-muscle geometry using automated, non-rigid atlas-based registration of MR images**

Ilse Jonkers, Dirk Loeckx, Lennart Scheys, Arthur Spaepen, Paul Suetens and Anja Van Campenhout,

Corresponding Author: Lennart Scheys

*K.U. Leuven*

**10:30 Characterizing hamstrings muscle dynamics during knee flexion-extension using real-time MRI**

Silvia Blemker, Andy Derbyshire, Nicholas Evoy,

Niccolo Fiorentino, Michael Guttman, Jonathan Lin, Dimitru Mazilu, Elliot McVeigh

Corresponding Author: Niccolo Fiorentino

*University of Virginia*

**10:45 A new method for quantifying foot bone-to-bone positions**

Michael J. Fassbind, David R. Haynor, Yangqiu

“Patrick” Hu, William R. Ledoux, Eric S. Rohr,

Bruce J. Sangeorzan

Corresponding Author: William Ledoux

*VA Puget Sound*

**Thursday, August 23, 2007**

**9:45 - 11:00 AM**

### Podium 3: Bone I

#### Cubberley Auditorium

*Chair: Glen Niebur*

**9:45 The enhanced daily load stimulus (EDLS): Accounting for saturation, recovery and standing**

Peter Cavanagh, Kerim Genc, Brad Humphreys,

Gail Perusek

Corresponding Author: Kerim Genc

*Case Western Reserve University*

**10:00 A computational approach to bone remodeling postoperative to facet fusion**

Dennis Abernathie, Ferris Pfeiffer, Douglas Smith

Corresponding Author: Ferris Pfeiffer

*University of Missouri*

**10:15 Episodic subluxation increases third body ingress and embedment in the THA bearing surface**

Anneliese D Heiner, Hannah J Lundberg, Thomas

E Baer, Douglas R Pedersen, John J Callaghan,

Thomas D Brown

Corresponding Author: Anneliese Heiner

*University of Iowa*

**10:30**     **A new method for studying the anabolic effects of vibrational loading of bone: constrained tibial vibration in mice**  
Philip Bayly, Blaine Christiansen, Matthew Silva  
Corresponding Author: Blaine Christiansen  
*Washington University in St. Louis*

**10:45**     **Measurements of in vivo patellofemoral joint kinematics with real-time MRI**  
Gary Beaupre, Thor Besier, Christine Draper, Garry Gold, Juan Santos, and Scott Delp  
Corresponding Author: Christine Draper  
*Stanford University*

**Thursday, August 23, 2007**                      **11:15 AM - 12:30 PM**

**Podium 4: Aging I**  
**Memorial Auditorium**

*Chair: James Ashton-Miller*

**11:15**     **\*Journal of Biomechanics Award Finalist**  
**Effects of lateral stabilization and arm swing on metabolic cost of walking in young and elderly adults**  
Claire Farley, Leslie Fehلمان, Justus Ortega  
Corresponding Author: Justus Ortega  
*University of Colorado*

**11:30**     **Human cervical spine mechanics across the maturation spectrum**  
Randal Ching, David Linders, David Nuckley  
Corresponding Author: David Nuckley  
*University of Washington*

**11:45**     **Load-modifying footwear intervention lowers knee adduction moment, reduces pain, and improves function in subjects with medial compartment knee osteoarthritis**  
Thomas Andriacchi, Jennifer Erhart, Nicholas Giori  
Corresponding Author: Jennifer Erhart  
*Stanford University*

**12 noon**     **Eccentric but not concentric muscle work is retained with age in level walking**  
Paul DeVita, Patrick Rider, Allison Gruber, Ken Steinweg, Mandana Fisher, Allison Mazzenga, Stanislaw Solnik and Tibor Hortobagyi  
Corresponding Author: Paul DeVita  
*East Carolina University*

**12:15**     **Effect of age on shear modulus of skeletal muscle**  
Kai-Nan An, Zachary Domire, Matthew McCullough  
Corresponding Author: Zachary Domire  
*Mayo Clinic College of Medicine*

**Thursday, August 23, 2007**                      **11:15 AM - 12:30 PM**

**Podium 5: Computational Biomechanics I**  
**Annenberg Auditorium**

*Chair: Richard Hughes*

**11:15**     **Experimental evaluation of model-based lower extremity induced accelerations**  
Yasin Dhaher, Betsy Hunter, Darryl Thelen  
Corresponding Author: Betsy Hunter  
*Northwestern University*

**11:30**     **3D Finite element simulation of bone remodeling under the tibial component of an Oxford knee replacement**  
Harinderjit Gill, Hans Gray, Amy Zavatsky  
Corresponding Author: Amy Zavatsky  
*University of Oxford*

**11:45**     **Predicting outcomes of treatment for stiff-knee gait using supervised learning**  
Scott Delp, Melanie Fox, Jeffrey Reinbolt, Michael Schwartz  
Corresponding Author: Jeffrey Reinbolt  
*Stanford University*

**12 noon**     **Influence of quadriceps muscle force distributions on cartilage stresses at the patellofemoral joint during running**  
Gary Beaupre, Thor Besier, Scott Delp, Garry Gold  
Corresponding Author: Thor Besier  
*Stanford University*

**12:15**     **Stresses on movable core and loads on facets are higher by implanting a cervical artificial disc prosthesis as compared to bone grafting fusion technique - a finite element model study**  
Howard An, Gunnar Andersson, Mozammil Hussain, Raghu Natarajan  
Corresponding Author: Mozammil Hussain  
*Rush University Medical Center*

**Thursday, August 23, 2007**                      **11:15 AM - 12:30 PM**

**Podium 6: Ergonomics and Occupational Biomechanics I**  
**Cubberley Auditorium**

*Chair: Devin Jindrach*

**11:15**     **Movement height affects kinematic variability during fatigue**  
Jonathan Dingwell, Deanna Gates  
Corresponding Author: Deanna Gates  
*University of Texas at Austin*

**11:30**     **Postural control strategies during prolonged standing: is there a relationship with low back discomfort?**  
Jack Callaghan, Diane Gregory, Erika Nelson-Wong, David Winter  
Corresponding Author: Erika Nelson-Wong  
*University of Waterloo*





**2:30 Interactive effects of running speed and weight support on metabolic cost and ground reaction forces**

Alena Grabowski, Rodger Kram  
Corresponding Author: Alena Grabowski  
*University of Colorado, Boulder*

**2:45 Determination of heading frequency in youth soccer**

Cynthia Bir, Erin Hanlon  
Corresponding Author: Cynthia Bir  
Wayne State University

**Thursday, August 23, 2007****3:15 - 4:30 PM****Podium 10: Running Memorial Auditorium***Chair: Rick Neptune***3:15 Integrating the mechanical and metabolic energetics of the swing phase of walking and running**

Richard Marsh, Jonas Rubenson  
Corresponding Author: Jonas Rubenson  
*Northeastern University*

**3:30 Walking, skipping, and running produced from a single bipedal model**

Arthur Kuo, Shawn O'Connor  
Corresponding Author: Shawn O'Connor  
*University of Michigan*

**3:45 Running stability is enhanced by a proximo-distal gradient in joint mechanics**

Biewener Andrew, Monica Daley  
Corresponding Author: Biewener Andrew  
*Harvard University*

**4:00 Changing the demand on specific muscle groups affects the walk-run transition speed**

Jamie Bartlett, Rodger Kram  
Corresponding Author: Jamie Bartlett  
*University of Colorado*

**4:15 Criteria for dynamic similarity in bouncing gaits**

Sharon Bullimore, Jeremy Burn, Max Donelan  
Corresponding Author: Sharon Bullimore  
*University of Calgary*

**Thursday, August 23, 2007****3:15 - 4:30 PM****Podium 11: Upper Extremity Annenberg Auditorium***Chair: Wendy Murray***3:15 Upper limb moment-generating capacity in middle aged adults**

Garry Gold, Katherine Holzbaur, Wendy Murray  
Corresponding Author: Katherine Holzbaur  
*Stanford University/VA Palo Alto HCS*

**3:30 Effect wrist and forearm muscle architecture on wrist radial-ulnar deviation and forearm pronation supination moment**

Roger Gonzalez, John Ramsay  
Corresponding Author: Roger Gonzalez  
*LeTourneau University*

**3:45 Glenohumeral joint reaction forces following latissimus tendon transfer**

Marcus Pandy, Kevin Shelburne, Michael Torry, Takashi Yanagawa  
Corresponding Author: Takashi Yanagawa  
*Steadman Hawkins Research Foundation*

**4:00 A three-dimensional model of the supraspinatus muscle**

Silvia Blemker, Scott Delp, Joshua Webb  
Corresponding Author: Joshua Webb  
*Stanford University*

**4:15 Moment arm measurement to validate a closed-loop feedback-controlled elbow joint simulator**

Laurel Kuxhaus, Pat Schimoler, Angela M. Flamm, Jeffrey S Viperman, Mark E. Baratz, and Mark Carl Miller  
Corresponding Author: Laurel Kuxhaus  
*University of Pittsburgh, Allegheny General Hospital*

**Thursday, August 23, 2007****3:15 - 4:30 PM****Podium 12: Tendon and Ligament Cubberley Auditorium***Chair: Zachary Domire***3:15 A technique for determination of transverse material properties of human flexor digitorum tendons**

Thomas D. Brown, Cheolwoong Ko, M. James Rudert  
Corresponding Author: Thomas D. Brown  
*University of Iowa*

**3:30 Relationship between knee flexion moment and early cartilage changes in the ACL reconstructed knee**

Sean Scanlan, Katerina Blazek, Joshua Schmidt, Seungbum Koo, Ajit Chaudhari, Jason Dragoo, and Tom Andriacchi  
Corresponding Author: Sean Scanlan  
*Stanford University*

**3:45 The influence of patellar ligament insertion angle on quadriceps usage during walking in ACL reconstructed subjects**

Thomas Andriacchi, Ajit Chaudhari, Chris Dyrby, Choongsoo Shin  
Corresponding Author: Choongsoo Shin  
*Stanford University*

- 4:00 **An algorithm for automated tracking of tendon excursion from ultrasound images**  
Sabrina Lee, Gregory Lewis, Stephen Piazza  
Corresponding Author: Stephen Piazza  
*The Pennsylvania State University*
- 4:15 **Cruciate ligament force during the wall squat and one-leg squat**  
Rafael F. Escamilla, Naiquan Zheng, Alan Hreljac, Rodney Imamura, Toran D. MacLeod, William B. Edwards, Glenn S. Fleisig, Kevin E. Wilk  
Corresponding Author: Rafael Escamilla  
*California State University, Sacramento*

**Friday, August 24, 2007 9:45 - 11:00 AM**

**Podium 13: Locomotion Energetics  
Memorial Auditorium**

*Chair: Young-Hui Chang*

- 9:45 **Comparison of two methods of determining relative effort during sit-to-stand**  
Dennis Anderson, Kathleen Bieryla, Michael Madigan  
Corresponding Author: Kathleen Bieryla  
*Virginia Tech*
- 10:00 **Independent effects of body weight and mass on the metabolic cost of running**  
Alena Grabowski, Rodger Kram, Lennart Teunissen  
Corresponding Author: Alena Grabowski  
*University of Colorado, Boulder*
- 10:15 **Disintegrating the metabolic cost of human running: weight support, forward propulsion, and leg swing**  
Rodger Kram, Erin Warddrip  
Corresponding Author: Rodger Kram  
*University of Colorado - Boulder*
- 10:30 **Mechanics and energetics of level walking with powered ankle exoskeletons**  
Daniel Ferris, Gregory Sawicki  
Corresponding Author: Gregory Sawicki  
*University of Michigan-Ann Arbor*
- 10:45 **Center of mass velocity redirection predicts COM work in walking**  
Peter Gabriel Adamczyk, Arthur D. Kuo  
Corresponding Author: Peter Gabriel Adamczyk  
*University of Michigan*

**Friday, August 24, 2007 9:45 - 11:00 AM**

**Podium 14: Hand**

*Annenberg Auditorium*

*Chair: Zong-Ming Li*

- 9:45 **Comparison of finger force enslaving and sharing between mvf and oscillatory finger force production tasks**  
Qi Li, Marcio A. Oliveira, Jae Kun Shim  
Corresponding Author: Qi Li  
*University of Maryland*
- 10:00 **A data-driven Markov Chain Monte Carlo Metropolis-Hastings algorithm for a model of the human thumb**  
Carlos Bustamante, Veronica Santos, Francisco Valero-Cuevas  
Corresponding Author: Veronica Santos  
*Cornell University & The University of Southern California*
- 10:15 **Modeling of the muscle/tendon excursions in an index finger using the commercial software AnyBody**  
Kai-Nan An, Robert G Cutlip, Ren G Dong, John Z Wu  
Corresponding Author: John Z Wu  
*National Institute for Occupational Safety and Health*
- 10:30 **Variation in force and moment stabilizing synergies with different finger combinations: an uncontrolled manifold analysis**  
Sohit Karol, Jae Kun Shim  
Corresponding Author: Sohit Karol  
*University of Maryland, College Park*
- 10:45 **Blind inference of tendon networks through minimal testing**  
Hod Lipson, Anupam Saxena, Francisco Valero-Cuevas  
Corresponding Author: Anupam Saxena  
*Cornell University & The University of Southern California*
- Friday, August 24, 2007 9:45 - 11:00 AM**
- Podium 15: Knee  
Cubberley Auditorium**
- Chair: Heidi-Lynn Ploeg*
- 9:45 **The effect of collagen fibres on permeability of articular cartilage**  
Salvatore Federico, Walter Herzog  
Corresponding Author: Salvatore Federico  
*The University of Calgary*

