American Society of Biomechanics
41st Annual Meeting
Boulder, Colorado

ASB2017 AMERICAN SOCIETY OF BIOMECHANICS

UNIVERSITY OF COLORADO **BOULDER**

August 8-11, 2017

http://asb2017.org

Program At A Glance

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Award Winners

Borelli	Mark Grabiner
Founders	Rick Neptune
Goel	Trey Crisco
Hay	Rick Lieber
Junior Faculty	Jacqueline Cole
Postdoctoral	Karl Zelik
Predoctoral	Colin Smith
Research Travel	Kaitlin Gallagher

	August 8 Tuesday	August 9 Wednesday
8:00		Fun run (6:30)
		Welcome Keynote – Beth Brainerd (UMC Ballroom)
9:00		
10:00		Break
		Aging Runner | Balance | Exo-skeletons | Muscle | Shoulder
11:00		
12:00	Registration begins	Lunch (C4C) Fellows Lunch (C4C Treehouse)
1:00	Tutorials Chris Hass 1:00-2:30 pm CHEM 140 Stephen Cain 2:30-4:00 pm UMC 235	
2:00		Motion Analysis | Lower Limb | Ergo-nomic | Tendon | Animal Mechanics
3:00		Posters (UMC Ballroom)
4:00		
5:00	Student Welcome	
	Opening Reception (UMC Ballroom)	Journal Awards | Osteo-arthritis | Wheel-chair | Low Back | Loco-motion
6:00		
7:00		Women in Science Cocktail (5th Floor Terrace)
8:00	Student After-Reception (UMC Connections)	Student Night Out (Fate Brewery)
9:00		

August 10 Thursday					August 11 Friday				
Inclusivity Breakfast (C4C, Colorado Room)					**Business Meeting** (UMC Ballroom)				
Borelli – Mark Grabiner (UMC Ballroom)					**Keynote – Julie Steele** (UMC Ballroom)				
Break					**Break**				
Running	Hip	Musculo-skeletal	Motor Control	Teaching	**Awards Session** (UMC Ballroom)				
Lunch (C4C)					**Lunch** (C4C)				
Energetics	Foot and Ankle	Imaging	Post-Stroke	Non-academic careers	Wearable Sensors	Dynamic Stability	Mobility in Aging	Energetics	Hay Memorial
Posters (UMC Ballroom)					**Break**				
					Osteo-arthritis	Human Perfor-mance	Walking	ACL	Muscle Force
					Closing Ceremony (UMC Ballroom)				
Tissue Mechanics	Bone	Footwear	Leg Rehab	Knee Arthro-plasty					
Student Career Event									
Optional Events									

Wednesday, August 9, 10:30 am – 12:00 pm

	Aging runner	Balance	Lower-body exoskeletons
Room	Chem 140	UMC Tent	UMC 235
Chairs	Max Paquette	Li-Shan Chou Noah Rosenblatt	Dan Ferris Karl Zelik
10:30 am	**Introduction**	**Locomotor adaptation to lateral center of mass movement amplification requires active stabilization**	**Human-exosuit interfaces absorb and return energy, reshaping exosuit to human power flow**
10:45 am	**Symmetry and stiffness in the aging runner**	**Is there a learning effect for balance assessment tests?**	**Hopping with a full-leg exoskeleton lowers metabolic cost and muscle activity**
11:00 am	**Coordination variability in aging runners**	**Relating obesity, cognition and biomechanics of fall recovery in older adults: preliminary results**	**Ultrasound measurements of soleus fascicle dynamics during human walking with elastic exoskeletons**
11:15 am	**Can running exposure preserve age-related changes in running biomechanics**	**Biomechanical measures of clinician-defined balance impairments in persons post-arthroscopy for femoro-acetabular impingement**	**Effects of speed on the mechanics and energetics of walking with an elastic exoskeleton**
11:30 am	**Effects of exercise intervention on age-related changes in running biomechanics**	**Below-knee amputees make specific anticipatory locomotor adjustments to resist lateral perturbation**	**Effects of ankle exoskeleton power and actuation timing on movement variability and metabolic cost of walking**
11:45 am		**Altered sensory organization during quiet stance following neurotoxic chemotherapy**	**A unilateral ankle assisting soft robotic exosuit can improve post-stroke gait during overground walking**

