



www.asbweb.org

In this issue

From the President	1
Student's Corner	4
Treasurer	5
Education Committee	6
Secretary/Membership	9
Past-President	12
ASB Award Changes	15
To Do Around Raleigh	16
Communications	18
Program Chair	20
R. McNeil Alexander	22
Diversity Committee	24
President-elect	26
Meeting Chairs	28
ASB 2017, Boulder CO	30
ASB 2015 Grant-in-Aid	32
ASB Regional Conference	38
What do you think...	42
Umbrellas are for Tourists	46
Events Calendar	47

Newsletter

Volume: 29 - Number: 1, June 2016

From the President

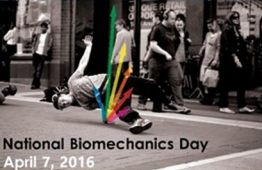















Paul DeVita



Dear Friends and Colleagues,

It has been a distinct honor and the highlight of my career to be your President and to serve you and the Society. I thank you very much for having the confidence in me to fulfill the responsibilities of this position. A wonderful consequence of being President is the privilege of working intimately with the many fabulous members of the Executive Board. These generous and creative people have only one goal in mind, to help the Society grow and prosper so that Biomechanics itself will grow and prosper. I extend my heartfelt gratitude to the entire Board and congratulate them for their superb contributions. While the Board changes substantially each year, several members have long-term positions which will end in August. Darryl Thelen, Karen Troy, Cécile Smeesters, and Amy Lenz have been the foundation of the Board for the past several years and they are to be commended for their valuable and selfless contributions. I look forward to the coming year in which our new President, Chris Hass, will most assuredly shine brightly. Congratulations, Chris. I also welcome the soon-to-be new Board members, President-Elect Wendy Murray, Program Chair-Elect Sylvia Blemker, and Student Representative Katie Read Knaus. Finally, I would be remiss to not acknowledge by name the exceptional work of Tammy Reid Bush, Stacie Ringleb, Robert Catena, Bil Ledoux (the Utility Fielder of the executive board – he does many things for the Board), Steve Piazza, and Kristin Zhao, Board members continuing on through next year, and Clare Milner and Kate Saul our current Program and Meeting Chairs. Onward and upward!

Speaking of which:

Celebrating the 21 st century's breakthrough science			
			
National Biomechanics Day April 7, 2016	National Biomechanics Day April 7, 2016	National Biomechanics Day April 7, 2016	National Biomechanics Day April 7, 2016
Supported by   	Supported by   	Supported by   	Supported by   

We did it. We shook the world by making 1,960 high school students and teachers aware of Biomechanics in a way never done before. We had a nation-wide, syn-

From the President, cont.

Paul DeVita

chronized celebration of Biomechanics on National Biomechanics Day (NBD)¹. As I hope you saw from my email in April, NBD was a whirlwind success thanks to everyone's incredibly enthusiastic participation. ***It was the single greatest day in biomechanics; more people smiled in more biomechanics labs than ever before.*** Fantastic, no doubt. NBD will certainly produce a burst of biomechanists if not biomechanist-enthusiasts. But where do we go from here? How do we build upon our initial success?

WE GO STRAIGHT AND IRRESISTIBLY INTO **NATIONAL BIOMECHANICS DAY 2017!** We participate in numbers that will astonish even ourselves and we bring Biomechanics to the world with a coolness (which it has), with an elegance (which it has), and with a love for people (which we have) that will be the foundation of a Biomechanics Revolution. **Why not do this?!? Why not make Biomechanics the break-through science of the 21st century?** We can expand the influence of Biomechanics, we can change the world, by changing young people. Let's change young people through a national, and yes, of course, an international effort called National Biomechanics Day. Canada can have National Biomechanics Day. New Zealand can have National Biomechanics Day. England can have National Biomechanics Day. All countries can have National Biomechanics Day. I express it this way and with apologies to Walter, Karen, and Bob, I say instead of having one Walter Herzog let's have 5, instead of having one Karen Troy, let's have 10, instead of having one Bob Gregor, let's have 15 (wow, now we're getting somewhere). National Biomechanics Day can produce these results. We can do all this through our own talents, our own energy, and our own force of will. Let's Do It!

Science is dispassionate but we need not be. We need to be enthusiastic. We will work towards a bigger and better NBD in 2017 than we had in 2016. But we will need help. We will need the participation of the entire Society, everyone from **undergraduate students to post-docs to first year assistant professors to grizzled, 40 year-in professors and scientists.** With all sincerity, I humbly request that each and every ASB member participate in NBD 2017. Please step up. It is rewarding; it is satisfying; it is consequential; and it is fun.

It is...



ASB Involvement

If you are interested in becoming more active in the Society (e.g., serving on a committee or chairing an annual meeting session), contact [Stacie Ringleb](#), Secretary/Membership Committee Chair, with your name, address, phone/fax number, email address, and your desired involvement. This information will be included in a database which is periodically updated and distributed to the Executive Board.



Back Copies of the Newsletter

All previous ASB newsletters have been converted into pdf documents and are archived on the [ASB website](#).

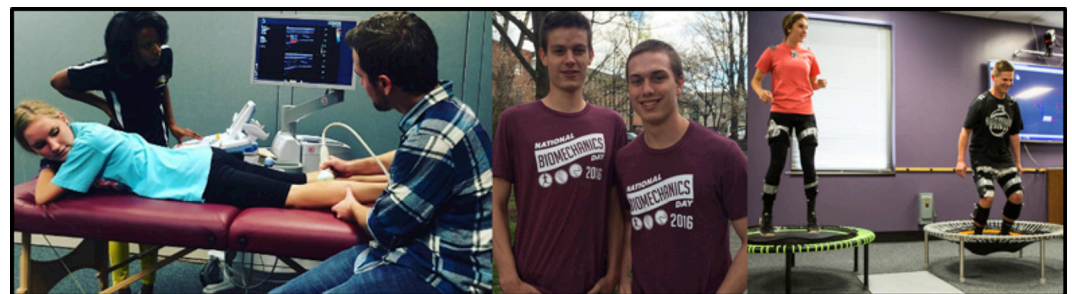
From the President, cont.

Paul DeVita

and...



and...



and more.