- 10:00** **Changes in patellofemoral contact pressure due to imbalance of the knee extensors**  
Doug Bourne, Walter Herzog, Azim Jihna, Andrew Sawatsky  
Corresponding Author: Andrew Sawatsky  
*University of Calgary*
- 10:15** **Regional variations in the depth-dependent strain distribution in the tibial plateau**  
Thomas Andriacchi, Scott Bevell, Paul Briant, Gabriel Sanchez  
Corresponding Author: Gabriel Sanchez  
*Stanford University*
- 10:30** **Decreased knee flexion during landing increases frontal plane loading of the knee**  
Christine Pollard, Christopher Powers, Susan Sigward  
Corresponding Author: Christine Pollard  
*University of Southern California*
- 10:45** **3d joint contact forces at the hip, knee, and ankle during running at different stride lengths**  
Timothy Derrick, W. Brent Edwards, Joshua Thomas  
Corresponding Author: W. Brent Edwards  
*Iowa State University*
- Friday, August 24, 2007** **11:15 AM - 12:30 PM**  
**Podium 16: Comparative Biomechanics Memorial Auditorium**  
*Chair: Andrew Biewener*
- 11:15** **A biomechanical study of vertebral allometry in primates**  
Andrew L. Schifle, Leah C. Anderson, David A. Loomis, Charles Kunos, Bruce Latimer, Christopher J. Hernandez  
Corresponding Author: Andrew Schifle  
*Case Western Reserve University*
- 11:30** **Effective fields in control muscles: efficacy of control depends on biomechanical context in an insect**  
Robert Full, Chris Mullens, Andrew Spence, Simon Sponberg  
Corresponding Author: Simon Sponberg  
*University of California, Berkeley*
- 11:45** **A hexapedal jointed-leg model for insect locomotion in the horizontal plane**  
Philip Holmes, Raghavendra Kukillaya  
Corresponding Author: Raghavendra Kukillaya  
*Princeton University*
- 12 noon** **Minimal muscle atrophy during hibernation in captive brown bears**  
John Hershey, David Lin, O. Lynne Nelson, Charles Robbins  
Corresponding Author: David Lin  
*Washington State University*
- 12:15** **Functional heterogeneity within and between hind limb muscles during running in guinea fowl**  
Andrew Biewener, Timothy Higham  
Corresponding Author: Timothy Higham  
*Harvard University*
- Friday, August 24, 2007** **11:15 AM - 12:30 PM**  
**Podium 17: Muscle Mechanics Annenberg Auditorium**  
*Chair: Silvia Blemker* **\*Microstrain Award Winner**
- 11:15** **In vivo sarcomere length measurement by minimally invasive microendoscopy**  
Robert P. J. Barretto, Scott L. Delp, Michael E. Llewellyn, Mark J. Schnitzer  
Corresponding Author: Michael E. Llewellyn  
*Stanford University*
- 11:30** **Force transmission from soleus muscle in the cat; is m. Soleus an independent actuator?**  
Huub Maas, Thomas G. Sandercock  
Corresponding Author: Huub Maas  
*Northwestern University*
- 11:45** **Functional implications of optimal muscle fiber lengths of the ankle plantarflexors**  
Edith Arnold, Scott Delp, Richard Lieber, Samuel Ward  
Corresponding Author: Edith Arnold  
*Stanford University*
- 12 noon** **\*Journal of Biomechanics Award Finalist Active and passive force enhancement in rabbit psoas myofibrils**  
Walter Herzog, Venus Joumaa, Tim Leonard  
Corresponding Author: Venus Joumaa  
*University of Calgary*
- 12:15** **Strains in the biceps brachii during dynamic elbow flexion show concentric, eccentric and isometric behavior simultaneously**  
Brian Knarr, John Novotny, Hehe Zhou  
Corresponding Author: John Novotny  
*University of Delaware*

Friday, August 24, 2007

11:15 AM - 12:30 PM

**Podium 18: Rehabilitation I  
Cubberley Auditorium**

*Chair: Yasin Dhafer*

**11:15 Upper extremity kinematics of crutch-assisted gait in children with myelomeningocele**  
Gerald Harris, Brooke Slavens, Peter Sturm  
Corresponding Author: Brooke Slavens  
Marquette University

**11:30 Correlation between knee adduction moment and the ratio of medial-to-lateral compartment compression in subjects with knee osteoarthritis undergoing high-tibial osteotomy.**  
Timothy Bhatnagar, Trevor Birmingham, Thomas Jenkyn  
Corresponding Author: Thomas Jenkyn  
University of Western Ontario

**11:45 Mechanical vibrations reduce the intervertebral disc swelling and muscle atrophy from bed rest**  
Nilsson Holguin, Jesse Muir, Harlan J. Evans, Yi-Xian Qin, Clinton Rubin, Mark Wagshul, and Stefan Judex  
Corresponding Author: Nilsson Holguin  
Stony Brook University

**12 noon Asymmetric stability margin of postural response to perturbation in unilateral transtibial amputees**  
Lena Ting, Yi-Ying Tsai  
Corresponding Author: Lena Ting  
Emory University and Georgia Institute of Technology

**12:15 Effect of visual uncertainty on adaptation to ankle perturbations**  
Timothy N. Judkins, Lewis A. Wheaton, J.C. Mizelle, Hermano I. Krebs, Richard F. Macko, and Larry W. Forrester  
Corresponding Author: Timothy Judkins  
University of Maryland School of Medicine

Friday, August 24, 2007

1:45 - 3:00 PM

**Podium 19: Neurorehabilitation  
Memorial Auditorium**

*Chair: David Reinkensmeyer*

**1:45 Spinal cord injured subjects use ankle-foot load feedback to modulate hip torque during locomotion**  
Keith Gordon, Brian Schmit, Ming Wu  
Corresponding Author: Keith Gordon  
Rehabilitation Institute of Chicago

**2:00 Motor adaptation during dorsiflexion-assisted walking with a powered orthosis**  
Daniel Ferris, Pei-Chun Kao  
Corresponding Author: Pei-Chun Kao  
University of Michigan

**2:15 Metabolic costs and walking symmetry of trans-tibial amputees are influenced by prosthetic mass distribution**  
Philip Martin, Jeremy Smith  
Corresponding Author: Jeremy Smith  
Ball State University

**2:30 Regulating shoulder net joint moments during wheelchair propulsion**  
Jill McNitt-Gray, Shashank Raina, Philip Requejo  
Corresponding Author: Shashank Raina  
University of Southern California

**2:45 Gait adaptability in people with unilateral trans-tibial amputations in response to variable walking speed and body weight support**  
Jason Johanning, Iraklis Pipinos, Nicholas Stergiou, A. Joseph Threlkeld, Clinton Wutzke  
Corresponding Author: A. Joseph Threlkeld  
Creighton University

Friday, August 24, 2007

1:45 - 3:00 PM

**Podium 20: Motor units  
Annenberg Auditorium**

*Chair: Rick Lieber*

**1:45 Detecting the transient recruitment of motor units in the surface electromyogram during a sustained contraction**  
Roger Enoka, Jane Litsey, Zachary Riley, Mary Terry, Alberto-Mendez Villaneuva  
Corresponding Author: Zachary Riley  
University of Colorado, Boulder

**2:00 Improving models of motor unit function is best done by refining their neural mechanisms**  
Kevin Keenan, Francisco Valero-Cuevas  
Corresponding Author: Kevin Keenan  
Cornell University & The University of Southern California

**2:15 DTI-based fiber tracking reveals a multifaceted alteration of pennation angle in tibialis anterior muscle upon muscle lengthening**  
Bruce Damon, Zhaohua Ding, Anneriet Heemskerk, Tuhin Sinha  
Corresponding Author: Anneriet Heemskerk  
Vanderbilt University



2:30 **Maximising the resolution of EMG characteristics from dynamic contractions by combining a muscle model and wavelet analysis**  
Steph Forrester, Matt Pain  
Corresponding Author: Matt Pain  
*Loughborough University*

2:45 **The effect of temperature on residual force enhancement in single skeletal muscle fibers**  
Walter Herzog, Eun-Jeong Lee  
Corresponding Author: Eun-Jeong Lee  
*University of Calgary*

**Friday, August 24, 2007 1:45 - 3:00 PM**

**Podium 21: Ergonomics and Occupational Biomechanics II  
Cubberley Auditorium**

*Chair: Joseph Crisco*

1:45 **Modeling of the dynamic muscle force in an index finger during tapping**  
Kai-Nan An, Robert G Cutlip, Ren G Dong, Kristine Krajnak, John Z Wu  
Corresponding Author: John Z Wu  
*National Institute for Occupational Safety and Health*

2:00 **Hammering and dart throwing are kinematically different**  
Joseph Crisco, Patrick Curran, Douglas Moore, Michael Rainbow  
Corresponding Author: Joseph Crisco  
*Brown University*

2:15 **Sagittal lumbar intervertebral angles in seated postures using fluoroscopy**  
Jack Callaghan, Nadine Dunk, Tom Jenkyn, Angela Kedgley  
Corresponding Author: Nadine Dunk  
*University of Waterloo*

2:30 **Predicting slow changes in muscle fatigue from kinematics**  
David Chelidze, Jonathan Dingwell, David Segala, Miao Song  
Corresponding Author: Jonathan Dingwell  
*University of Texas*

2:45 **Modeling 3D knee torque surfaces for males and females**  
Laura Frey Law, Andrea Laake  
Corresponding Author: Andrea Laake  
*University of Iowa*

**Friday, August 24, 2007**

**3:15 - 4:30 PM**

**Podium 22: Neuromechanics  
Memorial Auditorium**

*Chair: Jonathan Dingwell*

3:15 **\*Clinical Biomechanics Award Finalist  
Evidence of gender specific motor templates to resist a valgus perturbation at the knee**  
Martha Cammarata, Tobey DeMott, Yasin Dhafer  
Corresponding Author: Martha Cammarata  
*Northwestern University*

3:30 **Visual perturbation of walking balance**  
Arthur Kuo, Shawn O'Connor  
Corresponding Author: Shawn O'Connor  
*University of Michigan*

3:45 **Effect of neuromuscular resistance training on multi-finger synergy**  
Jeffrey Hsu, Sohit Karol, Jae Kun Shim  
Corresponding Author: Jeffrey Hsu  
*University of Maryland*

4:00 **Effects of repetitive drop jumps on lower extremity landing mechanics**  
Eric Dugan, Holmes Finch, Jeremy Smith, Joshua Weinhandl  
Corresponding Author: Joshua Weinhandl  
*Ball State University*

4:15 **Torque coupling post stroke: implication for gait**  
Yasin Dhafer, Theresa Hayes  
Corresponding Author: Theresa Hayes  
*Northwestern University*

**Friday, August 24, 2007**

**3:15 - 4:30 PM**

**Podium 23: Muscle  
Annenberg Auditorium**

*Chair: Kevin Keenan*

3:15 **Is a passive element responsible for the enhancement of isometric muscle force following active stretch?**  
Sharon Bullimore, Walter Herzog  
Corresponding Author: Sharon Bullimore  
*University of Calgary*

3:30 **Crouched gait postures reduce the capacity of uni-articular muscles to extend the hip and knee joints**  
Scott Delp, Jennifer Hicks, Michael Schwartz  
Corresponding Author: Jennifer Hicks  
*Stanford University*

**3:45 Growth-dependent enhancement of mouse neonatal muscle morphology and contractile function**  
David Gokhin, Richard Lieber  
Corresponding Author: Richard Lieber  
*University of California, San Diego*

**4:00 Increased stress production and response to injury in desmin knockout muscles rescued by plasmid transfection**  
Shannon Bremner, Richard Lieber, Michelle Palmisano  
Corresponding Author: Richard Lieber  
*University of California, San Diego*

**4:15 EMG characteristics of dynamic knee extensions determined by combined muscle modelling and wavelet analysis**  
Steph Forrester, Matt Pain  
Corresponding Author: Matt Pain  
*Loughborough University*

**Friday, August 24, 2007 3:15 - 4:30 PM**

**Podium 24: Rehabilitation II  
Cubberley Auditorium**

*Chair: Matt Tresch*

**3:15 Effects of UHMWPE surface roughness and lubrication on the frictional properties of total knee replacements**  
Ryan Landon, Ryan Lucking, Stephen Piazza  
Corresponding Author: Stephen Piazza  
*The Pennsylvania State University*

**3:30 Point markers versus cluster triads: multi-segment foot model performance is insensitive to the architecture of the reflective markers used in optical motion analysis**  
Kiersten Anas, Colin Dombroski, Thomas Jenkyn, Shawn Robbins  
Corresponding Author: Thomas Jenkyn  
*University of Western Ontario*

**3:45 Effect of the knee joint contact path on the quadriceps extension moment during gait**  
Hannah Lundberg, Valentina Ngai, Andrea Swanson, Markus Wimmer  
Corresponding Author: Hannah Lundberg  
*Rush University Medical Center*

**4:00 Variability in secondary motions of the knee following total joint replacement**  
Valentina Ngai, Markus Wimmer  
Corresponding Author: Valentina Ngai  
*Rush University Medical Center*

**4:15 Gait stability following total hip replacement**  
Li-Shan Chou, Dennis Collis, Brian Jewett, Virginia Klausmeier, Vipul Lugade  
Corresponding Author: Li-Shan Chou  
*University of Oregon*

**Saturday, August 25, 2007 9:45 - 11:00 AM**

**Podium 25: Aging II  
Memorial Auditorium**

*Chair: Darryl Thelen*

**9:45 Biomechanical modeling to identify risk factors in knee OA: model dependence upon source MRI field strength**  
Donald Anderson, Thomas Brown, Neil Segal, James Torner  
Corresponding Author: Donald Anderson  
*The University of Iowa*