Wednesday, August 9, 10:30 am – 12:00 pm

Muscle	Shoulder	
Dining Room	VAC 1B20	Room
Wendy Murray Xiao Hu	Kate Saul David Lipps	Chairs
A mechanical role for incompressible fluid in stretched muscle	EMG assessment of a shoulder support exoskeleton during on-site job tasks	10:30 am
Intramuscular pressure variability differs from force variability during ramped isometric contractions in healthy adults	Spatial dependency of shoulder muscle demand during dynamic unimanual pushing and pulling	10:45 am
Intraoperative measurement of human muscle properties	Submaximal normalizing methods to evaluate load sharing changes in repetitive upper extremity work	11:00 am
Reduced muscle stem cell number compromises serial sarcomere addition	Shoulder musculature activation during human brachiation	11:15 am
Positive force feedback allows for faster and safer recovery in perturbed hopping - at a cost	MRI vs. CT-based shape registration accuracy for quantifying shoulder motion using biplane fluoroscopy	11:30 am
Stretch-shortening cycle performance in dancers	Post-mastectomy breast reconstruction surgeries compromise passive shoulder stiffness	11:45 am

Wednesday, August 9, 1:30 – 3:00 pm

	ASB-GCMAS Motion analysis	Lower limb loss	Ergonomics
Room	Chem 140	Chem 142	UMC 235
Chairs	Kenton Kaufman	Elizabeth Russell Esposito Matthew Major	Kurt Beschorner Kaitlin Gallagher
1:30 pm	**Overview of the Gait and Clinical Movement Analysis Society**	**Effects of passive and powered ankle-foot prostheses on level-ground walking EMG**	**Effects of occupational wearable assistive device on low back loads**
1:45 pm	**Understanding the relation between impairment and foot/ankle function during gait in Charcot-Marie-Tooth disease**	**Effects of different power of powered prosthesis on gait asymmetry and metabolic cost**	**Workstation configuration and packaging type influence grocery store cashier arm postures**
2:00 pm		**Temporal spatial improvements for amputees during rehabilitation**	**An investigation of cervical spine kinematics in various tablet reading postures**
2:15 pm	**Patellar instability: what should we measure to guide treatment?**	**Intact knee joint kinetics during the first six months of prosthetic use**	**Finger flexor tendon and sub-synovial connective tissue motion with external mechanical pressure…**
2:30 pm	**Neuromuscular control during gait in cerebral palsy**	**Longitudinal changes in mediolateral trunk and pelvic motion among persons…** **How do prosthetic stiffness, height, and running speed…**	**Applied hand-rung forces after a ladder perturbation**
2:45 pm	**Torsional deformities and the knee flexion axis**	**Power and work generated throughout the running-specific prosthesis keel…** **Dynamic balance during running using running-specific prostheses**	**Comparison of 50th percentile human headforms to an adult male population using 3D modeling and principal…**

Wednesday, August 9, 1:30 – 3:00 pm

Tendon mechanics	ASB-SICB Animal mechanics	
Dining Room	VAC 1B20	Room
Darryl Thelen Karl Zelik	Jonas Rubenson Suzanne Cox	Chairs
Differences between in vivo tendon moment arms measured geometrically and from tendon excursion	**Introduction**	**1:30 pm**
Are ultrasound-based estimates of Achilles tendon kinematics consistent with the expected behavior of a passive elastic tissue in…	**Robobird: an avian model for passive-elastic exoskeletons**	**1:45 pm**
Do triceps surae muscle dynamics govern non-uniform Achilles tendon deformations?	**Uncovering mechanisms of mouth expansion in catfish using X-ray reconstruction of moving morphology**	**2:00 pm**
How do material transverse isotropy and pre-tension influence simulations of non-uniform displacements in the Achilles tendon?	**Biomechanics of strange fishes that don't swim**	**2:15 pm**
Assessing non-uniform stiffening of the Achilles tendon using surface wave elastography	**Biomechanics of mammalian and avian terrestrial locomotion: insights into human biomechanics and biorobotic design**	**2:30 pm**
In vivo tendon stress is predicted by non-invasive wave speed measurement		**2:45 pm**