Really, EVERYONE, please participate. NBD 2016 was so cool for many reasons just one of which was that everyone knew that everyone else was doing the same thing. If everyone participates then EVERYONE will participate. The world will shake.

Thank you and with apologies for all my flaws,

Paul DeVita

See you in Raleigh.

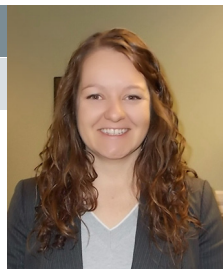
P.S. If we actually ALL participated, ALL of us, we can change the world, practically alter its rotational motion on its axis. The Effect Size would be large.

¹ In case you did not know, April 7, National Biomechanics Day was also National Beer Day, which begged the mathematical truism, NBD = NBD. We celebrated both NBDs here in Greenville, not in parallel but in series, as I hope you did.



Student's Corner

Amy Lenz



The summer solstice has just passed and organizing for the ASB annual meeting is in full swing. This year the meeting will be held in Raleigh, NC from August 2-5, 2016. Students will be pleasantly surprised with numerous student-focused events, variety of scientific podium sessions, and 40th anniversary ASB memories.

For those attending the annual conference, I encourage you to participate in the ASB one-on-one student mentoring program. This program is designed to allow students to network with more senior scientists, faculty and industry members. Students interested in being a mentee can be paired with a mentor on similar research interests or career paths. During the conference, mentors and mentees will find a time to meet over coffee, lunch or dinner that is convenient for both individuals. Mentor matches can discuss a variety of topics that are helpful for the students such as educational, career and professional objectives. I will be sending out reminders over the next month for those interested in participating to email me with information or questions. (Please note, students had to respond by July 1st if you wish to be paired with a mentor.)

During the conference another great opportunity is the Student Event entitled, "Welcome to ASB". The event will be held on the first night of the conference, Tuesday August 2nd at 5pm. I will be talking about helpful tips for students to professionally interact with senior researchers at their posters, learning the most from sessions, networking, and making impressionable conversations. The next day, Wednesday August 3rd, there is another student event at 6pm, "Careers Round Table Discussions." This event will provide students with the opportunity to informally travel between career topic tables to talk with professionals regarding matters such as: post-doc experiences, clinical gait laboratory positions, faculty life in academia, a career in industry, work life balance, and other helpful topics. On Wednesday night, students can unwind with peers at the "Student Night Out". Bring your lab mates to relax with libations or come to meet students from other universities around the country. Go out for dinner first and then come for desserts and a fun night starting at 8pm a short walk from the conference hotel.

Other events of interest for students include the diversity breakfast (Wednesday August 3rd at 7 am) and the Women in Science Breakfast (Thursday August 4th at 7am). Both events are typically a great success focusing on increasing diversity in ASB and creating open discussions amongst accomplished women scientists in biomechanics. Additionally, there is a new student event this year over lunch on Thursday August 4th focused on "How to Successfully Apply to Graduate School". The purpose is to help undergraduate or graduate students looking to change schools or programs with helpful tips for creating a strong application.

Lastly, I'd like to congratulate Katie Read Knaus as the newly elected ASB Student Rep for the 2016-2018 term. It has been my honor to serve ASB these past two years and help our organization flourish with increased student involvement. For those of you interested in being more involved in ASB, please reach out to me and I will forward your information to Katie when she begins her term at this year's conference. Any suggestions for the student advisory committee or the annual meeting student events can be [emailed](#) directly to me. I look forward to seeing you in Raleigh!



Editorial Board

Editor & Layout
William Ledoux
wrlledoux@uw.edu

Calendar & Advertising
Dan Gales
DGales@lhup.edu

Editorial Assistant
Cara Lewis
lewisc@bu.edu

Advertising in the Newsletter

The Editorial Board invites businesses that have products or services of interest to members of the Society to advertise in the ASB Newsletter. Advertising space may also be purchased for job postings or other special announcements.

The current advertising rates are as follows:

1/4 page--\$100
1/2 page--\$200
full page--\$400
back page--\$600

If you are interested in learning more about advertising in the ASB newsletter, please email Dan Gales:

DGales@lhup.edu



ASB Executive Board 2015-16

President

Paul DeVita, PhD
East Carolina University
Greenville, NC 27858
(252) 737-4563
devitap@ecu.edu

Past-President

Darryl Thelen, PhD
University of Wisconsin-Madison
Madison, WI 53706
(608) 262-1902
thelen@engr.wisc.edu

President-Elect

Chris Hass, PhD
University of Florida
Gainesville, FL 32611
(352) 294-1716
cjhass@hhp.ufl.edu

Treasurer

Karen Troy, PhD
Worcester Polytechnic Institute
Worcester, MA 01605
(508) 831-6093
ktroy@wpi.edu

Treasurer-Elect

Tamara Reid Bush, PhD
Michigan State University
East Lansing, MI 48824
(517) 353-9544
reidtama@egr.msu.edu

Treasurer

Karen Troy



I have realized over the past three years that although ASB Treasurer is a 3-year position, the role of “Past Treasurer” is a lifetime appointment. Throughout the past several years, I have had the privilege of talking to my distinguished predecessors including Don Anderson, Paul DeVita, and Gary Heise when checks and bills get mis-sent to them. In that spirit, I would like to take this opportunity to thank a few people and update you on the society finances one last time before handing over the position to Tammy Bush, our new Treasurer.

First, let’s talk finances. Our long-term reserve investments, which include investments tied to the Hay Award, total around \$187,000 right now, down around \$2,000 since December due to market fluctuation. For several reasons, our checking account has more in it than usual at the moment – around \$66,000. First, our increase in dues has resulted in approximately \$8,000 additional revenue, which will go towards the Junior Faculty Research Award and to increase our long-term reserves. Second, we received a check from the 2015 Annual Meeting organizers for a net surplus of \$26,000. This may make you wonder why we have to pay so much for registration costs. Having spoken to Ajit Chaudhuri at OSU, I assure you that a large portion of this was an unplanned “bonus” from the host hotel. Our recent annual meeting hosts have done an excellent job of organizing events that are increasingly large in terms of budget, scope, and participation. Although our last three meetings have ended up with a surplus, this is not the goal and is not always the case. As our meetings grow, so does the financial risk and uncertainty, and given that the majority of our meeting expenses go towards food for participants, the total cost is highly dependent upon the number of registrants.