**10:00 Hip joint moments and bone mineral density in healthy older women**  
Thomas Andriacchi, Gary Beaupre, Katherine Boyer  
Corresponding Author: Katherine Boyer  
*Stanford University*

**10:15 Lateral falls after a slip are affected by medial/lateral slipping foot displacement**  
Stephanie Donovan, Mark Grabiner, Karen Troy  
Corresponding Author: Mark Grabiner  
*University of Illinois at Chicago*

**10:30 Rapid shoulder flexion after a slip may assist fall avoidance**  
Stephanie Donovan, Mark Grabiner, Karen Troy  
Corresponding Author: Mark Grabiner  
*University of Illinois at Chicago*

**10:45 Young adults adapt to prevent falls from unpredictable balance disturbances**  
Michael Pavol, Lisa Welsh  
Corresponding Author: Michael Pavol  
*Oregon State University*

**Saturday, August 25, 2007 9:45 - 11:00 AM**

**Podium 26: Computational Biomechanics II  
Annenberg Auditorium**

*Chair: Veronica Santos*

**9:45 Long-duration muscle-actuated simulations of walking at multiple speeds**  
Frank (Clay) Anderson, Scott Delp, Eran Guendelman, Jill Higginson, Chand John  
Corresponding Author: Chand John  
*Stanford University*

**10:00**     **OPENSIM: an open-source platform for simulating and analyzing musculoskeletal dynamics**  
 Frank (Clay) Anderson, Eran Guendelman, Peter Loan, Ayman Habib, Chand John, Allison Arnold, Darryl Thelen, and Scott Delp  
 Corresponding Author: Frank (Clay) Anderson  
*Stanford University*

**10:15**     **Biomechanical neck model based on the visible human female**  
 Richard Lasher, Linda Rico, Anita Vasavada, Liying Zheng  
 Corresponding Author: Liying Zheng  
*Washington State University*

**10:30**     **Can a passive dynamic walking robot exhibit a deterministic nonlinear gait?**  
 Chris Arellano, Timothy Judkins, Max Kurz, Melissa Scott-Pandorf  
 Corresponding Author: Timothy Judkins  
*University of Maryland School of Medicine*

**10:45**     **Simulation insights into experimental techniques for estimating walking stability**  
 Kevin Granata, Anthony Marsh, James Norris  
 Corresponding Author: James Norris  
*WFU - VT*

**Saturday, August 25, 2007**                      **9:45 - 11:00 AM**  
**Podium 27: Sports II**  
**Cubberley Auditorium**  
*Chair: Alison Sheets*

**9:45**     **Design of safe ski jump landing surfaces**  
 Mont Hubbard  
 Corresponding Author: Mont Hubbard  
*University of California, Davis*

**10:00**     **Reduced shoe-surface friction can increase the risk of non-contact ACL injury during cutting movements**  
 Ariel Dowling, Stefano Corazza, Lars Mundermann, Todd Alamin, Thomas Andriacchi, and Ajit Chaudhari  
 Corresponding Author: Ariel Dowling  
*Stanford University*

**10:15**     **Regulation of reaction forces during the impact phase of landings**  
 Henryk Flashner, Jill McNitt-Gray, Joseph Munaretto  
 Corresponding Author: Joseph Munaretto  
*University of Southern California*

**10:30**     **The influence of maturation and lower extremity kinetics on swing limb foot velocity in young females during a soccer kick**  
 Mark Lyle, Christine Pollard, Christopher Powers, Susan Sigward  
 Corresponding Author: Mark Lyle  
*University of Southern California, Los Angeles, CA*

**10:45**     **Roles of leading and trailing arms in baseball bat swing**  
 Richard Hinrichs, Young-Kwan Kim  
 Corresponding Author: Young-Kwan Kim  
*Arizona State University*

**Saturday, August 25, 2007**                      **11:15 AM - 12:30 PM**  
**Podium 28: Motor Control II**  
**Memorial Auditorium**  
*Chair: Boris Prilutsky*

**11:15**     **Enhanced inter-joint reflex coupling may contribute to impaired coordination in hemiparetic stroke**  
 Yasin Dhaher, James Finley, Eric Perreault  
 Corresponding Author: James Finley  
*Northwestern University*

**11:30**     **Quantifying stretch reflex contributions to multijoint coordination following stroke**  
 Eric Perreault, Vengateswaran Ravichandran, Randy Trumbower  
 Corresponding Author: Randy Trumbower  
*Rehabilitation Institute of Chicago & Northwestern University*

**11:45**     **Movement stability is affected by muscle fatigue**  
 Jonathan Dingwell, Deanna Gates  
 Corresponding Author: Deanna Gates  
*University of Texas at Austin*

**12 noon**     **Stability criteria reduce neuromuscular redundancy in postural control**  
 Nathan E. Bunderson, Thomas J. Burkholder, Lena H. Ting  
 Corresponding Author: Nathan E. Bunderson  
*Georgia Institute of Technology*

**12:15**     **Cortical networks for controlling instabilities in dexterous manipulation**  
 Chad Lau, Kristine Mosier, Francisco J. Valero-Cuevas, Madhusudhan Venkadesan, Yang Wang  
 Corresponding Author: Madhusudhan Venkadesan  
*Cornell University, The University of Southern California & Indiana University*

Saturday, August 25, 2007

11:15 AM - 12:30 PM

Podium 29: Methods II  
Annenberg Auditorium

Chair: Li-Shan Chou

- 11:15**     **Tracking the position of insole pressure sensors during walking and running**  
Elizabeth Chumanov, Christian Remy, Darryl Thelen  
Corresponding Author: Elizabeth Chumanov  
*University of Wisconsin - Madison*
- 11:30**     **Automatic generation of a subject specific model for accurate markerless motion capture and biomechanical applications**  
Thomas Andriacchi, Stefano Corazza, Emiliano Gambaretto, Lars Mündermann  
Corresponding Author: Stefano Corazza  
*Stanford University*
- 11:45**     **In vivo knee loading measured by an instrumented total knee replacement during activities of daily living**  
Thomas Andriacchi, Cliff Colwell, Darryl D'Lima, Chris Dyrby, Anne Muendermann  
Corresponding Author: Chris Dyrby  
*Stanford University*
- 12 noon**     **Temporomandibular joint kinematics in osteoarthritic patients pre- and post-surgery: The combination of electromagnetic motion data with patient-specific CT images**  
Kai-Nan An, Evre Baltali, Eugene Keller, Matthew Koff, Kristin Zhao  
Corresponding Author: Kristin Zhao  
*Mayo Clinic*
- 12:15**     **A novel method for patient specific finite element mesh development of the spine**  
Nicole Grosland, Nicole Kallemeyn, Kiran Shivanna  
Corresponding Author: Nicole Grosland  
*The University of Iowa*

Saturday, August 25, 2007

11:15 AM - 12:30 PM

Podium 30: Bone II  
Cubberley Auditorium

Chair: Katherine Boyer

- 11:15**     **Subject specific geometry reconstruction of knee bones**  
Anthony G Au, Darren Palathinkal, Adrian B Liggins, V James Raso, Jason Carey, Robert G Lambert, Alidad Amirfazli  
Corresponding Author: Alidad Amirfazli  
*University of Alberta*
- 11:30**     **Compressive properties of trabecular bone in the distal femur**  
Travis Burgers, Jim Mason, Glen Niebur, Heidi Ploeg  
Corresponding Author: Travis Burgers  
*University of Wisconsin-Madison*
- 11:45**     **Displaced soft tissue volume as a metric of comminuted fracture severity**  
Donald Anderson, Thomas Brown, J Lawrence Marsh, Thaddeus Thomas  
Corresponding Author: Thaddeus Thomas  
*University of Iowa*
- 12 noon**     **Determining site-specific bone loss in mice**  
Brandon Ausk, Ted Gross, Philippe Huber, Sundar Srinivasan  
Corresponding Author: Brandon Ausk  
*University of Washington*
- 12:15**     **A biomechanical comparison of an all-locked vs. Hybrid screw configuration of proximal tibial plates**  
Kristine Csavina, Chris Estes, David Jacofsky, Wade Shrader  
Corresponding Author: Kristine Csavina  
*SHRI-CORE Orthopedic Research Labs*



**SCIENTIFIC SESSIONS: Poster***Author lists are in alphabetical order***Thursday, August 23, 2007****4:30 - 6:15 PM****Poster Session 1: Skeletal Tissue  
Memorial Auditorium**

- P1-1**     **Transverse damage and failure behavior of trabecular bone**  
Jaqueline Keilty, Glen Niebur, Constance Slaboch  
Corresponding Author: Glen Niebur  
*University of Notre Dame*
- P1-2**     **A calibration method for stereo fluoroscopic imaging systems**  
J. Erik Giphart, Bart Kaptein, Kevin Shelburne, Michael Torry  
Corresponding Author: J. Erik Giphart  
*Steadman-Hawkins Research Foundation, Vail, CO*
- P1-3**     **A finite element analysis of femoral stresses in a simulated falling on the hip condition**  
Kevin E. Bennet, Mark E. Bolander, Dan M. Dragomir-Daescu, Sean McEligot, Miranda N. Shaw, Michael J. Burke, and Geraldine K. Bernard  
Corresponding Author: Dan M. Dragomir-Daescu  
*Mayo Clinic Division of Engineering*
- P1-4**     **The effect of loading rate on porcine lumbar spinal segments: an in-vitro biomechanical study**  
Kornelia Kulig, Gadi Pelled, John Popovich, Wafa Tawackoli, Judson Welcher, D. Gazit  
Corresponding Author: John Popovich  
*University of Southern California*
- P1-5**     **Stresses in the L2 vertebra under different loading conditions**  
Ibrahim Erdem, Eeric Truumees, Marjolein C.H. van der Meulen  
Corresponding Author: Marjolein C.H. van der Meulen  
*Cornell University*
- P1-6**     **Refinements in modeling the mechanical properties of laryngeal soft tissue**  
Eric Hunter, Ingo Titze  
Corresponding Author: Eric Hunter  
*National Center for Voice and Speech; Denver Center for the Performing Arts*
- P1-7**     **Non-rigid registration of deformable shape models produces a superior normative femur model**  
Weidong Luo, Frances Sheehan, Steven Stanhope  
Corresponding Author: Weidong Luo  
*Catholic University of America*
- P1-8**     **Difference in biomechanical properties between a cervical pedicle screw construct and lateral mass cervical fixation**  
Brad Dunlap, Eldin Karaikovic, Hyung-Soon Park, Li-Qun Zhang  
Corresponding Author: Li-Qun Zhang  
*Rehabilitation Institute of Chicago*
- P1-9**     **Effect of facet arthroplasty on the biomechanics of the lumbar spine — a finite element study**  
Jorge Ochoa, David Rosler, Sasidhar Vadapalli  
Corresponding Author: Sasidhar Vadapalli  
*Archus Orthopedics Inc.,*
- P1-10**    **Bone surface tracking for standing knee MRI: a validation study**  
Peter Barrance, Joaquin Barrios, Irene Davis, Brian Noehren, Michael Pohl  
Corresponding Author: Peter Barrance  
*Kessler Medical Rehabilitation Research and Education Center*
- P1-11**    **Carpal cartilage thickness mapping using micro-CT**  
Jane Casey, Joseph Crisco, Douglas Moore  
Corresponding Author: Douglas Moore  
*Department of Orthopaedics, Brown Medical School/RI Hospital*
- P1-12**    **Effects of labrum thickness and modulus on glenohumeral capsule and labrum strains**  
Richard Debski, Nick Drury, Ben Ellis, Jeff Weiss  
Corresponding Author: Jeff Weiss  
*University of Utah*
- P1-13**    **Effects of area selection choice on quantifying proximal tibia bone density**  
David Hudson, Todd Royer  
Corresponding Author: Todd Royer  
*University of Delaware*
- P1-14**    **Biomechanics of the prodisc artificial disc using finite element analysis**  
Yabo Guan, Dennis J. Maiman, Frank A. Pintar, Narayan Yoganandan, Jiangyue Zhang  
Corresponding Author: Yabo Guan  
*Medical College of Wisconsin*
- P1-15**    **Strand-based simulation of tendinous systems**  
Dinesh K. Pai, Shinjiro Sueda  
Corresponding Author: Shinjiro Sueda  
*University of British Columbia*
- P1-16**    **Accuracy of radiographic intervertebral kinematics as a determinant of lumbar fusion**  
Amir Fayyazi, Bruce Fredrickson, Nathaniel Ordway, Soo-An Park, Mike Sun, Hansen Yuan  
Corresponding Author: Soo-An Park  
*SUNY-Upstate Medical University*