Wednesday, August 9, 5:30 – 6:30 pm

	Journal award finalists	Joint loading and osteoarthritis	Wheelchair biomechanics
Room	Chem 140	Chem 142	UMC 235
Chairs	Silvia Blemker Paul DeVita	Don Anderson Karen Kruger	Deanna Gates Rick Neptune
5:30 pm	**High-acceleration training during growth increases optimal fiber lengths in an avian bipedal model**	**Incremental lateral wedging: effects on knee moment in medial knee osteoarthritis**	**Rotator cuff tendon forces during weight-relief lift in tetraplegia**
5:45 pm	**In vivo determination of optimal muscle fascicle length and PCSA using multi-scale measurements**	**Effect of the Atlas knee system on stress in the medial tibial cartilage**	**Upper extremity kinematics of wheelchair Lacrosse athletes during overhead throw**
6:00 pm	**Individuals with lower limb trauma prioritize stability over maneuverability when navigating a virtual obstacle course**	**Articular cartilage contact during gait in obese individuals with knee pain**	**Handrim biomechanics of pediatric manual wheelchair mobility**
6:15 pm	**ACL reconstruction graft geometry is associated with asymmetric in vivo cartilage contact patterns**	**Abnormal muscle forces during gait are related to cartilage health after hip arthroplasty in femoro-acetabular impingement…**	**The relation between propulsion pattern and the development of upper-extremity pain in manual wheelchair users**

Wednesday, August 9, 5:30 – 6:30 pm

Low-back pain	Animal models of locomotion	
Dining Room	VAC 1B20	**Room**
Ram Haddas Rumit Kakar	Tom Roberts Chris Arellano	**Chairs**
The effect of lumbar belts on psychological and biomechanical outcomes	**Muscle contractile properties in mice with LGMD2i muscular dystrophy**	**5:30 pm**
The influence of lumbar spine postures on monitor location when using sit-to-stand workstations	**Towards subject-specific tendon models: an experimental and modeling framework**	**5:45 pm**
Time-varying contributions to lumbar lordosis during an unstable sitting task in people who do not develop low back pain when standing	**3D X-ray motion analysis indicates treadmill exercise exacerbates knee osteoarthritis in MMT rats**	**6:00 pm**
Landing mechanics during a stop jump in individuals with low back pain and low back injuries	**The effect of drag loading on the maneuverability of bottlenose dolphins**	**6:15 pm**

Thursday, August 10, 10:30 am – 12:00 pm

	Running	Hip structure and muscle function	Modeling and simulation
Room	Chem 140	UMC Tent	UMC 235
Chairs	Rodger Kram Allison Gruber	Cara Lewis Jessica Goetz	Ross Miller Manoj Srinivasan
10:30 am	**Soft tissue increases stability and propulsion during human running**	**Gait effects on joint mechanics and clinical outcomes in hip dysplasia patients**	**Sagittal plane control of trunk posture after spinal cord injury**
10:45 am	**Differential leg joint function during running** **The energetics of a human foot across a range of running speeds**	**Kinematic variability and local dynamic stability in individuals with hip dysplasia**	**The influence of kinematics on a muscle's ability to contribute to the sit-to-stand transfer**
11:00 am	**Hip alignment, position at foot strike and peak hip abduction angle in runners**	**Hip strength and hip moments during gait in women with and without stress urinary incontinence**	**Simple and two-element Hill-type muscle models cannot replicate realistic muscle stiffness**
11:15 am	**Influence of stride frequency on knee joint stiffness and anterior tibial shear forces in runners**	**Hip lateral rotator muscle force during variations of the single leg squat**	**Modeling stiffening in the neck in specified directions through muscle coactivation**
11:30 am	**Multiscale entropy of center of mass acceleration as a measure for cumulative running fatigue** **Changes in mechanics across a marathon**	**Deep hip muscle activation is altered during squatting in symptomatic femoro-acetabular impingement**	**A mechanistic damage model for ligaments**
11:45 am	**Changes in running mechanics during the 2016 US Olympic Trials** **Coasting to a sub-2 hour marathon using drafting**	**Sagittal plane hip impulse during gait is greater after surgical intervention for femoroacetabular impingement syndrome**	**Differences in the active state of a simulated ankle muscle using two foot models**