Here are the “big ticket” items that we spend Society dollars on in the spring and summer. Awards: including the Grant in Aid, Student Travel, the Borelli and Hay Awards, and the Junior Faculty Research Award account for just over \$20,000. Mid-year Executive Board Meeting: every year the executive board meets mid-year, usually at the site of the summer meeting, which in this case was Raleigh, NC in February. Our total meeting costs were \$11,974, which is about 30% more than the last two years. The major reasons for this were the lack of a University-affiliated hotel and travel for an extra exec board member, the Diversity Chair. We will continue to work on keeping this cost as low as possible in the future.

Although the members of the Executive Board are volunteers, we do employ a few folks on an “as-needed” basis. As such, I’d like to direct a few thanks. Brenda Bowen is a trustworthy bookkeeper that I “inherited” from Gary Heise, and she has kept our financial books in tip-top shape over the past six years. We still employ Tom Pope for tax preparation (thanks to Rob Shapiro). Finally, it has been a privilege serving as your treasurer, and I am certain that Tammy will serve you capably.

Hello ASB! Karen has graciously given me the opportunity to say a few words. For the last year, I have served in the Treasurer-Elect position to learn the duties and how to deal with the management of journal subscriptions and membership renewals as well as our accounting and reporting activities. Karen has been an excellent instructor and she assures me that I can call her any time! I look forward to serving our society and seeing everyone this summer. – Tammy Bush

Education Committee

Cécile Smeesters, Kimberly Bigelow

Spring is the time for the **ASB regional conferences**: the Human Movement Science and Biomechanics Research Symposium was held in February, the Rocky Mountain ASB Regional Meeting took place in April and, just a few days



ago, June saw the Northwest Biomechanics Symposium. Unfortunately, the Midwest ASB Regional Meeting had to be cancelled due to a serious injury to the main organizer. We wish him well in his recovery and are looking forward to the 2017 edition of the Midwest ASB Regional Meeting. You can read about the resounding success of each one of these other student centered conferences on pages 38 to 41. ASB wishes to thank the organizers of each of these regional conferences for their efforts and the various institutional and commercial sponsors that helped make them possible. If you are interested in hosting an ASB regional conference, [applications for ASB support](#) are due on September 30 each year. I would like to particularly encourage applications from the Northeast and Southwest regions, which have not had a regional conference since 2007 and 2008, respectively.

Spring is also the busiest time for the Education Committee, as it is **ASB graduate student Grant-In-Aid (GIA)** review time. There were only ten proposals submitted this year but the competition was just as intense as last year. Three of the eight members of the Education Committee were randomly assigned to review each proposal. After this initial screening, the top seven proposals were selected for further evaluation by all eight reviewers. While all of these were very good research proposals, we found the five proposals finally selected to be quite outstanding. Finally, the recommendation of the Education Committee was forwarded to the ASB executive board which approved our funding decision. So congratulations to the 2016 GIA recipients:

- **Jordan J Craig**, University of Kansas, Advisor: Jessie Huisinga, "Assessment of Variability and Coordination of Upper and Lower Body Segments during Walking in Healthy Young Adults and Elderly Fallers and Non-Fallers"
- **Ching-Ting Hwang**, Washington University, Advisor: Linda Van Dillen, "Lumbar Alignment and the Development of Low Back Pain in Prolonged Standing"
- **Gu Eon Kang**, University of Michigan, Advisor: Melissa Gross, "A Pilot Longitudinal Study of Motor Behavior in Bipolar Disorder"
- **Daniel J Kuhman**, East Carolina University, Advisor: Paul DeVita, "The Relationships Between Physical Capacity and Biomechanical Plasticity with Age During Level and Incline Walking"
- **K Michael Rowley**, University of Southern California, Advisor: Kornelia Kulig, "Perturbation of Systems Contributing to the Neuromotor Control of Posture in Persons with Low Back Pain"

While we will have to wait until next year to hear the results of their research, you can read about the results of the 2015 GIA recipients on pages 32 to 37. Deadline



ASB Executive Board 2015-16

Secretary/ Membership Chair

Stacie Ringleb, PhD
Old Dominion University
Norfolk, VA 23529
(757) 683-5934
SRingleb@odu.edu

Education Committee Chair

Cécile Smeesters, Eng,
PhD
Université de Sherbrooke
Sherbrooke, QC Canada
J1K2R1
(819) 821-8000 x 66717
cecile.smeesters@usherbrooke.ca

Communication Committee Chair

Robert Catena, PhD
Washington State
University
Pullman, WA 99164
(509) 335-4250
robert.catena@wsu.edu

Newsletter Editor

William Ledoux, PhD
VA Puget Sound
Seattle, WA 98108
(206) 768-5347
wrledoux@uw.edu



ASB Executive Board 2015-16

Meeting Chair

Katherine Saul, PhD
North Carolina State University
Raleigh, NC 27695
(919) 515-1273
ksaul@ncsu.edu

Program Chair

Clare Milner, PhD
Drexel University
Philadelphia, PA 19102
(267) 359-5550
milner@drexel.edu

Program Chair - Elect

Steven Piazza, PhD
Pennsylvania State University
University Park, PA 16802
(814) 865-3413
piazza@psu.edu

Education Committee, cont.

Cécile Smeesters, Kimberly Bigelow

for submission of ASB Graduate Student GIA [applications](#) is January 15.