- P1-17**     **A novel approach to design knee implants for wear and stress shielding performance**  
Alidad Amirfazli, Anthony Au, Il Yong Kim, Ryan Willing  
Corresponding Author: Il Yong Kim  
*Queen's University*
- P1-18**     **3.5 mm lag screws as compared with 6.5 mm lag screws for fixation of the distal femur: implications for reconstruction of complex joint injuries**  
Anjali Gupta, John McCamley, M. Wade Shrader, Kristine Csavina, David J. Jacofsky, Paul Tornetta III  
Corresponding Author: Kristine Csavina  
*SHRI-CORE Orthopedic Research Labs, Sun City West, AZ*
- P1-19**     **An in vivo 3d articular model of the radioscapho-capitate (RSC) ligament during wrist flexion/extension and ulnar/radial deviation**  
Edward Akelman, Joseph Crisco, Douglas Moore, Michael Rainbow, Scott Wolfe  
Corresponding Author: Joseph Crisco  
*Department of Orthopaedics, Brown Medical School/Rhode Island Hospital*
- P1-20**     **North American perception of the prestige of biomechanics serials**  
John Chow, Duane Knudson  
Corresponding Author: Duane Knudson  
*California State University, Chico*
- P1-21**     **Fatigue induced damage in cemented total hip arthroplasty can be investigated by acoustic emission**  
Jihui Li, Gang Qi  
Corresponding Author: Jihui Li  
*Columbia University*
- P1-22**     **Finite element parameters affecting micromotion and strain energy density predictions in tibial model as determined by factorial analysis**  
Michael Dunbar, Adam Henderson, Heidi Ploeg, Jill Schmidt  
Corresponding Author: Jill Schmidt  
*University of Wisconsin-Madison*
- P1-23**     **The influence of using one or two lag screws on the mechanical environment of a femoral neck fracture.**  
Chris Brown, Philip Procter, David Simpson, Alan Yettram  
Corresponding Author: David Simpson  
*University of Oxford*
- P1-24**     **The effect of using modular necks with an uncemented hip stem on primary stability**  
Harinderjit Gill, Paige Little, David Simpson  
Corresponding Author: David Simpson  
*University of Oxford*
- P1-25**     **Polyethylene stresses in unicompartmental knee replacements during a step-up activity.**  
Harinderjit Gill, David Simpson  
Corresponding Author: David Simpson  
*University of Oxford*
- P1-26**     **Dynamic loading and biological growth**  
Samer Adeeb, Marcelo Epstein, Walter Herzog  
Corresponding Author: Samer Adeeb  
*University of Calgary*
- P1-27**     **The effect of bone microstructure on microcracks propagation trajectory**  
Ahmad Reza Arshi, Mohamad Reza Eslami, Hamid Reza Katoozian, E. Mallakin, Manssour Moeinzadeh, Ahmad Raeisi Najafi  
Corresponding Author: Manssour Moeinzadeh  
*University of Illinois at Urbana- Champaign*
- P1-28**     **Biomechanical effects of minimally invasive treatment for cervical spondylotic myelopathy**  
Gunnar B.J. Andersson, Lacey E. Bresnahan, Richard G. Fessler, Mozammil Hussain, Raghu N. Natarajan  
Corresponding Author: Lacey E. Bresnahan  
*The University of Chicago*
- P1-29**     **Calibration of the ZETOS bone loading system**  
Sylvana Garcia, Heidi Ploeg, Everett Smith  
Corresponding Author: Sylvana Garcia  
*University of Wisconsin - Madison*
- P1-30**     **Anisotropic stress analysis of the second metatarsal**  
Timothy Derrick, W. Brent Edwards, Stacey Meardon, Erin Ward  
Corresponding Author: W. Brent Edwards  
*Iowa State University*
- P1-31**     **In vitro validation of a dynamic finite element tkr model**  
Randy Ellis, Joel Lanovaz  
Corresponding Author: Joel Lanovaz  
*University of Saskatchewan*
- P1-32**     **Joint loads and bone strains associated with a resurfaced femoral head**  
Donald L. Bartel, Christopher T. Cheng, Jason P. Long  
Corresponding Author: Jason P. Long  
*Cornell University*
- P1-33**     **The evaluation of tribological properties of biomaterials used for knee replacements**  
Radek Sedlacek, Jana Vondrova  
Corresponding Author: Radek Sedlacek  
*Czech Technical University in Prague, Faculty of Mechanical Engineering*

- P1-34** **Marrow space used for high resolution image segmentation of cancellous and cortical bone**  
Robert Burden, Michael Voor, Seid Waddell, Qian Xu  
Corresponding Author: Qian Xu  
*University of Louisville*
- P1-35** **A finite element investigation into the biomechanical effects of minimally invasive treatment for cervical spondylotic myelopathy**  
Gunnar B.J. Andersson, Lacey E. Bresnahan, Richard G. Fessler, Mozammil Hussain, Raghu N. Natarajan  
Corresponding Author: Lacey E. Bresnahan  
*The University of Chicago*
- P1-36** **Effects of ACL interference screws on articular cartilage thickness measurements with 1.5T and 3T MRI**  
Megan Bowers, Braden Fleming, Evan Leventhal, Nhon Trinh, Glenn Tung, JJ Crisco, BB Kimia  
Corresponding Author: Braden Fleming  
*Brown Medical School/Rhode Island Hospital*
- P1-37** **Can height loss across a functional spinal unit modified by static rest breaks mitigate cumulative compression induced injury?**  
Jack P. Callaghan, Robert J Parkinson  
Corresponding Author: Robert J Parkinson  
*University of Waterloo*
- P1-38** **Ankle angle and localized muscle fatigue effects on tibial response during heel impacts**  
David Andrews, Adriana Holmes  
Corresponding Author: Adriana Holmes  
*University of Windsor*
- P1-39** **Biomechanics of adjacent segments with number of inter-body bone grafts and spinal instrumentations for a multi-level fusion construct using a finite element model**  
Howard An, Gunnar Andersson, Mozammil Hussain, Ahmad Nassr, Raghu Natarajan  
Corresponding Author: Mozammil Hussain  
*Rush University Medical Center*
- P1-40** **Relationship between failure progression in a lumbar disc and manual lifting - a poroelastic finite element model study**  
Howard An, Gunnar Andersson, Steve Lavender, Raghu Natarajan  
Corresponding Author: Raghu Natarajan  
*Rush University of Medical Center*
- P1-41** **Finite element simulation of nanoindentation tests for cortical bone using a damaged plastic model**  
Satya Paruchuru, Xuanliang Dong, Xiaodu Wang  
Corresponding Author: Xuanliang Dong  
*University of Texas at San Antonio*
- P1-42** **Mechanical testing of tendon in transverse compression**  
C. Paul Buckley, S.T. Samuel Salisbury, Amy B. Zavatsky  
Corresponding Author: Amy B. Zavatsky  
*University of Oxford*
- Thursday, August 23, 2007** **4:30 - 6:15 PM**  
**Poster Session 2: Aging**  
**Memorial Auditorium**
- P2-1** **Effects of age and loss of balance direction on the kinematics of the threshold of balance recovery**  
Cecile Smeesters, Alessandro Telonio  
Corresponding Author: Cecile Smeesters  
*Universite de Sherbrooke*
- P2-2** **Stair descent knee power changes following minimally invasive computer navigated total knee arthroplasty**  
Kristine Csavina, David Jacofsky, John McCamley, M. Wade Shrader  
Corresponding Author: John McCamley  
*SHRI-CORE Orthopedic Research Labs, Sun City West, AZ*
- P2-3** **Dynamic postural stability during sit-to-walk transitions in the healthy young and healthy elderly**  
Thomas Buckley, Chris Hass, Chris Pitsikoulis  
Corresponding Author: Thomas Buckley  
*Georgia Southern University*
- P2-4** **Effect of Parkinson's disease on step response to a backwards pull**  
Stephen D. Jernigan, Carl Luchies, Kelly Lyons, Molly McVey, Rajesh Pahwa, Antonis Stylianou  
Corresponding Author: Carl Luchies  
*The University of Kansas*
- P2-5** **Passive and active contributions to joint kinetics in elderly gait**  
Bryan Heiderscheit, Amy Silder, Darryl Thelen, Ben Whittington  
Corresponding Author: Amy Silder  
*University of Wisconsin - Madison*
- P2-6** **Altered response to a backwards pull in Parkinson's disease.**  
Carl Luchies, Kelly Lyons, Molly McVey, Rajesh Pahwa, Antonis Stylianou  
Corresponding Author: Carl Luchies  
*University of Kansas*

- P2-7**     **Age and fatigue effects on lower extremity joint torque development**  
 Gregory King, Carl Luchies, Molly McVey, Antonis Stylianou  
 Corresponding Author: Gregory King  
*University of Missouri - Kansas City*
- P2-8**     **Separating the influence of age and speed on gait variability**  
 Jonathan Dingwell, Hyun Gu Kang  
 Corresponding Author: Jonathan Dingwell  
*University of Texas at Austin*
- P2-9**     **Pad causes alterations in the variability of gait patterns**  
 Jason Johanning, Naomi Kochi, Sara Myers, Iraklis Pipinos, Nick Stergiou  
 Corresponding Author: Sara Myers  
*University of Nebraska at Omaha*
- P2-10**    **Center of mass and ankle inclination angles during walking: an alternative detection of gait instability**  
 Chu-Jui Chen, Li-Shan Chou  
 Corresponding Author: Li-Shan Chou  
*University of Oregon*
- P2-11**    **Cruciate ligament removal contributes to abnormal knee motion during posterior stabilized total knee arthroplasty**  
 Melinda Cromie, Scott Delp, Nicholas Giori, Robert Siston  
 Corresponding Author: Melinda Cromie  
*Stanford University*
- P3-4**     **Changes in the postural control system following localized muscle fatigue: a time-delayed stability analysis**  
 Bradley Davidson, Michael Madigan, Maury Nussbaum  
 Corresponding Author: Bradley Davidson  
*Virginia Tech*
- P3-5**     **Electromyographic correlates of internal models of target reaching tasks in randomized force fields**  
 Wen Liu, Mukul Mukherjee  
 Corresponding Author: Mukul Mukherjee  
*University of Kansas Medical Center*
- P3-6**     **Processing effects on joint moments during impact landings**  
 Jeffery Podraza, Scott White  
 Corresponding Author: Scott White  
*University at Buffalo*
- P3-7**     **Presentation of target torque level and error information enhance maximal voluntary elbow flexion torque**  
 Makoto Fukuda, Tetsuo Fukunaga, Yasuo Kawakami, Yohei Takai  
 Corresponding Author: Makoto Fukuda  
*Waseda University*
- P3-8**     **A non-linear analysis of kinematic variability during cyclic reach-and-point movements.**  
 Robert Gregory, David Heller  
 Corresponding Author: Robert Gregory  
*United States Military Academy*
- P3-9**     **Modelling static force generation of rat hindlimb muscles by direct stimulation**  
 Dinesh Pai, Matthew Tresch, Sang Hoon Yeo  
 Corresponding Author: Matthew Tresch  
*Northwestern University*
- P3-10**    **Critical time-to-contact after postural perturbations**  
 Graham Caldwell, Catherine Garipey, Christopher Hasson, William McDermott, Richard Van Emmerik  
 Corresponding Author: Christopher Hasson  
*University of Massachusetts*
- P3-11**    **Adaptations to task mechanics alter stretch reflex gain but not intermuscular coordination**  
 Kuifu Chen, Gwyn Lewis, Eric Perreault  
 Corresponding Author: Eric Perreault  
*Northwestern University*
- P3-12**    **Effect of surface compliance on stepping responses to trunk perturbations**  
 James Ashton-Miller, Manuel Hernandez  
 Corresponding Author: Manuel Hernandez  
*University of Michigan*

**Thursday, August 23, 2007**

**4:30 - 6:15 PM**

**Poster Session 3: Motor Control  
 Memorial Auditorium**

- P3-1**     **Muscle synergies for human postural control are robustly used across multiple postural configurations**  
 Lena Ting, Gelsy Torres-Oviedo  
 Corresponding Author: Lena Ting  
*Emory University and Georgia Institute of Technology*
- P3-2**     **Solutions of a redundant motor task with sub-task conflict**  
 Jaebum Park, Jae Kun Shim  
 Corresponding Author: Jaebum Park  
*University of Maryland*
- P3-3**     **Bidirectional neural coupling between upper and lower limbs**  
 Daniel Ferris, Helen Huang  
 Corresponding Author: Helen Huang  
*University of Michigan*