Thursday, August 10, 10:30 am – 12:00 pm

Motor control	Teaching	
Dining Room	VAC 1B20	Room
Keith Gordon Helen Huang	Kimberley Bigelow Kimberly Fournier, Erin Feser	Chairs
Effects of remote pain on muscle fatigue during repetitive movements		**10:30 am**
Stiffness perception at the human ankle and knee	**Enhancing the biomechanics classroom with entrepreneurial mindset learning activities**	**10:45 am**
Mechanical and visual perturbation of human walking to find general principles of locomotion control	**Active learning in biomechanics using wearable sensors**	**11:00 am**
Effect of mirror visual feedback on motor adaptation and learning	**Teaching undergraduate biomechanics to students with diverse disabilities**	**11:15 am**
Segmental coordination during turning in people with Parkinson's disease	**The teaching repository as a tool for you** **Getting started with the science of teaching and learning in biomechanics**	**11:30 am**
Specific manual tasks transform EMG into a probe for neural dysfunction in Parkinson's disease		**11:45 am**

Thursday, August 10, 1:30 – 3:00 pm

	Energetic optimization	Foot and ankle	Musculoskeletal imaging
Room	Chem 140	Chem 142	UMC 235
Chairs	James Finley	Sabrina Lee Josh Baxter	Michael Hahn Tyler Brown
1:30 pm	**Introduction**	**Ankle-foot orthosis alignment affects center of pressure velocity**	**Validation of a model based on tracking technique to measure in vivo patellofemoral kinematics**
1:45 pm	**Energy optimality in unconventional tasks in human locomotion and its tradeoff with robustness**	**Finite helical axis variation between cavus, neutrally aligned, and planus feet under passive loading**	**Estimating the longitudinal axis of the tibia based on CT scan reconstruction using partial lengths of tibial shaft**
2:00 pm	**Energy optimization and the control of walking**	**Foot pressure analysis to assess planovalgus foot deformity correction using the calcaneal-cuboid-cuneiform osteotomy**	**Feasibility of biplane fluoroscopy for quantification of shoulder kinematics during manual wheelchair use**
2:15 pm	**Energetic consequences of asymmetry in healthy and hemiparetic gait**	**Concurrent validity of an automatic technique to calculate plantar contact area at mid-stance during gait**	**Comparison of real-time MRI pulse sequences for tracking tissues of the actively moving wrist**
2:30 pm	**Kinematic costs explain the control of reaching movements**	**Running strike pattern, midtarsal locking, and the Windlass mechanism**	**Extended field-of-view ultrasound of the extensor carpi ulnaris**
2:45 pm	**A representation of effort in decision making and movement control**	**Intra-op biomechanical guidance improves articular fracture reduction**	**Four-Year Follow-Up Of Knee Joint Kinematics In Adolescent Females With Patellofemoral Pain**

Thursday, August 10, 1:30 – 3:00 pm

Post-stroke biomechanics	Non-academic careers	
Dining Room	VAC 1B20	Room
Elisa Arch Louis Awad	Chris Hass	Chairs
Explicit modification of step length asymmetry transfers to over-ground walking post-stroke	Introduction #1 novel electronics #2 Nike #3 Engineering and analysis #4 Auburn University #5 University of Colorado Denver	1:30 pm
Intrarater reliability of a novel semi-automated approach to determine knee articular cartilage morphology via MRI		1:45 pm
A unilateral soft exosuit for the paretic ankle can reduce gait compensations in patients post-stroke		2:00 pm
The influence of lateral stabilization on hemiparetic walking		2:15 pm
Merged plantar flexor muscle excitation module predicts poor balance in post-stroke hemiparetic subjects		2:30 pm
Task-specific perturbation training provides a viable rehabilitation strategy to reduce falls in stroke survivors		2:45 pm