The last spring task for the Education Committee is to evaluate topic and speaker suggestions for the **tutorials** and **teaching symposium** from the ASB membership. For this year's ASB Meeting we have selected for you the following two **tutorials**:

- **Best Practices in Laboratory Management**, Elizabeth Hsiao-Weeksler, University of Illinois at Urbana-Champaign, Chris Hass, University of Florida, and Daniel Ferris, University of Michigan, Tuesday, August 2 2016, 1:00-3:00 PM. **Feel free to send questions beforehand to ethw@illinois.edu by July 18, 2016.**
- **Inverse or Forward, Simple or Complex...Which Model Should I Use?**, Brian R. Umberger, University of Massachusetts – Amherst, Tuesday, August 2, 2016, 3:00-5:00 PM

We also have a great lineup planned for this year's **Teaching Biomechanics Symposium**, which will be held Friday, August 5 2016, 11:00AM-12:30PM:

- **Demonstrating Continuous Improvement in Teaching and Learning: How To Document Your Work in the Classroom for Tenure and Promotion**, Michelle B Sabick, Saint Louis University
- **Effects of Image-Based and Text-Based Exercises on Student Learning**, Melissa Gross, University of Michigan
- **Creating Assignments That Excite and Empower Students: The Sports Biomechanics Video Presentation**, Kimberly Bigelow, University of Dayton
- **The new ASB Teaching Repository: Your Go To Place for Biomechanics Teaching Ideas**, Cécile Smeesters, Université de Sherbrooke, Kimberly Bigelow, University of Dayton

Yes, our hard work has finally come to fruition! When I organised the second teaching symposium in 2012, the teaching repository was only a dream. The ASB executive board appointed me as Education Committee Chair in 2013, in part to determine what we needed to make it a reality. By 2014 we had a plan, but no viable technological solution to implement it. We explored various options in 2015, refined our plan and secured some funding from the ASB executive board. Finally, in April 2016, a website design and development team was selected and programming has started. We are thus ecstatic to announce that we will unveil the new **ASB Teaching Repository** at ASB2016! A sneak peek will be available shortly, as soon as our program and meeting chairs make our teaching symposium abstract available to all.

I would like to take this opportunity to thank the members of my **Education Committee** for the considerable time and effort they dedicated to the ASB over the past year: Amy Lenz (Student Representative, Michigan State University), Kimberly Bigelow (University of Dayton), Zachary Domire (East Carolina Uni-

Education Committee, cont.

Cécile Smeesters, Kimberly Bigelow

versity), Alena Grabowski (University of Colorado Boulder), Hyun Gu Kang (Cal State San Marcos), Erika Nelson-Wong (Regis University), and Mike Pavol (Oregon State University). They helped me finalise the new competency based scoring rubric for the GIAs which we tested out last year. They reviewed each GIA application diligently and in a timely fashion. Using the new GIA rubric they provided brief comments about notable strengths or weaknesses of each GIA proposal to give applicants some feedback. They suggested topics and speakers for the tutorials and teaching symposium and participated in the final selection. Finally, they will help me end my third year as Education Committee Chair with a bang, by helping me make the ASB Teaching Repository a reality.

Sadly, this is indeed my final year as **Education Committee Chair**. I leave having learned more than I ever expected, satisfied of what I have been able to accomplish, and with an enormous pride and respect for ASB, its members and its executive board. In August, I will thus pass the torch in the very capable hands of Kimberly Bigelow. So good luck Kim, and thanks for lightening my load in the last few months of my term. *If you would like to join Kim's 2016-2019 Education Committee, email her.*



ASB Executive Board 2015-16

Diversity Chair

Kristin Zhao, PhD
Mayo Clinic
Rochester, MN 55905
(507) 284-8942
zhao.kristin@mayo.edu

Student

Representative

Amy Lenz, MSME
Michigan State University
East Lansing, MI 49503
(616) 840-8689
lenzamy@msu.edu



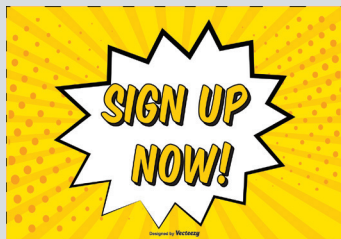
GAIN INSIGHT IN GAIT ANALYSIS WITH PRESSURE MEASUREMENT

READ PRACTICAL RESEARCH EXAMPLES USING TEKSCAN TECHNOLOGY

- FALL RISK EVALUATIONS
- GAIT ANALYSIS FOR STROKE PATIENTS
- PEDIATRIC GAIT
- PT EVALUATIONS
- FOOTWEAR ANALYSIS



DOWNLOAD eBook



Secretary/Membership

Stacie Ringleb



A lot has happened since my last newsletter article. For the first time, we had three drawings for Amazon gift cards. Mariusz Ziejewski, Ching-Ting Hwang, and Douglas Pedersen won for renewing by December 1st, December 15th, and January 15th, respectively. The only negative consequence to reminding people to renew early is that some people purchased their dues a second time when it was time for early registration for the annual meeting. Please remember that when you login to asbmem.org, select “keep your contact and profile details up to date,” and you can see your payment history for membership dues. The highest volume of applications came in between the time abstracts were accepted and the May 15th early registration deadline for ASB’s 40th annual meeting. Additional high volume times were just before the grant-in-aid applications were due and right before the travel grants were due.

For 2016, we have increased the amount of demographic information that we request from our members and applicants. All of this information, excluding your major research area, has an option of “prefer not to answer”. We are planning to use this information in aggregate form for tasks including, but not limited to, supporting information for NIH grants that help support our annual meetings, including the diversity travel award, and to provide data to help the Diversity Committee to identify action items. Additionally, the Executive Board drafted a society confidentiality statement relating to the handling of sensitive membership data; the final accepted version will be shared on the society website.

A summary of our membership numbers and demographics follows. As of June 1st, we have 830 active members (533 regular and 297 student members). Of the people whose profile includes sex, there are 265 female members, 480 male members, and one who did not wish to answer. For race (following the NIH guidelines), there is 1 American Indian/Alaska Native, 96 Asian, 16 Black/African American, 2 Native Hawaiian/Other Pacific Islander, 20 other, 620 white, and 71 who did not wish to answer. The ASB has 756 members without a disability, 8 members with a disability and 64 members who didn’t wish to answer. Before we updated our system to follow NIH requirements for reporting ethnicity, we had many racial categories mixed in with ethnicity, therefore this category doesn’t have complete data. Of the 460 members who updated their membership profile (or submitted new applications), 92 identified as Hispanic or Latino, 319 are not Hispanic or Latino, and 49 did not wish to answer. Please take a few minutes to login to asbmem.org to update your profile (even if it’s to “do not wish to answer”), to help complete our database. If you need help logging on because you have moved and you can’t send yourself an email to reset your password, please let me know, as I can manually change your email address in the system.