- P3-13 The optimal release angles of elite discus throwers**  
Steve Leigh, Hui Liu, Bing Yu  
Corresponding Author: Steve Leigh  
*The University of North Carolina at Chapel Hill*
- P3-14 Switching control to actuate elbow motion**  
Mark E. Baratz, Daniel Budny, Angela Flamm, Laurel Kuxhaus, Mark Carl Miller, Pat Schimoler, Jeffrey Viperman  
Corresponding Author: Pat Schimoler  
*University of Pittsburgh*
- P3-15 Stabilization of locomotion by a musculoskeletal model of cat hindlimbs with hill-type actuators**  
Alexander Klishko, Boris Prilutsky  
Corresponding Author: Boris Prilutsky  
*Georgia Institute of Technology*
- P3-16 Rambling-trembling decomposition in two dimensions**  
Marcos Duarte, Mark Latash, Thomas Robert, Vladimir Zatsiorsky  
Corresponding Author: Thomas Robert  
*The Pennsylvania State University*
- P3-17 Angular momentum control of forward dynamic walking**  
Mark Able, Bradford Bennett, Alexandre Ledoux, Shawn Russell, Pradip Sheth  
Corresponding Author: Bradford Bennett  
*University of Virginia*
- P3-18 Examination of cutting knee mechanics using principal components analysis**  
Michael Bottum, Kristian O'Connor  
Corresponding Author: Kristian O'Connor  
*University of Wisconsin - Milwaukee*
- P3-19 Joint moments are coordinated to stabilize vertical endpoint forces during human locomotion**  
Young-Hui Chang, Jasper Yen  
Corresponding Author: Jasper Yen  
*Georgia Institute of Technology*
- P3-20 Selecting among neuromechanical control architectures using kinematic phase and perturbation experiments**  
Robert Full, Daniel Koditschek, Shai Revzen  
Corresponding Author: Shai Revzen  
*University of California, Berkeley*
- P3-21 Mechanics of bipedal running turns**  
Devin Jindrich  
Corresponding Author: Devin Jindrich  
*Arizona State University*
- P3-22 Test-retest reliability of sitting posture in typically developing infants.**  
Joan Deffeyes, Stacey DeJong, Regina Harbourne, Anastasia Kyvelidou, Wayne Stuber, Nicholas Stergiou, Junfeng Sun  
Corresponding Author: Anastasia Kyvelidou  
*University of Nebraska at Omaha*
- P3-23 Neuromechanical modeling of functional muscle synergies for postural control in the cat**  
J. Lucas McKay, Lena H. Ting, Gelsy Torres-Oviedo  
Corresponding Author: Lena H. Ting  
*Georgia Institute of Technology and Emory University*
- P3-24 Muscle function is biased towards positive over negative work in level human gait**  
Paul DeVita, Allison Gruber, Tibor Hortobagyi, Lars Janshen, Brian Moscicki, Patrick Rider, Stanislaw Solnik, Paul Zalewski  
Corresponding Author: Paul DeVita  
*East Carolina University*
- P3-25 Upper and lower limb disturbance rejection of self-triggered and computer-cued load perturbations**  
Kari Danek, Daniel Ferris, Brent Gillespie, Jessy Grizzle  
Corresponding Author: Kari Danek  
*University of Michigan*
- P3-26 Biomechanical constraints on equilibrium point control of multi-joint arm postures**  
James Gordon, Ning Lan, Dan Song  
Corresponding Author: Ning Lan  
*University of Southern California*
- P3-27 Lower limb force production and bilateral force asymmetries are based on sense of effort**  
Daniel Ferris, Ann Simon  
Corresponding Author: Ann Simon  
*University of Michigan*
- P3-28 Revisiting the EMG-torque relationship of the trunk musculature: effects of antagonistic co-contraction**  
Stephen Brown, Stuart McGill  
Corresponding Author: Stephen Brown  
*University of Waterloo*
- P3-29 Muscular contributions to vertebral joint rotational stiffness during the standard pushup**  
Tyson Beach, Jack Callaghan, Samuel Howarth  
Corresponding Author: Samuel Howarth  
*University of Waterloo*
- P3-30 Muscle activation patterns change the inherent stiffness of the human trunk**  
Stephen Brown, Stuart McGill  
Corresponding Author: Stephen Brown  
*University of Waterloo*



- P3-31 Joint kinetic contributions to acute performance enhancement & degradation**  
Loren Chiu, George Salem  
Corresponding Author: Loren Chiu  
*University of Southern California*
- P3-32 Gender differences in spinal posture and user positioning on a prototype seat pan**  
Jack Callaghan, Diana De Carvalho, Nadine Dunk  
Corresponding Author: Diana De Carvalho  
*University of Waterloo*
- P3-33 Effects of gender on lower extremity muscle activation in children performing a single-leg unanticipated landing task**  
David Clark, Kristof Kipp, Kristin Kipp, Seth Kuhlman, Ronald Pfeiffer, Michelle Sabick, Kevin Shea  
Corresponding Author: Ronald Pfeiffer  
*Boise State University*
- P3-34 Effects of breathing on muscle strength of large muscle groups**  
Adam Borg, Devn Brown, Elizabeth Ikeda, Sheng Li, Jessica Malouf  
Corresponding Author: Sheng Li  
*University of Montana*
- P3-35 Obstacle avoidance with varying ability to spatially orient attention following mild traumatic brain injury**  
Robert Catena, Li-Shan Chou, Charlene Halterman, Paul van Donkelaar  
Corresponding Author: Li-Shan Chou  
*University of Oregon*
- Thursday, August 23, 2007 4:30 - 6:15 PM**  
**Poster Session 4: Injury**  
**Memorial Auditorium**
- P4-1 Lower extremity kinematic consequences during vertical to horizontal momentum redirection**  
Henryk Flashner, Laura Held, Jill McNitt-Gray  
Corresponding Author: Laura Held  
*University of Southern California*
- P4-2 Factors affecting lumbar kinetics during dependent transfers on an aircraft.**  
Brian Higginson, Welsh Lisa, Michael Pavol  
Corresponding Author: Michael Pavol  
*Oregon State University*
- P4-3 Muscle forces at the knee during walking and running in patients with patellofemoral pain**  
Gary Beaupre, Thor Besier, Garry Gold, Michael Fredericson, Scott Delp  
Corresponding Author: Thor Besier  
*Stanford University*
- P4-4 The effect of hand position on subscapularis force during the belly-press test**  
Marcus Pandy, Kevin Shelburne, Michael Torry, Takashi Yanagawa  
Corresponding Author: Takashi Yanagawa  
*Steadman Hawkins Research Foundation*
- P4-5 Effect of orientation on failure criteria for lumbar spine segments**  
David Burnett, Naira Campbell-Kyureghyan, Sai Vikas Yalla  
Corresponding Author: Naira Campbell-Kyureghyan  
*University of Louisville*
- P4-6 Deformation at branch points in human cerebral arteries**  
Louis Cheng, Geoffrey Manley, Kenneth Monson, Joshua Smith  
Corresponding Author: Joshua Smith  
*University of California, San Francisco*
- P4-7 The influence of stride length on impact shock and metabolic cost during walking in obese women**  
Joseph Hamill, Elizabeth Russell  
Corresponding Author: Elizabeth Russell  
*University of Massachusetts*
- P4-8 Spinal mechanics during drop landing: effects of gender and landing technique**  
John W. Chow, Soo-An Park, Mark D. Tillman  
Corresponding Author: Soo-An Park  
*SUNY-Upstate Medical University*
- P4-9 A stochastic biomechanical model for the risk and risk factors for non-contact ACL injury**  
Bing Yu, Chengfeng Lin, Chuanshu Ji, Paul S. Weinholt, Michael T. Gross, Darin A. Padua, and William E. Garrett  
Corresponding Author: Bing Yu  
*The University of North Carolina at Chapel Hill*
- P4-10 Meniscal injury in conjunction with acute and chronic ACL tears increase peak cartilage stresses**  
Thomas Andriacchi, Nathan Netravali  
Corresponding Author: Nathan Netravali  
*Stanford University*
- P4-11 Prospective study of kinetic factors associated with tibial stress fractures in runners**  
Irene Davis, Joseph Hamill, Michael Pohl  
Corresponding Author: Michael Pohl  
*University of Delaware*
- P4-12 Validation of tri-axial accelerometer for the calculation of elevation angles**  
Tal Amasay, Andrew Karduna, Laurel Kincl, Keely Zodrow  
Corresponding Author: Tal Amasay  
*University of Oregon*

- P4-13** **Acute torsional failure: do physiological loading rates effect the spine's limit?**  
Jack Callaghan, Janessa Drake  
Corresponding Author: Janessa Drake  
*University of Waterloo*
- P4-14** **Sagittal ACL graft orientation influences passive and dynamic anterior tibial translation**  
Katerina Blazek, Ajit Chaudhari, Jason Drago, Sean Scanlan, Joshua Schmidt, and Tom Andriacchi  
Corresponding Author: Sean Scanlan  
*Stanford University*
- P4-15** **Correlation of dynamic cartilage contact stress aberration with severity of joint instability**  
Thomas Brown, Todd McKinley, Douglas Pedersen, M. James Rudert, Yuki Tochigi  
Corresponding Author: Yuki Tochigi  
*University of Iowa*
- P4-16** **Frontal plane knee joint stiffness: gender and hormonal effects**  
Martha Cammarata, Tobey DeMott, Yasin Dhaher, Jennifer Moore  
Corresponding Author: Yasin Dhaher  
*Northwestern University*
- P4-17** **Electromyographic and kinematic evaluation of provocative tests for slap lesions**  
Seth M. Kuhlman, Michelle B. Sabick, Ronald P. Pfeiffer, Kurt Nilsson, Kevin G. Shea, Mike Curtin, and David Clark  
Corresponding Author: Seth Kuhlman  
*Boise State University*
- P4-18** **Model for occupants ejected from vehicles with roll and yaw**  
Chad Hovey, Matthew Kaplan, Robert Piziali  
Corresponding Author: Chad Hovey  
**Piziali and Associates, Inc.**
- P4-19** **Evaluation of injury criteria for predicting commotio cordis**  
Cynthia Bir, Nathan Dau, Mark Link, Christopher Madias  
Corresponding Author: Nathan Dau  
*Wayne State University*
- P4-20** **Prospective study of the biomechanical factors associated with patellofemoral pain**  
Irene Davis, Brian Noehren  
Corresponding Author: Brian Noehren  
*University of Delaware*
- P4-21** **Glucosamine and chondroitin sulfate affect the response of exercised articular cartilage to blunt impact loading**  
Nurit Golenberg, Roger Haut, Eugene Kepich, Feng Wei  
Corresponding Author: Roger Haut  
*Michigan State University*
- P4-22** **Biofidelity requirements for an advanced headform for the prediction of eye injuries**  
Fred Brozoski, Paul Depinet, Stefan Duma, Eric Kennedy  
Corresponding Author: Eric Kennedy  
*Virginia Tech - Wake Forest University Center for Injury Biomechanics*
- P4-23** **The effect of cardiovascular fatigue on trunk muscle activation and spine postures during firefighting tasks**  
Jack Callaghan, Diane Gregory, Samuel Howarth, Sonia Narula  
Corresponding Author: Diane Gregory  
*University of Waterloo*
- P4-24** **Effect of linear wheelchair velocity on a new manual wheelchair user joint injury index**  
Mohammadreza Mallakzadeh, Farrokh Sassani, Bonita J Sawatzky  
Corresponding Author: Mohammadreza Mallakzadeh  
*The University of British Columbia*
- P4-25** **Whiplash causes increased laxity of cervical capsular ligament**  
Erik J. Carlson, Marcus Coe, Shigeki Ito, Paul Ivancic, Anthony B. Ndu, Manohar M. Panjabi, Wolfgang Rubin, Yasuhiro Tominaga  
Corresponding Author: Paul Ivancic  
*Yale University School of Medicine*

Friday, August 24, 2007

4:30 - 6:15 PM

**Poster Session 5: Rehabilitation  
Memorial Auditorium**

- P5-1** **Gait adaptations and recovery rates following minimally invasive total hip replacement**  
Richard Berger, Kharma Foucher, Robert Trombley, Markus Wimmer  
Corresponding Author: Markus Wimmer  
*Rush University Medical Center*
- P5-2** **Functional gait outcomes after intertrochanteric hip fracture**  
Ellen Boeke, Kristine Csavina, M. Wade Shrader, Kimberly Yarnall  
Corresponding Author: Kimberly Yarnall  
*SHRI-CORE Orthopedic Research Labs, Sun City West, AZ*
- P5-3** **Post-TKA effects of prehabilitation on standing knee kinetics**  
Peter M. Quesada, James E. Doane, Ann M. Swank, Claudia A. Angeli, John Nyland, and Robert V. Topp  
Corresponding Author: Peter Quesada  
*University of Louisville*

- P5-4 Surgical recession of the gastrocnemius for isolated contracture: a case study**  
Michael Castro, Nicole Chimera, Kurt Manal  
Corresponding Author: Kurt Manal  
*Center for Biomedical Engineering Research, University of Delaware*
- P5-5 Assessment of function of an orthotic brace control mechanism**  
Steven Anderson, Jessica Hagan, William Hnat, John Lilly, Kenneth A. Mook, Peter Quesada  
Corresponding Author: Peter Quesada  
*University of Louisville*
- P5-6 Effects of wheelchair propulsion training on pushrim kinetics**  
Michael Boninger, Rachel Cowan, Alicia Koontz, Ian Rice  
Corresponding Author: Alicia Koontz  
*Human Engineering Research Laboratories*
- P5-7 Disease severity influences trunk sway and knee loading during walking in patients with medial compartment knee OA**  
Thomas P. Andriacchi, Jessica L. Asay, Annegret Muendermann  
Corresponding Author: Annegret Muendermann  
*Stanford University*
- P5-8 Reflex and nonreflex characterization of spasticity in children with cerebral palsy: dependence of catch angle on velocity**  
Jia-Jin Chen, Deborah Gaebler, Hyung-Soon Park, Yi-Ning Wu, Li-Qun Zhang  
Corresponding Author: Li-Qun Zhang  
*Northwestern University*
- P5-9 Can intervertebral kinematics predict clinical outcome of lumbar discectomy?**  
Jerry Calabrese, Amir Fayyazi, Nathaniel Ordway, Soo-An Park, Hansen Yuan  
Corresponding Author: Soo-An Park  
*SUNY-Upstate Medical University*
- P5-10 Lower limb synergy patterns of stroke subjects while walking in a lokomat robotic orthosis**  
Joseph Hidler, Nathan Neckel, Diane Nichols  
Corresponding Author: Nathan Neckel  
*Catholic University of America*
- P5-11 Integer programming models for optimizing shoulder rehabilitation**  
James Carpenter, Christopher Gatti, Richard Hughes, Jason Scibek, Oleg Svintsitski  
Corresponding Author: Richard Hughes  
*University of Michigan*
- P5-12 Control system development for automatic standing balance using functional neuromuscular stimulation (FNS) following spinal cord injury (SCI)**  
Musa Audu, Robert Kirsch, Raviraj Nataraj, Ronald Triolo  
Corresponding Author: Raviraj Nataraj  
*Case Western Reserve University*
- P5-13 Effect of the lateral wedged insoles on the joint load of knee and ankle in patients with medial knee osteoarthritis**  
Yuji Kuroyanagi, Hideo Matsumoto, Takeo Nagura, Toshiro Otani, Yasumori Suda, and Y. Toyama  
Corresponding Author: Yuji Kuroyanagi  
*Department of Orthopedic Surgery, Keio University*
- P5-14 3-d joint motion of ACL deficient and reconstructed knees during daily activities**  
Bo Gao, Peter Indelicato, Michael Moser, Nigel Zheng  
Corresponding Author: Nigel Zheng  
*University of Florida*
- P5-15 Is gait after unilateral total knee arthroplasty similar to healthy adults?**  
Clare Milner  
Corresponding Author: Clare Milner  
*University of Tennessee*
- Friday, August 24, 2007 4:30 - 6:15 PM**  
**Poster Session 6: Computational Biomechanics**  
**Memorial Auditorium**
- P6-1 Analytical expression of musculotendon model including viscoelastic properties of tendon**  
Miloslav Vilimek  
Corresponding Author: Miloslav Vilimek  
*Czech Technical University in Prague*
- P6-2 Influence of loading on knee extensor mechanics in total knee replacement: a computer simulation study**  
Michael Hast, Ryan Landon, Stephen Piazza  
Corresponding Author: Stephen Piazza  
*The Pennsylvania State University*
- P6-3 Musculo-skeletal modeling software (MSMS) for biomechanics and virtual rehabilitation**  
Rahman Davoodi, Mehdi Khachani, Gerald E. Loeb  
Corresponding Author: Mehdi Khachani  
*Alfred Mann Institute and Department of Biomedical Engineering - University of Southern California*
- P6-4 Criteria for wrapping surface parameters for spinal muscles**  
Richard Lasher, Travis Meyer, Anita Vasavada  
Corresponding Author: Anita Vasavada  
*Washington State University*