Thursday, August 10, 5:30 – 6:30 pm

	Tissue mechanics	Bone	Footwear and inserts
Room	Chem 140	Chem 142	UMC 235
Chairs	William Ledoux Tammy Haut Donahue	Karen Troy Allison Altman Singles	Steve Jamison Irene Davis
5:30 pm	**Residual limb skin strain within a socket prosthesis in transfemoral amputees during walking**	**Path-specific von-Misses stresses inflicting the pre- and post-THR femur during walking**	**Muscle activity during postural stability tasks: role of military footwear and workload**
5:45 pm	**Shoulder posture, torque magnitude, and torque direction highlight the heterogeneous elasticity of the pectoralis major**	**Evidence of low back injury in the absence of radiographic detection**	**Lower extremity kinematics in military footwear during slip events**
6:00 pm	**Biaxial testing of the passive properties of native and regenerated muscle tissue**	**Bone microarchitecture and running biomechanics in first-time marathoners**	**The effects of a carbon fiber shoe insert on speed and power in collegiate athletes**
6:15 pm	**Movement restriction increases thoracolumbar fascia stiffness in a porcine model**	**Finite element analysis prediction of glenohumeral joint growth following neonatal brachial plexus injury**	**Lower extremity stiffness when running in minimalist, neutral, and ultra-cushioning shoes**

Thursday, August 10, 5:30 – 6:30 pm

Lower extremity neurorehabilitation	Knee arthroplasty	
Dining Room	VAC 1B20	**Room**
Lise Worthen-Chaudhari James Schmiedeler	Robert Siston Clare Milner	**Chairs**
Plantar pressure changes with use of a custom dynamic ankle-foot orthosis	**Multi-scale model in co-stimulation to estimate patellofemoral contact stress in total knee replacement**	**5:30 pm**
Segmental turning velocity and coordination in adults with mTBI	**Biomechanical gait variable estimation using wearables after total knee arthroplasty**	**5:45 pm**
Individuals with a prior traumatic brain injury exhibit decreased neuromuscular complexity during gait	**Concurrent osteoarthritis of contralateral knee alters joint biomechanics of the knee with mobile-bearing implant**	**6:00 pm**
Plantar flexor remodeling following Achilles tendon rupture repair	**Knee biomechanics of dissatisfied total knee replacement patients during stair ascent**	**6:15 pm**

Friday, August 11, 1:30 – 3:00 pm

	Wearable sensors	Dynamic stability of locomotion	Mobility in aging
Room	Chem 140	Chem 142	UMC 235
Chairs	Herman van Werkhoven Stephen Cain	Jonathan Dingwell Jesse Dean	Katherine Boyer Mark Grabiner
1:30 pm	**Longitudinal data from wearable sensor systems suggests movement improves standing** **Quantifying the shoulder movement of manual wheelchair users** **Joint moment estimation using inertial sensor measurements** **Accuracy of a shoe-worn device for measuring running mechanics** **Using inertial sensors during stair running** **An adaptive filter to estimate sprint velocity** **Energy expenditure during exercise using piezoelectric foam sensors** **A 'smart' pressure insole for gait retraining** **Outcome estimation using wearables after knee arthroplasty**	**A new measure of trip risk integrating minimum foot clearance and dynamic stability across the swing phase of gait**	**Material properties of ankle plantar flexor and dorsiflexor muscles – effect of aging**
1:45 pm		**Using detrended fluctuation analysis to assess system stability during running**	**Differences in hamstring muscle quality between highly active and sedentary older adults**
2:00 pm		**Do inverted pendulum models of stability make consistent predictions of dynamic balance for assessing powered prosthesis…?**	**Cognitive and neuro-psychological differences between elderly populations with good and poor balance**
2:15 pm		**Does dynamic stability govern propulsive force generation in human walking?**	**The relation between physical capacity and biomechanical plasticity in old adults**
2:30 pm		**Aging effects on leg joint variability during walking in the presence of optical flow perturbations**	**Age and falls history effects on the modular control of walking with optical flow perturbations**
2:45 pm		**How healthy older adults negotiate stepping objects while walking**	**Power training increased neuromuscular activation of the extensor muscles during gait in old adults**