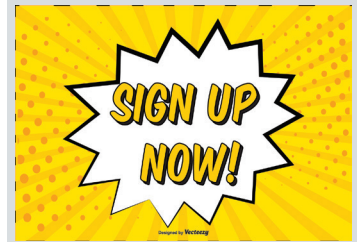
In addition to the more traditional demographic data, all members report their primary research discipline. There are 33 members in the biological sciences area, 364 in engineering and applied physics, 51 in ergonomics and human factors, 249 in exercise and sport science, and 128 in health sciences. Finally, I examined where our members live and/or work. There are 2 ASB members in Australia, 1 in Brazil, 25 in Canada, 3 in China, 1 in Germany, 2 in Israel, 3 in Japan, 2 in New Zealand, 1 in Switzerland, 2 in the United Kingdom, and 786 in the United

Secretary/Membership, cont.

Stacie Ringleb

States. From the 764 members who have their state included in their membership profile, we have members in 43 states (including Alaska and Hawaii) and the District of Columbia.

My predecessor, Andy Karduna, made some changes to the profiles that are maintained in the ASB membership database, to make it easier to evaluate membership applications and to adhere to our bylaws. The first change is that all applicants must provide the membership number of two current members to be their sponsors. Student member applicants can have a regular and a student sponsor, while regular member applicants must have two current regular members sponsor their applications. If you are asked to sponsor a member, use the guidelines provided by the bylaws to determine if you would like to sponsor their membership. Regular members are “individuals with an established professional reputation in biomechanics,” and student members are “College and University students with a demonstrated interest in biomechanics.” The second change to the online application was an easier method of entering information from your CV, including education, experience, publications and your affiliation. Please take a few minutes to update your profile, especially if you applied for your membership on paper, like I did. Sometimes potential members don’t know ASB members and contact me to help identify sponsors. When I suggest potential sponsors, I do my best to find someone at your institution or a nearby institution with similar research interests. Please take the time to consider sponsoring potential members who contact you, as they could end up being future collaborators or even co-hosts of a regional ASB meeting.



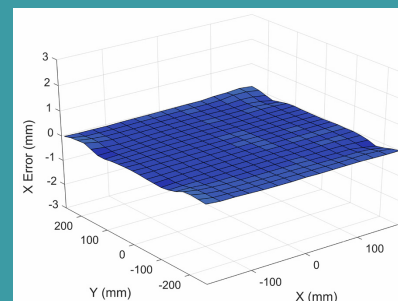
DO YOU CARE ABOUT ACCURACY?



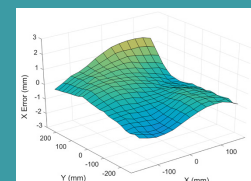
Up to **100X** more accurate over the entire working surface

AMTI OPTIMA

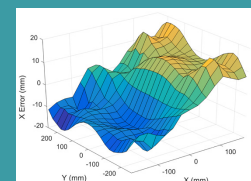
Extreme accuracy over the entire working surface



MANUFACTURER A COP X ERROR



MANUFACTURER B COP X ERROR



Your conclusions are only as good as your equipment.

AMTI has established our OPTIMA calibration as a best-in-industry process. We measure error in more than 40 different ways to optimize your platform's performance. Worldwide, biomechanics researchers and clinicians rely on AMTI platforms to deliver the most accurate force measurements. Shouldn't you?

CONTACT

E: optimasales@amtmail.com
P: 617-926-6700
www.amti.biz



MVN BIOMECH LINK

3D Kinematics in Sports Biomechanics



Xsens

phone +31 88 97367 00
general e-mail info@xsens.com
sales e-mail sales@xsens.com

Xsens North America Inc.

phone 310-481-1800
general e-mail info@xsens.com
sales e-mail sales@xsens.com

WWW.XSENS.COM

Past-President

Darryl Thelen

A major duty of the Past-President is to oversee the awards process and selection of the travel grant awardees. I would like to begin by thanking all the ASB members who graciously agreed to serve on the Awards Committee. It is really a pleasure to have a membership that is so willing to pitch in to help, and to get reviews completed in a thoughtful and timely manner. Following are the 2016 winners of our ASB awards.



Borelli Award: Ted Gross

This is the most prestigious honor given by the ASB. The award recognizes outstanding career accomplishment and is awarded annually to an investigator who has conducted exemplary research in any area of biomechanics. This year's Borelli Award winner is Ted Gross, PhD, from the University of Washington. Dr. Gross received his PhD from the State University of New York at Stony Brook in Mechanical Engineering, following a BS in Mechanical Engineering from Trinity University and a MS in Sport Biomechanics from Penn State. Dr. Gross's research has explored how bone and bone cells respond to mechanical stimuli in normal and pathological situations. His work has transcended from animal studies looking at phenomenological relationships between mechanics and bone remodeling, to his more recent work focused on understanding the molecular basis for bone remodeling. The theme of his nomination was 'Exploring Bone Mechanotransduction: A Winding Path through Bone, Muscle, and Nerve.' Dr. Gross previously served as ASB President (2005-06) and is an ASB Fellow. Dr. Gross will deliver the Borelli Keynote Lecture on August 4th at the 40th Annual Meeting of ASB.



Jim Hay Memorial Award: Jill McNitt-Gray

The Jim Hay Memorial Award was established in 2004 through the support of the Hay family and additional donors to recognize outstanding career accomplishment. Selection of the awardee is based on originality, quality and depth of the research, and the relevance of the work to the field of sports and exercise biomechanics. This year's Hay Award winner is Jill McNitt-Gray, PhD, from the University of Southern California. Dr. McNitt-Gray received her PhD from Penn State University in Biomechanics, following an AB in Mathematics and Statistics from Miami University in Ohio and a MA in Biomechanics from the University of North Carolina. Dr. McNitt-Gray's interdisciplinary research focuses on the neuromuscular control and dynamics of human movements, and aims to identify risk



2016 Award Summary

Borelli Award

Ted Gross,
University of Washington

Jim Hay Memorial Award

Jill McNitt-Gray,
University of Southern California



2016 Award Summary

Young Scientist Pre-Doctoral

Emily Lawrence,
University of Southern California

Young Scientist Post-Doctoral Award

Katherine Steele,
University of Washington

Clinical Biomechanics Award

Nathan D'Amico, et al.,
Georgia Southern University, Campbell University, and University of Prince Edward Island

Journal of Biomechanics Award

Benjamin Robertson, et al.,
Temple University and North Carolina State University

Junior Faculty Research Award

Jeremy Crenshaw
University of Delaware

President's Award

TBD at the annual meeting

Research Travel Grant

No applications received

Past-President, cont.