- P6-5 Robust contact spring placement using trimmed nurbs surfaces for simulation of articular contact**  
Ryan Landon, Stephen Piazza  
Corresponding Author: Stephen Piazza  
*The Pennsylvania State University*
- P6-6 Validation of orthopaedic related image segmentation techniques**  
Nicole DeVries, Esther Gassman, Nicole Grosland, Nicole Kallemeyn, Vincent A. Magnotta, Kiran Shivanna  
Corresponding Author: Nicole Grosland  
*University of Iowa*
- P6-7 Three-dimensional hyperelastic model of the human knee: a parametric sensitivity study**  
Yasin Dhaher, Qunli Sun  
Corresponding Author: Yasin Dhaher  
*Northwestern University and Rehabilitation Institute of Chicago*
- P6-8 Virtue of boundary element method in calculation of pressure distribution on boundary based segmented medical images**  
Nasser Fatourae, Ali Pashae  
Corresponding Author: Nasser Fatourae  
*Amirkabir University of Technology*
- P6-9 A musculoskeletal model of the rat hindlimb**  
V Reggie Edgerton, Devin Jindrich, William Johnson, Roland Roy  
Corresponding Author: William Johnson  
*UCLA*
- P6-10 A genetic algorithm approach to singularity avoidance in the analysis of weight lifting performance**  
Ahmed Reza Arshi, Amir Homayoun Javadi, Manssour Moeinzadeh, Elham Shirzad  
Corresponding Author: Manssour Moeinzadeh  
*University of Illinois at Urbana-Champaign*
- P6-11 Magnetic resonance image segmentation for biomechanical modeling of the orbit**  
Joseph L. Demer, Joel M. Miller, Dinesh K. Pai, Qi Wei  
Corresponding Author: Qi Wei  
*Rutgers University*
- P6-12 Shoulder mechanics: analytical modeling and validation**  
Noshir Langrana, Sue Ann Sisto, Sarah Sullivan  
Corresponding Author: Sarah Sullivan  
*Rutgers University*
- P6-13 Forward dynamics simulations of human gait using neuromusculoskeletal tracking**  
Hyung Joo Kim, Marcus Pandy, Ajay Seth  
Corresponding Author: Ajay Seth  
*Stanford University*
- P6-14 Muscle activation, joint position and muscle mass distribution: considerations for musculoskeletal modeling**  
Timothy Clark, David Hawkins  
Corresponding Author: David Hawkins  
*University of California - Davis*
- P6-15 A rigid body model of a lacrosse shot underestimates measured ball velocities**  
Joseph Crisco, Michael Rainbow, Eileen Wang  
Corresponding Author: Joseph Crisco  
*Bioengineering Laboratory, Department of Orthopaedics, Brown Medical School/Rhode Island Hospital*
- P6-16 Simulation study of walking patterns with knee osteoarthritis using opensim**  
Jill Higginson, Ming Xiao  
Corresponding Author: Ming Xiao  
*University of Delaware*
- P6-17 A proposed new obstacle-set algorithm for modeling the wrapping path of deltoid**  
Brian Garner, Bo Xu  
Corresponding Author: Brian Garner  
*Baylor University*
- P6-18 Using distributions of forward dynamic simulations to investigate model inaccuracies**  
Matt Camilleri  
Corresponding Author: Matt Camilleri  
*Sacramento City College*
- P6-19 A novel elastic foundation contact detection algorithm for use in a six degree of freedom knee model**  
Roger Gonzalez, Nathan Green  
Corresponding Author: Roger Gonzalez  
*LeTourneau University*
- P6-20 A neuro-musculoskeletal motor control model with somatosensory and vestibular feedback**  
Kamran Iqbal, Anindo Roy  
Corresponding Author: Kamran Iqbal  
*University of Arkansas at Little Rock*
- P6-21 Patient specific finite element modeling of lumbar vertebrae**  
Dennis Abernathie, Dirk Alander, Ferris Pfeiffer, Douglas Smith, Carol Ward  
Corresponding Author: Ferris Pfeiffer  
*University of Missouri*
- P6-22 Expressing joint axis orientation**  
Kevin A Ball, Thomas M Greiner  
Corresponding Author: Kevin A Ball  
*University of Hartford*

- P6-23**     **A model of maximum voluntary joint torque variation with joint angle and angular velocity**  
 Dennis Anderson, Michael Madigan, Maury Nussbaum  
 Corresponding Author: Dennis Anderson  
*Virginia Tech*
- P6-24**     **Exclusion of the subtalar joint affects significantly the calculated ankle muscle forces during gait.**  
 Ilse Jonkers, Gerlinde Lenaerts, Friso Hagman, Louis Peeraer, Jos Vander Sloten, and Georges Van der Perre  
 Corresponding Author: Ilse Jonkers  
*Katholieke Universiteit Leuven*
- P6-25**     **Reliability of lower extremity anthropometric measures and their effect on wobbling mass tissue predictions**  
 David Andrews, Timothy Burkhart, Katherine Teigrob  
 Corresponding Author: Timothy Burkhart  
*University Of Windsor*
- P6-26**     **Bayesian techniques improve human motion estimation**  
 Friedl De Groote, Tinne De Laet, Joris De Schutter, Ilse Jonkers  
 Corresponding Author: Friedl De Groote  
*Katholieke Universiteit Leuven*
- P6-27**     **Response-surface mapping to generate distributions of forward dynamic simulations**  
 Matt Camilleri  
 Corresponding Author: Matt Camilleri  
*Sacramento City College*
- P6-28**     **Muscle contributions to body segment mechanical power during able-bodied toe walking**  
 Judith Burnfield, Sara Mulroy, Richard Neptune, Kotaro Sasaki  
 Corresponding Author: Richard Neptune  
*Department of Mechanical Engineering, The University of Texas at Austin, Austin, TX*
- P6-29**     **Automated hexahedral meshing of anatomical structures using deformable registration**  
 Ritesh Bafna, Nicole Grosland, Vincent Magnotta  
 Corresponding Author: Nicole Grosland  
*The University of Iowa*
- P6-30**     **A new trunk volume representation for geometric body segment models**  
 Genevieve Dumas, Jason Wicke  
 Corresponding Author: Jason Wicke  
*Texas A&M University - Commerce*
- P6-31**     **A check of mesh quality**  
 Nicole Grosland, Curtis Lisle, Vincent Magnotta, Steve Pieper, Kiran Shivanna  
 Corresponding Author: Nicole Grosland  
*The University of Iowa*
- P6-32**     **Patient-specific orthopaedic surgical planning: image datasets to fe models**  
 Nicole M Grosland, Vincent A Magnotta, Kiran H Shivanna, Srinivas C Tadepalli  
 Corresponding Author: Srinivas C Tadepalli  
*The University of Iowa*
- P6-33**     **Determining vertical ground reaction forces without a force platform using a mass-spring-damper model**  
 Graham Caldwell, Timothy Derrick, Ross Miller  
 Corresponding Author: Ross Miller  
*University of Massachusetts Amherst*
- Friday, August 24, 2007**     **4:30 - 6:15 PM**  
**Poster Session 7: Muscle Memorial Auditorium**
- P7-1**     **A comparison of force-velocity properties of single muscle fibers obtained under dynamic and steady-state conditions**  
 Sampath Gollapudi, David Lin  
 Corresponding Author: David Lin  
*Washington State University*
- P7-2**     **Muscle architecture of extensor carpi radialis longus and brevis: a comprehensive volumetric modeling approach**  
 Anne Agur, Eugene Fiume, Victor Ng-Thow-Hing, Kajeandra Ravichandiran, Karan Singh  
 Corresponding Author: Anne Agur  
*University of Toronto*
- P7-3**     **Emg-based estimates of pennation angle for the primary ankle dorsi and plantarflexors during isometric contractions**  
 Thomas Buchanan, Kurt Manal, Dustyn Roberts  
 Corresponding Author: Kurt Manal  
*Center for Biomedical Engineering Research, University of Delaware*
- P7-4**     **In vivo examinations of medial gastrocnemius: change of force-generating capacity in stroke survivors**  
 Fan Gao, Li-Qun Zhang  
 Corresponding Author: Li-Qun Zhang  
*Rehabilitation Institute of Chicago & Northwestern University*
- P7-5**     **Trade-offs in performance associated with muscle fiber type composition**  
 Brian Umberger  
 Corresponding Author: Brian Umberger  
*University of Massachusetts Amherst*



- P7-6 Architecture of the first dorsal interosseous muscle**  
John Challis, Daniel Gales, Benjamin Infantolino  
Corresponding Author: Benjamin Infantolino  
*Pennsylvania State University*
- P7-7 Determination of the psoas major muscle thickness by B-mode ultrasonography**  
Tetsuo Fukunaga, Yoichi Katsumata, Yasuo Kawakami, Yohei Takai  
Corresponding Author: Yoichi Katsumata  
*Waseda University*
- P7-8 An unconstrained workloop approach to study stability in frog muscle in vitro**  
Stephen DeWeerth, Kartik Sundar, Lena Ting  
Corresponding Author: Kartik Sundar  
*Georgia Institute of Technology*
- P7-9 Temperature-dependent mechanical properties of human type-I muscle fibers**  
Sampath Gollapudi, David Lin  
Corresponding Author: Sampath Gollapudi  
*Washington State University*
- P7-10 Estimation of myotendinous junction displacement using a cross correlation algorithm for ultra-sound images**  
Daniel Alves, Liliam Oliveira, Carolina Peixinho, Taian Vieira  
Corresponding Author: Liliam Oliveira  
*Federal University of Rio de Janeiro*
- P7-11 Influence of isometric muscle fatigue on the human force-length relationship**  
Eric Berton, Stuart Binder-Macleod, Thomas Buchanan, Ramu Perumal, Guillaume Rao  
Corresponding Author: Guillaume Rao  
*Department of Mechanical Engineering, University of Delaware*
- P7-12 Human lower extremity design: architecture of hip, knee, and ankle muscles**  
Jacqueline Braun, Carolyn Eng, Trevor Kingsbury, Richard Lieber, Kristin Lieber, Laura Smallwood, Samuel Ward, Taylor Winters  
Corresponding Author: Samuel Ward  
*University of California San Diego*
- P7-13 Scaling of joint mechanics and muscle architecture in the human knee**  
Samuel R. Ward, Trevor Kingsbury, Taylor Winters, Kristin M. Lieber, Jacqueline Braun, Carolyn M. Eng, and Richard L. Lieber  
Corresponding Author: Samuel Ward  
*University of California San Diego*
- P7-14 The relationship between muscle force and intramuscular pressure during dynamic muscle contractions**  
Jennifer Davis, Kenton Kaufman, Richard Lieber, Samuel Ward  
Corresponding Author: Samuel Ward  
*University of California San Diego*
- P7-15 Cyclic compressive loading facilitates functional and histological recovery following strain induced damage in skeletal muscle**  
Sudha Agarwal, Thomas Best, Timothy Butterfield, Yi Zhao  
Corresponding Author: Timothy Butterfield  
*The Ohio State University*
- P7-16 Continuum-based model of skeletal muscle**  
Tammy Haut Donahue, Kenton Kaufman, Duane Morrow, Gregory Odegard  
Corresponding Author: Gregory Odegard  
*Michigan Technological University*
- P7-17 Human lower extremity design: architecture of human hamstring and quadriceps muscles**  
Jacqueline Braun, Carolyn Eng, Trevor Kingsbury, Kristin Lieber, Taylor Winters  
Corresponding Author: Kristin Lieber  
*University of California*
- P7-18 The effect of muscle fatigue on correlations in timing errors**  
Jonathan Dingwell, Deanna Gates  
Corresponding Author: Deanna Gates  
*University of Texas at Austin*
- P7-19 Evaluation of three methods for determining EMG-muscle force parameter estimates for the shoulder muscles**  
Christopher J. Gatti, Lisa Case Doro, Joseph E. Langenderfer, Amy G. Mell, Joseph D. Maratt, James E. Carpenter, Richard E. Hughes  
Corresponding Author: Richard Hughes  
*University of Michigan*
- P7-20 Effect of glutathione depletion and age on skeletal muscle performance during a chronic stretch-shortening contraction exposure**  
Brent Baker, Robert Cutlip, Melinda Hollander, Michael Kashon  
Corresponding Author: Robert Cutlip  
*National Institute for Occupational Safety and Health*
- P7-21 Reliability of hand-free ultrasound measurement for vastus medialis obliquus**  
Gabriel Ng, Yiu Ming Wong  
Corresponding Author: Yiu Ming Wong  
*Hong Kong Polytechnic University*