Friday, August 11, 1:30 – 3:00 pm

Energetics	Hay memorial	
Dining Room	VAC 1B20	Room
Greg Sawicki Kota Takahashi	Jill McNitt-Gray Walter Herzog	**Chairs**
Does metabolic cost explain mass-based changes in preferred reaching speed?	**Biomechanical studies of muscle injury**	**1:30 pm**
Mechanics and energetics of walking with a flat center of mass trajectory		**1:45 pm**
The metabolic cost of walking on rough terrain	**Relationship between hamstring flexibility and strain in sprinting**	**2:00 pm**
Why is the energy-speed curve for human walking U-shaped?	**Modulation of muscle-tendon kinematics with running cadence and speed**	**2:15 pm**
A passive hip exoskeleton for reducing metabolic cost of walking	**The converging fiber hypothesis and muscle injury**	**2:30 pm**
Energy cost of walking in a passive-elastic ankle-metatarsophalangeal exoskeleton		**2:45 pm**

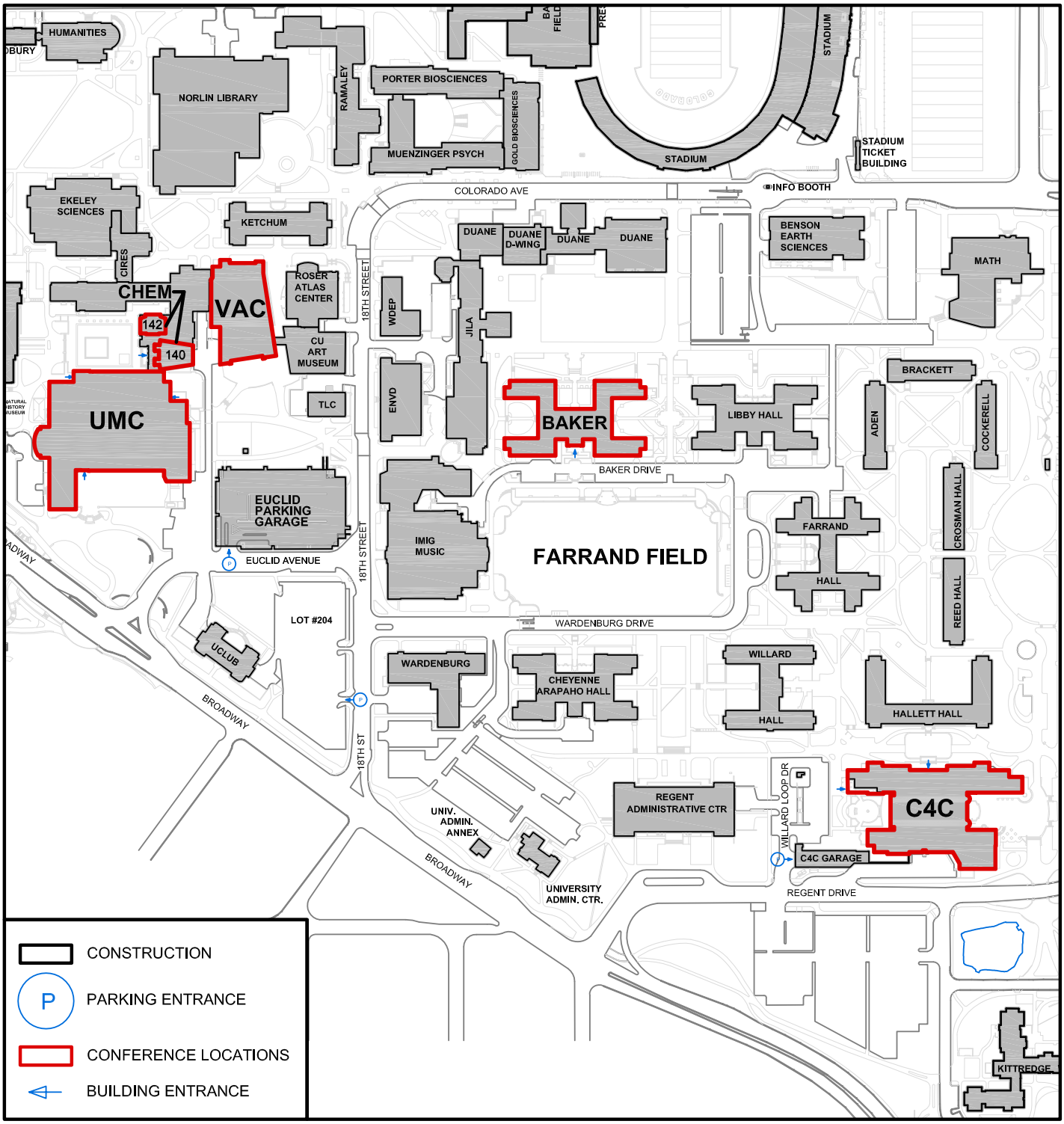
Friday, August 11, 3:30 – 5:00 pm

	ASB-OARSI Osteoarthritis	Human performance	Walking
Room	Chem 140	Chem 142	UMC 235
Chairs	Paul DeVita Tim Griffin	Kristian O'Connor Kristof Kipp	Jason Franz Young-Hui Chang
3:30 pm	**Introduction**	**The effect of Achilles tendon moment arm length on stretch-shortening cycle performance in the vertical jump**	**Power imbalance nearly eliminated in whole-body analysis**
3:45 pm	**Movement analysis and gait retraining**	**Biomechanical differences in female athletes with varying levels of leg stiffness**	**Lower extremity joint kinetics in young adults walking with varied step lengths**
4:00 pm	**Biomechanical knee modeling and cartilage conditioning**	**Modified hockey skate blade profiles affect skating biomechanics and performance**	**Functional utilization of propulsive capacity during human walking**
4:15 pm	**Overview of the Osteoarthritis Research Society International**	**Inverse dynamics of swinging baseball bats of various moments of inertia**	**Joint power generation during gait across mood phases in bipolar disorder**
4:30 pm	**Diving into diarthrodial joints: identifying cartilage mechanical environment**	**Energy generation strategies related to peak elbow varus torque in high school baseball pitchers**	**Multi-objective control of lateral stepping while walking**