Darryl Thelen

factors and develop effective methods for performance enhancement for individuals with various ability levels (clinical populations as well as elite athletes). She uses both experimental and dynamic modeling approaches to test research hypotheses specific to control priorities during physically-demanding well-practiced tasks. Dr. McNitt-Gray has served ASB as Education Chair (1993-95), Program Chair (2002) and as President (2010-11), and is an ASB Fellow. Dr. McNitt-Gray will deliver the Hay Award Keynote Lecture on August 5th at the annual meeting.

Young Scientist Pre-Doctoral Award: Emily Lawrence

This award recognizes early achievements by a promising young scientist prior to the award of their PhD. Selection is based upon the scientific quality of the submitted materials which included a letter of nomination, curriculum vitae, description of research interests, representative published papers, and an abstract submitted to the 2016 meeting. This year's winner is Emily Lawrence of the University of Southern California. Emily is a PhD student in the Brain-Body Dynamics Laboratory directed by Dr. Francisco Valero-Cueva, and is conducting research on sex differences in motor control. She completed her BS and MS degrees in Biomedical Engineering at Louisiana Tech and previously worked as an engineer in the NASA Neuroscience Motion Lab. Ms. Lawrence will deliver her award presentation on August 5th at the annual meeting.

Young Scientist Post-Doctoral Award: Katherine Steele

This award recognizes early achievements by a promising young scientist. Nominees for this award must have received their doctoral degree within five years of the annual meeting. Selection is based upon the scientific quality of the submitted materials which included a letter of nomination, curriculum vitae, description of research interests, representative published papers, and an abstract submitted to the 2016 meeting. This year's winner is Katherine Steele, PhD, of the University of Washington. Dr. Steele received her MS and PhD from Stanford in Mechanical Engineering, following a BS in Engineering from Colorado School of Mines. She completed a Post-Doctoral Fellowship at the Rehabilitation Institute of Chicago and now directs the Human Ability and Engineering Lab in the Mechanical Engineering Department at The University of Washington. Her research focuses on using principles of biomechanics, engineering, and design to improve movement after brain injury. Dr. Steele will deliver her award presentation on August 5th at the annual meeting.

Clinical Biomechanics Award: Nathan D'Amico, et al.

This award recognizes outstanding new biomechanics research targeting a contemporary clinical problem, and is sponsored by Elsevier Science, Ltd., publishers of Clinical Biomechanics. The awardee is expected to submit their work for publication in the journal Clinical Biomechanics. The awardee is selected by a committee from all submitted abstracts for the 2016 Annual Meeting. The winners of this year's Clinical Biomechanics Award are Nathan D'Amico, Megan Mormile, Katelyn Grimes, Barry Munkasy, Doug Powell, Rebecca Reed-Jones and Nicholas Murray for their abstract entitled "Assessment of gaze stability within 24-48 hours post-concussion."

Past-President, cont.

Darryl Thelen

Journal of Biomechanics Award: Benjamin Robertson, et al.

This award recognizes substantive and conceptually novel mechanics approaches explaining how biological systems function. It is sponsored by Elsevier Science, Ltd., publishers of the Journal of Biomechanics. The awardee is expected to submit their work for publication in the Journal of Biomechanics. The awardee is selected by a committee from all submitted abstracts for the 2016 Annual Meeting. The winners of this year's Journal of Biomechanics Award are Benjamin Robertson, Siddharth Vadakkevedu and Gregory Sawicki for their abstract entitled "An in vitro approach for directly observing muscle-tendon dynamics with parallel elastic mechanical assistance."

Junior Faculty Research Award: Jeremy Crenshaw

The Junior Faculty Research Award is a \$5,000 grant that can be used to generate pilot data and support early investigators. 2016 is the first year this award has been distributed. This year there were twelve applications that were each reviewed by three members of the review committee. The awardee was selected based on the significance of the problem, the scientific approach, and the impact of the project on the candidate's research program. The winner of this year's Junior Faculty Research Award is Jeremy Crenshaw from the University of Delaware, for his proposal titled, "Fall-Recovery Training for Individuals with Chronic Stroke".

Research Travel Grant: No applications received

Student Travel Awards:

The student travel award is to help students attend the ASB annual meeting. To be eligible, one must be an ASB student member and have authored an abstract for presentation at the 2016 Annual Meeting. The award comes with \$250 to offset travel costs. Winners of the award for this year are Albert Angiolilo (University of Colorado), Matthew Beerse (Georgia State University), Elizabeth Bell (University of Maryland), Scott Ducharme (University of Massachusetts, Amherst), Brecca Gaffney (University of Denver), Rena Hale (University of Texas at El Paso), Amy Hegarty (Colorado School of Mines), Jenny Kent (University of Nebraska at Omaha), Paige Lin (University of Southern California), Evan McConnell (Virginia Tech), Zachary Merrill (University of Pittsburgh), Renani Mohsen (University of Missouri-Kansas City), Joseph Mozingo (Mayo Clinic), Iman Shojaei (University of Kentucky) and Aida Valevicius (University of Alberta).

American Society of Biomechanics Fellows:

In 2011, ASB created the status of Fellow to recognize professional achievement and service of the top members of the Society and to encourage continued service to the Society in leadership roles. There are three new ASB Fellows to be inducted in 2016: Vijay Goel, PhD (University of Toledo), Richard Hughes, PhD (University of Michigan) and Richard Neptune, PhD (University of Texas).

Congratulations to our award winners and new Fellows!