**P7-22 Residual force depression is not abolished following a quick shortening step**  
Walter Herzog, Timothy Leonard  
Corresponding Author: Walter Herzog  
*University of Calgary*

**Friday, August 24, 2007**

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**Poster Session 8: Sports  
Memorial Auditorium**

**P8-1 Stroke resumption following flip turns in swimming**  
Richard Hinrichs, Bethany Larsen  
Corresponding Author: Richard Hinrichs  
*Arizona State University*

**P8-2 Cruciate ligament force between the forward lunge long and short with and without a stride**  
Rafael F. Escamilla, Naiquan Zheng, Alan Hreljac, Rodney Imamura, Toran D. MacLeod, William B. Edwards, Glenn S. Fleisig, Kevin E. Wilk  
Corresponding Author: Rafael Escamilla  
*California State University, Sacramento*

**P8-3 Changes in leg stiffness and sprint characteristics during the acceleration phase of running in top sprinters**  
Kai Kobayashi, Shigeo Iso, Kazuyuki Kanosue, Hiroyasu Tsuchie, Tetsuo Fukunaga, Yasuo Kawakami  
Corresponding Author: Kai Kobayashi  
*Waseda University*

**P8-4 Contributions of passive-tension vs. inertial effects on gravity correction for strength training**  
Colleen Delmonaco, Laura Frey Law, Andrea Laake  
Corresponding Author: Laura Frey Law  
*University of Iowa*

**P8-5 Ground reaction forces between running shoes, racing flats and distance spikes in runners**  
Iain Hunter, Suzanna Logan  
Corresponding Author: Iain Hunter  
*Brigham Young University*

**P8-6 The effect of stroke length on active drag in swimming**  
Richard Hinrichs, Bryan Morrison  
Corresponding Author: Bryan Morrison  
*Valparaiso University & Arizona State University*

**P8-7 Influence of cycling intensity on running kinematics and electromiography in well trained triathletes**  
Javier Mon, Ramón Maañón, Oscar Viana, Jose A. Sánchez, Rafael Martín, Miguel Fernández del Olmo  
Corresponding Author: Miguel Fernández del Olmo  
*Faculty of Sciences of Sport and Physical Education (INEF Galicia)*

**P8-8 Multi-segment foot kinematics in high- and low-arched females recreational athletes during walking and running**  
Benjamin Long, Clare Milner, Douglas Powell, Songning Zhang  
Corresponding Author: Douglas Powell  
*The University of Texas of the Permian Basin*

**P8-9 Lumbar motion during pitching in professional baseball players**  
Ajit Chaudhari, Christopher McKenzie  
Corresponding Author: Ajit Chaudhari  
*The Ohio State University*

**P8-10 Dynamic and static changes in foot shape**  
Sharna Clark-Donovan, Gordon Valiant  
Corresponding Author: Sharna Clark-Donovan  
*Nike Sport Research Lab*

**P8-11 Comparison of split double twists and split triple twists in pairs figure skating**  
Deborah L. King, Sarah L. Smith, Michele R. Brown, Jean L. McCrory, Barry A. Muncasy, Gary L. Scheirman  
Corresponding Author: Deborah King  
*Ithaca College*

**P8-12 Stepping aerobics: how do the stepping direction and height affect joint kinetics?**  
Man-Ying Wang, Hsin-Chang Wu  
Corresponding Author: Man-Ying Wang  
*University of Southern California*

**P8-13 Push up bars and hand position affect upper extremity muscle activity during the push up exercise**  
Aaron Decker, Siufong Lam, Steven McCaw, Amanda Somers, Mitch Waller  
Corresponding Author: Steven McCaw  
*Illinois State University*

**P8-14 A mechanical cause of body rotation about the vertical axis in baseball batting**  
Toshimasa Yanai  
Corresponding Author: Toshimasa Yanai  
*Chukyo University*

**Friday, August 24, 2007**

**4:30 - 6:15 PM**

**Poster Session 9: Locomotion  
Memorial Auditorium**

**P9-1 Effects of physical assistance on narrow beam walking**  
Antoinette Domingo, Daniel Ferris  
Corresponding Author: Antoinette Domingo  
*University of Michigan*

- P9-2 Walking with increased push-off decreases hip flexion moment**  
Daniel Ferris, Cara Lewis  
Corresponding Author: Cara Lewis  
*University of Michigan*
- P9-3 Comparison of the plantarflexion moment arms of lateral gastrocnemius between sprinters and non-sprinters**  
Sabrina Lee, Stephen Piazza  
Corresponding Author: Stephen Piazza  
*The Pennsylvania State University*
- P9-4 Kinematic correlates of the free moment and combined loads during running**  
Timothy Derrick, PhD, William Edwards, Stacey Meardon  
Corresponding Author: Stacey Meardon  
*Iowa State University*
- P9-5 Mechanics and energetics of incline walking with powered ankle exoskeletons**  
Daniel Ferris, Gregory Sawicki  
Corresponding Author: Gregory Sawicki  
*University of Michigan-Ann Arbor*
- P9-6 In vivo measurement of the inversion-eversion moment arms of gastrocnemius and tibialis anterior**  
Sabrina Lee, Stephen Piazza  
Corresponding Author: Stephen Piazza  
*The Pennsylvania State University*
- P9-7 Functional gait outcomes in stair climbing after intertrochanteric hip fracture**  
Ellen Boeke, Kristine Csavina, M. Wade Shrader, Kimberly Yarnall  
Corresponding Author: Kimberly Yarnall  
*SHRI-CORE Orthopedic Research Labs, Sun City West, AZ*
- P9-8 Estimating lean angle through application of the gravity line projection algorithm**  
Elizabeth Hsiao-Wecksler, Pilwon Hur, Seiji Naito  
Corresponding Author: Elizabeth Hsiao-Wecksler  
*University of Illinois at Urbana Champaign*
- P9-9 An innovative diagnostic tool for reducing traumatic knee injuries**  
Brian Armstrong, Michael Bottum, Mustafa Farrah, Kristian O'Connor, Stephen Watts  
Corresponding Author: Kristian O'Connor  
*University of Wisconsin - Milwaukee*
- P9-10 A functional method for locating the subtalar joint axis: in vivo assessment of accuracy**  
Gregory S. Lewis, Andrea R. Seisler, Tamara L. Cohen, Kevin A. Kirby, Frances T. Sheehan, Stephen J. Piazza  
Corresponding Author: Gregory Lewis  
*The Pennsylvania State University*
- P9-11 Measurement of ground reaction force in single limb support through markerless motion capture**  
Thomas Andriacchi, Stefano Corazza  
Corresponding Author: Stefano Corazza  
*Stanford University*
- P9-12 Finite helical axes of ACL-deficient and ACL-reconstructed knees during walking**  
Bo Gao, Nigel Zheng  
Corresponding Author: Nigel Zheng  
*University of Florida*
- P9-13 A hybrid methodology using ultrasonography and motion analysis for estimation of achilles tendon moment arms in vivo**  
Thomas Buchanan, Nicole Chimera, Justin Cowder, Kurt Manal  
Corresponding Author: Kurt Manal  
*Center for Biomedical Engineering Research, University of Delaware*
- P9-14 Effects of an elastic knee orthosis on unilateral hopping**  
Michael S. Cherry, Daniel P. Ferris, Sridhar Kota  
Corresponding Author: Michael S. Cherry  
*The University of Michigan*
- P9-15 Independent effects of weight and mass on muscle activity during walking**  
Rodger Kram, Craig McGowan, Richard Neptune  
Corresponding Author: Craig McGowan  
*University of Colorado at Boulder*
- P9-16 Traditional vs. continuous data collection for gait evaluation**  
James Doane, Peter Quesada, Ann Swank, Robert Topp  
Corresponding Author: Peter Quesada  
*University of Louisville*
- P9-17 Does weight influence locomotive stability?**  
Christopher J. Arellano, Max J. Kurz, Charles S. Layne, Daniel P. O'Connor, Melissa Scott-Pandorf  
Corresponding Author: Christopher J. Arellano  
*University of Houston*
- P9-18 Exploring the impulse response of the postural control system**  
Brett Duiser, Elizabeth Hsiao-Wecksler, Pilwon Hur  
Corresponding Author: Elizabeth Hsiao-Wecksler  
*University of Illinois at Urbana-Champaign*
- P9-19 Power required to maintain balance on a moving platform**  
Jerome Allen, Thomas Edwards, Venkata Gade, Nitin Moholkar, David Tung  
Corresponding Author: Venkata Gade  
*Kessler Medical Rehabilitation Research and Education Center*

- P9-20 Evaluation of the assessment of symmetry during gait**  
John Challis, Daniel Gales  
Corresponding Author: Daniel Gales  
*Pennsylvania State University*
- P9-21 Estimation of knee joint compression forces in subjects with medial compartment knee osteoarthritis**  
Jill Higginson, Joseph Zeni, Jr  
Corresponding Author: Joseph Zeni, Jr  
*University of Delaware*
- P9-22 Static postural stability of individuals with mental retardation before and after weight and balance training**  
Courtney Haynes, Thurmon Lockhart  
Corresponding Author: Courtney Haynes  
*Virginia Tech*
- P9-23 Height estimation of an obstacle is scaleable to toe elevation at obstacle crossing**  
Chris Rhea, Shirley Rietdyk  
Corresponding Author: Chris Rhea  
*Purdue University*
- P9-24 Sensitivity of functional hip joint center location to body mass index, movement pattern and marker cluster**  
Annegret Mündermann, Stefano Corazza, Priyanshu Gupta, Valentina Camomilla, Chris O. Dyrby, Thomas P. Andriacchi  
Corresponding Author: Annegret Muendermann  
*Stanford University*
- P9-25 Variability of joint coupling within the lower extremity in runners with patellofemoral pain during a prolonged run**  
Irene Davis, Tracy Dierks, Joseph Hamill, John Scholz  
Corresponding Author: Tracy Dierks  
*Indiana University*
- P9-26 Feedforward postural control in standing: role of lateral muscles and body orientation**  
Alexander Aruin, Marcio Santos  
Corresponding Author: Marcio Santos  
*University of Illinois at Chicago*
- P9-27 Comparison of kinematic methods for determining footstrike and toe-off during overground running**  
Irene Davis, Rebecca Fellin  
Corresponding Author: Rebecca Fellin  
*University of Delaware*
- P9-28 Energetics and biomechanics of walker assisted gait**  
Rodger Kram, Jonathon Priebe  
Corresponding Author: Jonathon Priebe  
*University of Colorado*
- P9-29 A gait modification to reduce the external adduction moment at the knee: a case study**  
Joaquin Barrios, Irene Davis  
Corresponding Author: Joaquin Barrios  
*University of Delaware*
- P9-30 Sensitivity of lyapunov exponent estimation for human gait**  
Joseph Hamill, Trampas TenBroek, Richard Van Emmerik  
Corresponding Author: Trampas TenBroek  
*University of Massachusetts*
- P9-31 Older adults exhibit reduced lateral acceleration of the center of mass at fast walking speeds**  
Bryan Heiderscheit, Antonio Hernandez, Amy Silder, Darryl Thelen  
Corresponding Author: Antonio Hernandez  
*University of Wisconsin - Madison*
- P9-32 Postural control of self-initiated weight shifts in children and adults**  
James Abbas, Andrea Downing, K Narayanan  
Corresponding Author: Andrea Downing  
*Center for Adaptive Neural Systems, Arizona State University*
- P9-33 The effects of stepping off vs. hopping off a box on calculated drop heights in two-legged landings**  
Mostafa Afifi, Richard Hinrichs  
Corresponding Author: Mostafa Afifi  
*Arizona State University*
- P9-34 Reducing errors in inverse dynamics-based joint torques through optimized body segment parameters and segment motion profiles**  
Elizabeth T. Hsiao-Weckler, Raziel Riemer  
Corresponding Author: Raziel Riemer  
*Ben-Gurion University*
- P9-35 Effects of attention on dynamic stability of walking**  
Jonathan Dingwell, Mark Grabiner, Roland Robb, Karen Troy  
Corresponding Author: Jonathan Dingwell  
*University of Texas*
- P9-36 A mechanism to reduce the knee adduction moment during walking**  
Thomas Andriacchi, Jennifer Erhart, Anne Mündermann, Lars Mündermann  
Corresponding Author: Jennifer Erhart  
*Stanford University*
- P9-37 An elusive talus: re-thinking the ankle complex**  
Kevin A Ball, Thomas M Greiner  
Corresponding Author: Kevin A Ball  
*University of Hartford*