4:45 pm	**Inflammation, oxidation, and the mechanobiology of a resilient joint**	**Arm slot and its relation to shoulder and elbow safety and efficiency in youth baseball pitchers**	**Regulation of whole-body angular momentum and muscle activation during walking adaptability tasks post-stroke**

Friday, August 11, 3:30 – 5:00 pm

ACL	Muscle force	
Dining Room	VAC 1B20	Room
Timothy Hewett Nathan Schilaty	Walter Herzog	**Chairs**
Assessing movement asymmetry using the normalized symmetry index in ACL patients		**3:30 pm**
Failure modalities induced by a novel mechanical impact simulator designed to induce ACL failure	**The distribution problem in biomechanics**	**3:45 pm**
Sex differences in knee forces and moments that occur with ACL rupture on cadaveric impact simulations		**4:00 pm**
The combination of tissue collagen quality and quantity estimated from MR T2* relaxometry predicts time-specific structural…	**Muscle architecture and material properties: influence on muscle function**	**4:15 pm**
Effect of return-to-sport training on gait mechanics and knee loading after ACLR	**Neural strategies of muscle force production: controversies and evidences from studies of motor unit behavior**	**4:30 pm**
Knee force vector and tibia plateau orientation during the stance phase of gait		**4:45 pm**

Conference Venue



Poster Session Topics

Topic	Poster #	Topic	Poster #
Aging	113-127	Modeling and simulation	304-330
Anterior cruciate ligament	275-292	Motor control	477-503
Balance	385-405	Muscle and tendon	504-528
Bone and soft tissue mechanics	406-428	Pathological gait	185-209
Clinical biomechanics	128-135	Prosthetics	210-231
Ergonomics	1-17	Rehabilitation	232-253
Exoskeletal devices	18-33	Running	331-359
Experimental methods and tools	430-457	Slips and falls	529-540
Footwear	293-303	Spine	46-70
Gait	136-171	Sport and exercise	71-112
Jumping and landing	34-45	Teaching	360-366
Knee mechanics	172-184	Upper extremity	254-274
Lower extremity	458-476	Wearable Sensors	367-384