2016 Award Summary

Student Travel Awards

Albert Angiolilo, University of Colorado

Matthew Beerse, Georgia State University

Elizabeth Bell, University of Maryland

Scott Ducharme, University of Massachusetts, Amherst

Brecca Gaffney, University of Denver

Rena Hale, University of Texas at El Paso

Amy Hegarty, Colorado School of Mines

Jenny Kent, University of Nebraska at Omaha

Paige Lin, University of Southern California

Evan McConnell, Virginia Tech

Zachary Merrill, University of Pittsburgh

Renani Mohsen, University of Missouri-Kansas City

Joseph Mozingo, Mayo Clinic

Iman Shojaei, University of Kentucky

Aida Valevicius, University of Alberta



2016 Award Summary

ASB Fellows

Vijay Goel, University of Toledo

Richard Hughes, University of Michigan

Richard Neptune, University of Texas

Major Changes in ASB Awards

Chris Hass, Darryl Thelen, Paul DeVita

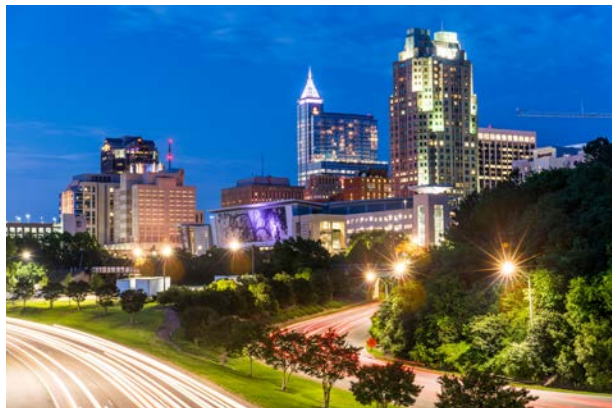
We have two major developments on society awards that we would like to share with the ASB membership. First, following a series of discussions with membership over the last two years, the ASB Executive Board has voted to change the criteria for the Jim Hay Memorial Award. Beginning in 2017, the Hay Award will be open to mid-career ASB members of all disciplines and research interests. Recipients of the award must be within 20 years of their terminal degree, and have demonstrated both scientific accomplishment in biomechanics and excellence in mentoring. We made these changes because as previously defined, the Hay Award was open to individuals working in only sports and exercise science biomechanics, which represented a smaller component of the society's overall research activities. Also, the Hay Award was for outstanding career accomplishments, meaning that nominees for that award were also prime nominees for the Borelli Award. We believe that transforming the Hay Award into a mid-career award would better distinguish it from the Borelli, while promoting ASB members at an important point in their careers when they are being considered for promotions or recognition within their institutions. An official call for nominations will be posted to the society website this summer, so please begin considering eligible members who you believe would be strong candidates for the award.

The second major development is that the society has received a very generous gift from the family of Vijay Goel to establish the Goel Award for Translational Research in Biomechanics. It is the intent of the donors to recognize biomechanics research activities that result in commercial and societal benefits. The ASB Executive Board is now drafting eligibility, nomination, and review criteria, and would welcome any input from the membership as they go through the process of setting up the award. We hope to establish the criteria in time to receive nominations in early 2017, with the first Goel Award presented at the 2017 Annual Meeting. Please send any comments or suggestions you might have regarding the new award to President-Elect [Chris Hass](#), President [Paul DeVita](#), or Past-President [Darryl Thelen](#).

Chris Hass, President-Elect
Paul DeVita, President
Darryl Thelen, Past-President

*"People go into science out of curiosity, not to win awards.
But scientists are human and have ambitions."*

- Venkatraman Ramakrishnan



Things to do around Raleigh

When you're looking for the fun, excitement and attractions of a great city, combined with the approachability and appeal of a classic Southern town, look no further than Raleigh. Excellent cultural and entertainment opportunities, mild climate, natural beauty, and convenient and accessible location. Everything you'd expect in a metropolitan area, plus a touch of the unexpected.

Research Triangle Park

Home to eight universities and colleges, Raleigh, N.C., is one of the three corners of North Carolina's Research Triangle Region, namesake of The Research Triangle Park. Since 1959, RTP today is the largest continuously operating research park in the nation. It is home to 170 companies, offering opportunities to more than 42,000 knowledgeable professionals, Nobel Laureates. It also has spawned more than 1,500 start-up companies since 1980. To stay, plan a visit to colleagues at [local universities and colleges](#) or any of the research facilities easily accessible throughout the state.

North Carolina State Capital

Just blocks from the Raleigh Convention Center is the North Carolina State Capitol. Since 1840, this National Historic Landmark is one of the finest and best-preserved examples of a civic building in the Greek Revival style of architecture. Visit the Capitol to learn about its history and ghost stories. Tours are free.

1 E. Edenton St., Raleigh 27601 • 919.733.4994 • www.nchistoricsites.org/capitol

Museums

If museums play to your interests, there are plenty of options in the Raleigh area.

North Carolina Museum of History

Explore North Carolina's past and learn about its people. See exhibits highlighting the state's history, decorative arts, sports heroes and more. Special programs include craft demonstrations, music concerts and family events. The museum is a part of the Office of Archives and History, Department of Cultural Resources. The Museum Shop, featuring North Carolina merchandise, is open daily. Free admission.

5 E. Edenton St., Raleigh 27601 • 919.807.7900 • www.ncmuseumofhistory.org

North Carolina Museum of Natural Sciences and Nature Research Center

The Southeast's largest natural history museum offers four floors of exhibits, IMAX theater, and Acro Cafe. Highlights include the world's most complete Acrocanthosaurus skeleton, the first dinosaur discovered with a fossilized heart; a two-story waterfall; and the conservatory, which is buzzing with hummingbirds and butterflies. Additionally, the Nature Research Center (open for our banquet) allows you to explore not just what we know about the natural world, but how we know it—the tools, techniques, and real live scientists that study the past, present, and future of our planet.

11 W. Jones St., Raleigh 27601 • 919.733.7450; 877.462.8724 • www.naturalsciences.org



Contemporary Art Museum

The Contemporary Art Museum (CAM) was originally established in 1983 as the City Gallery of Contemporary Art to complement other Raleigh area museums and galleries by presenting solely contemporary art. The name change to CAM came in 1996. In its new home in downtown Raleigh's Warehouse District as of April 2011, CAM explores what's now and nearing in an always-changing museum experience.

409 W. Martin St., Raleigh, 27603 • 919.513.0946 • www.cam.ncsu.edu

Marbles Kids Museum

Marbles Kids Museum delivers purposeful play in a big way. Children imagine, discover and learn in dozens of interactive exhibits, daily educational programs, field trips, birthday parties, special events... and giant-screen IMAX films, too! Kids connect, communicate, create and learn through extraordinary adventures in play at the museum.