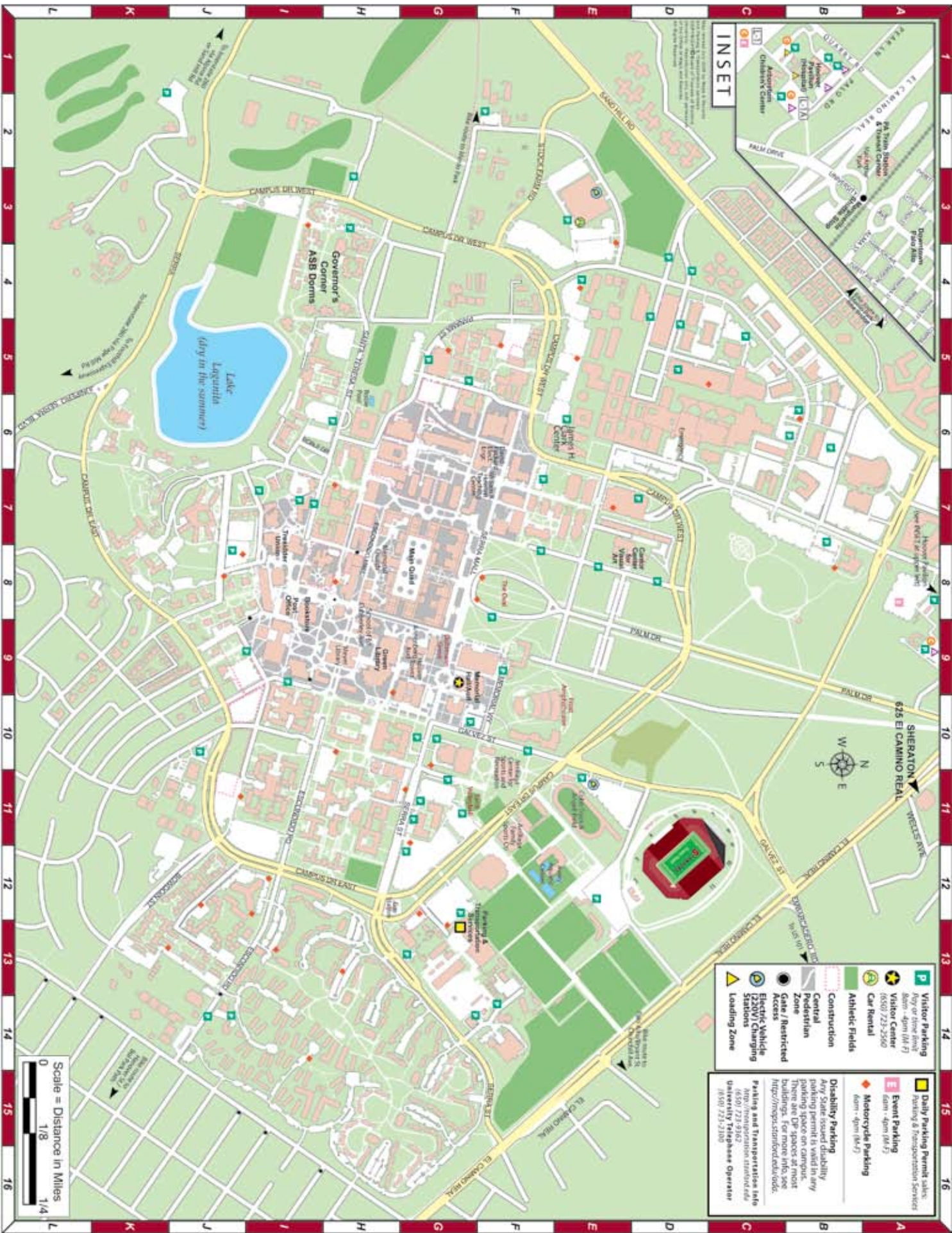
- P9-38**     **Approximate entropy is robust to non-stationarity in analysis of infant sitting postural sway**  
Joan Deffeyes, Stacey DeJong, Regina Harbourne, Anastasia Kyvelidou, Nicholas Stergiou, Wayne Stuber  
Corresponding Author: Joan Deffeyes  
*Biomechanics Laboratory, University of Nebraska at Omaha*
- P9-39**     **Accuracies of skin marker based knee motion analysis using different techniques**  
Bryan Conrad, Bo Gao, Nigel Zheng  
Corresponding Author: Nigel Zheng  
*University of Florida*
- P9-40**     **Lower limb local or global asymmetry in gait of people without impairments**  
Heydar Sadeghi  
Corresponding Author: Heydar Sadeghi  
*Tarbiat Moallem University*
- P9-41**     **Contact stress elevation with lateral talar shift**  
Daniel Fuchs, Tina Maxian, Robert Spilker, Richard Uhl, Jeremy Winston  
Corresponding Author: Tina Maxian  
*Eastern Maine Medical Center*
- P9-42**     **Importance of preswing rectus femoris activity**  
Allison Arnold, Scott Delp, Melanie Fox, Sylvia Ounpuu, Jeffrey Reinbolt  
Corresponding Author: Melanie Fox  
*Stanford University*
- P9-43**     **The effect of manipulating subject mass on lower extremity torque patterns during locomotion**  
Ronita Cromwell, John De Witt, R Donald Hagan  
Corresponding Author: John De Witt  
*Bergaila Engineering Services*
- P9-44**     **Gait adaptations and high implant twisting moments during stair climbing in subjects with total hip replacements**  
Kharma Foucher, Debra Hurwitz, Markus Wimmer  
Corresponding Author: Kharma Foucher  
*Rush University Medical Center*
- P9-45**     **Origins of the long-range correlations in stride times**  
Jonathan Dingwell, Deanna Gates, Jimmy Su  
Corresponding Author: Deanna Gates  
*University of Texas at Austin*
- P9-46**     **The short-term effect of whole body vibration training on collegiate sprint athletes**  
Mike Bishop, Iain Hunter, Brad Roberts, Robert Thiebaud  
Corresponding Author: Iain Hunter  
*Brigham Young University*
- P9-47**     **How precise is the hip joint centre position found using functional methods?**  
Richard Good, Julie Stebbins, Tim N. Theologis, Amy B. Zavatsky  
Corresponding Author: Amy B. Zavatsky  
*University of Oxford*
- P9-48**     **Comparison of two alternate methods for tracking toe trajectory**  
Jacob Bloomberg, Rachel Brady, Al Feiveson, Chris Miller, Ajitkumar Mulavara, Brian Peters, Liz Warren  
Corresponding Author: Chris Miller  
*Wyle Laboratories; Houston, TX*
- Friday, August 24, 2007**     **4:30 - 6:15 PM**  
**Poster Session 10: Manipulation**  
**Memorial Auditorium**
- P10-1**     **The effect of handle friction and torque on axial push force**  
Thomas Armstrong, Yoko Konishi, Na Jin Seo  
Corresponding Author: Na Jin Seo  
*University of Michigan*
- P10-2**     **Principal component analysis reveals control strategies in static grasp at multiple time scales**  
Daniel Brown, Francisco Valero-Cuevas  
Corresponding Author: Francisco Valero-Cuevas  
*Cornell University*
- P10-3**     **Asymmetry of wheelchair pushrim biomechanics over varying surfaces**  
Kai-Nan An, Kenton Kaufman, Melissa Morrow  
Corresponding Author: Kenton Kaufman  
*Mayo Clinic*
- P10-4**     **Reference hand configurations during grip force adjustments**  
Sun W Kim, Mark L. Latash, Vladimir M. Zatsiorsky  
Corresponding Author: Mark L. Latash  
*Penn State University*
- P10-5**     **Coactivation of hand muscles and movement fluctuations in old adults**  
Roger Enoka, Adam Marmon, Minoru Shinohara  
Corresponding Author: Minoru Shinohara  
*Georgia Institute of Technology*
- P10-6**     **Analysis of strains in extensor mechanism of index finger**  
Hua Chen, Derek Kamper, Sang Wook Lee, Joseph Towles  
Corresponding Author: Sang Wook Lee  
*Rehabilitation Institute of Chicago*



- P10-7 Quantitative analysis of finger movements during reaching and grasping tasks**  
Thomas Armstrong, Jaewon Choi  
Corresponding Author: Jaewon Choi  
*University of Michigan*
- P10-8 Effective moment arm estimation of index finger muscles**  
Hua Chen, Derek Kamper, Sang Wook Lee, Joseph Towles  
Corresponding Author: Sang Wook Lee  
*Rehabilitation Institute of Chicago*
- P10-9 Simultaneous performance of two tasks by the fingers of the human hand**  
Mark Latash, John Scholz, Vladimir Zatsiorsky, Wei Zhang  
Corresponding Author: Wei Zhang  
*The Penn State University*
- P10-10 Prehension synergies: effects of finger manipulation**  
Mark Budgeon, Mark Latash, Vladimir Zatsiorsky  
Corresponding Author: Mark Budgeon  
*Pennsylvania State University*
- P10-11 Upper extremity kinematic model for walker assisted gait**  
Jeffrey Ackman, Kevin Cao, Gerald F. Harris, Jeffrey Schwab, Kelly Striffling, Mei Wang  
Corresponding Author: Kelly Striffling  
*Marquette University*
- P10-12 Effect of elevation angle on movement velocity in a non-visually-guided reaching task**  
David Harmer, David Suprak  
Corresponding Author: David Harmer  
*University of Colorado, Colorado Springs*
- P10-13 Prehension of the objects with complex friction patterns**  
Mark Latash, Xun Niu, Vladimir Zatsiorsky  
Corresponding Author: Xun Niu

# NOTES

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- Visitor Parking  
Any or some event  
8am - 4pm (M-F)  
(650) 723-2560
- Visitor Center  
8am - 4pm (M-F)  
(650) 723-2560
- Car Rental  
8am - 4pm (M-F)  
(650) 723-2560
- Athletic Fields
- Construction
- Central Pedestrian Zone
- Gate / Restricted Access
- Electric Vehicle (EV) Charging Stations
- Loading Zone
- Daily Parking Permit sales, Parking & Transportation Services  
8am - 4pm (M-F)
- Event Parking  
8am - 4pm (M-F)
- Motorcycle Parking  
8am - 4pm (M-F)
- Disability Parking  
Any State issued disability parking permit is valid in any parking space on campus, except for spaces reserved for people with physical disabilities. For more information, visit <http://spcs.sdstate.edu/ocdc>.
- Parking and Transportation Info  
http://transportation.sdstate.edu  
(650) 723-9162  
University Telephone Operator  
(650) 723-2108

Scale = Distance in Miles  
 0 1/8 1/4





Wed, Aug 22, 2007

Thurs, Aug 23, 2007

Fri, Aug 24, 2007

Sat, Aug 25, 2007

7:30 AM  
8:15 AM  
8:30 AM  
8:45 AM  
9:00 AM  
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6:30 PM  
6:45 PM  
7:00 PM

**Breakfast**

OpenSim workshop (8am-9pm)  
Clark Center Room S360

**Breakfast**

Welcome

**Keynote Address**  
Memorial Auditorium  
Franz Goller

**Breakfast**

Memorial

**Keynote Address**  
Memorial Auditorium  
Paul Selvin

**Breakfast**

Announcements

**Borelli Lecture**  
Memorial Auditorium  
Richard Lieber

**Podium 1**  
Motor Control I

Memorial Auditorium  
Annenberg Auditorium

**Podium 2**  
Methods I

Annenberg Auditorium

**Podium 3**  
Bone I

Cubberley Auditorium

**Podium 13**  
Locomotion Energetics

Memorial Auditorium

**Podium 14**  
Hand

Annenberg Auditorium

**Podium 25**  
Aging II

Memorial Auditorium

**Podium 26**  
Computational Biomech. II

Annenberg Auditorium

**Podium 27**  
Sports II

Cubberley Auditorium

**Podium 4**  
Aging I

Memorial Auditorium

**Podium 5**  
Computational Biomech. I

Annenberg Auditorium

**Podium 6**  
Erg. & Occ. Biomech. I

Cubberley Auditorium

**Podium 16**  
Comparative Biomechanics

Memorial Auditorium

**Podium 17**  
Muscle Mechanics

Annenberg Auditorium

**Podium 28**  
Motor Control II

Memorial Auditorium

**Podium 29**  
Methods II

Annenberg Auditorium

**Podium 30**  
Bone II

Cubberley Auditorium

**Lunch Boxes / Exhibits**

Dohrmann Grove

**Lunch Boxes / Exhibits**

Student Luncheon with ASB Founding Members  
Dohrmann Grove

**Lunch Boxes**

Women in Science Luncheon  
Tresidder Union

**Tutorial 1**  
Biomechanical Modeling and Simulation  
Scott Delp  
Clark Center

**Tours 1**  
Durand Building Biomechanics Lab  
Atrillaga Center Human Performan Lab

**Podium 7**  
Walking

Memorial Auditorium

**Podium 8**  
Injury

Annenberg Auditorium

**Podium 9**  
Sports I

Cubberley Auditorium

**Podium 19**  
Neuro-rehabilitation

Memorial Auditorium

**Podium 20**  
Motor Injury

Annenberg Auditorium

**Podium 21**  
Erg. & Occ. Biomech. II

Cubberley Auditorium

**Podium 10**  
Running

Memorial Auditorium

**Podium 11**  
Upper Extremity

Annenberg Auditorium

**Podium 12**  
Tendon & Ligament Cubberley

Auditorium

**Podium 22**  
Mechanics

Memorial Auditorium

**Podium 23**  
Muscle

Annenberg Auditorium

**Podium 24**  
Rehabilitation I

Cubberley Auditorium

**Tutorial 2**  
Molecular Biology in Biomechanics  
Richard Lieber  
Clark Center

**Tours 2**  
Clark Center Neuromuscular Biomechanics  
3D Radiology Lab

**ASB Executive Board Meeting**  
Clark Center

**Reception**  
(Clark Center)

**Poster Session / Exhibits**

**Poster Session / Exhibits**

**ASB Business Meeting**  
Memorial Auditorium

**Closing Ceremonies**

**ASB Executive Board Meeting**

**Night on the town**

**Conference Dinner**  
(Frost Amphitheater)