Poster Sessions

Wednesday and Thursday from 3:00 pm to 5:30 pm
Rooms: UMC Ballroom, Arcade (outside UMC beside Fountain)

Authors must be present at the poster during the assigned 75-min timeslot on either Wednesday or Thursday:

A = 3:00 to 4:15 pm
B = 4:15 to 5:30 pm

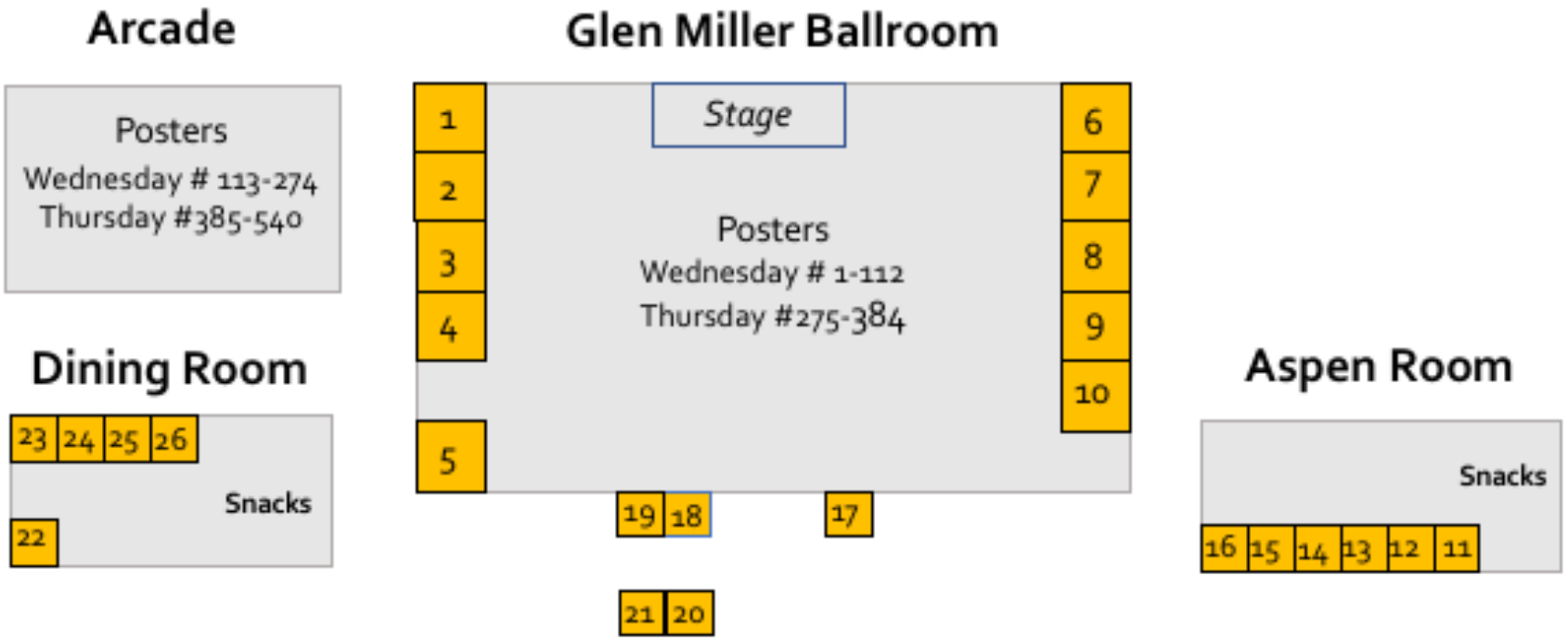
Poster #	Day	Location
1-112	Wednesday	UMC Ballroom
113-274	Wednesday	Arcade
275-384	Thursday	UMC Ballroom
385-540	Thursday	Arcade

Posters should be installed on the assigned board by 9:00 am on the day of presentation (Wednesday or Thursday) and removed at 5:30 pm the same day.

Notes

Notes

Exhibitors and Posters



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