201 E. Hargett St., Raleigh 27601 • 919.834.4040 • www.marbleskidsmuseum.org

Duke Energy Center for the Performing Arts

Experience the most elegant, immersive suite of live-performance venues in the Southeast at the Duke Energy Center for the Performing Arts, located right next to the conference center. Indulge your love of theater, opera, ballet and other live entertainments, in performance halls and centers designed around each unique art. As part of Raleigh's Hot Summer Nights Series, Steel Magnolias is playing in the Kennedy Theatre during ASB. Tickets are available online.

2 E South St, Raleigh, NC 27601 • 919-996-8700 • www.dukeenergycenterraleigh.com

Local Tours

Enjoy a narrated tour of downtown Raleigh from an "old" point of view on the **Historic Trolley Tour**! The trolley stops at Mordecai Historic Park, Bicentennial Plaza, Glenwood South, Joel Lane Museum House and City Market. Passengers can de-board at these stops and re-board at no additional fee. For more information, visit www.raleighnc.gov/mordecai.

If a Segway is more your style, try **Triangle Glides'** fully narrated tours. These fun and information tours will get you up close to Raleigh's fascinating points of interest. Unlike a walking tour, you'll cover much more ground as you effortlessly "glide" from place to place. Triangle Glides provides training, helmets and a wireless audio pack so you can easily hear your guide's live narration about Raleigh's interesting history. Choose from several different tours from one to two hours. For more information, visit www.triangleglides.com.

Beaches

If you are planning on extending your stay, check out the Outer Banks (www.outerbanks.org) or Wilmington beaches (www.wilmingtonandbeaches.com). There are great places to sit by the water's edge and enjoy fresh local seafood and regional specialties.

For more information about visiting Raleigh,
go to visitRaleigh.com • #visitRaleigh



Communications Committee

Robert Catena

If you haven't got a chance yet, I would recommend you read Michael Gazzaniga's [Tales from Both Sides of the Brain](#) in your free time. Equally as good as his history of split brain research is his interjecting accounts of a distinguished career in academia. Hearing a leader in his field explain both his research and career reminds me of two great opportunities ASB members have this year at our annual conference in Raleigh. The Founders and Fellows Forum will give you chance to hear from leaders in the biomechanics field. The keynote presentations are a chance to hear of lifelong research endeavors that make a successful academic career. Both offer students and earlier-career scientists opportunities to hear of ways by which they can shape their own careers.

Speaking of helping individuals start a long distinguished career, the communications committee has recently updated our [grad programs website](#). Over the past few months we've had over 7000 hits on this site. Hopefully this is helping students find the best opportunities for their particular interests. We ask that you encourage students to use it and provide us feedback on how it can be improved. We continue to get information on programs and labs and are working to keep the site up-to-date. The communications committee is also continuously checking links and contacting labs and programs if we find that their links are broken.

Over the next year our goal is to focus our attention on improvements for the rest of the ASB website. One of the most exciting additions will be the posting of our keynote and award-winner presentations from our Raleigh conference. Check back to the website shortly after the conference conclusion to see these. Our ultimate hope is that these recordings could be viewed by students at all levels of their education to see all the exciting research going on in the field. We will also soon be soliciting for new exciting pictures for our homepage banner.

Thanks to all who have helped improve the ASB website and I look forward to hearing from you and seeing you in Raleigh.



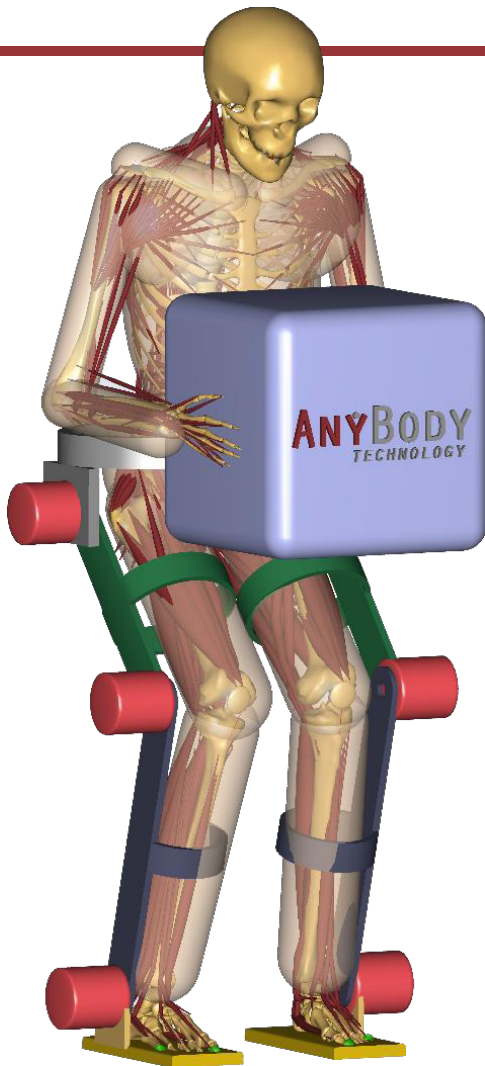
Find us on Facebook or Follow us on Twitter

Facebook: [American_Society_of_Biomechanics](#)

Twitter: [@AmSocBiomech](#)

Rio Olympics and Biomechanics

Colleagues - We are one month away from the Rio Olympics. This event is a great opportunity for our member to provide biomechanically relevant commentary and to showcase the research that our members are conducting to maximize human performance. University public relations offices are always looking for ways to connect faculty research and expertise to current events. For example, UC Boulder's recent research on the ground reaction forces produced during the steeplechase hurdle and water jumps would be great to highlight by both the University of Colorado and ASB. These commentaries are a great way for us to highlight the influence of biomechanics on the world around us. ASB would love to work with our members and university public relations offices in this manner. Additionally, ASB will host these commentaries on the ASB website and social media outlets. Please contact ASB Communications Director, [Robert Catena](#), with your posts.



Harness the full potential of human biomechanical simulation with the **AnyBody** Modeling System.

Use our libraries of validated models and tools to compute muscle effort and joint loading during motions in real-life environments.

Let's meet at ASB 2016 2-5 August in Raleigh, NC

Stop by booth #10 to discuss how our simulations could add value to your research. [Book a meeting](#)

Visit **AnyBody** online

Visit our website (www.anybodytech.com) and browse our YouTube channel for over 50 webcasts on biomechanics and simulation.

Recommended views:

[Simulating Man-machine Symbiosis](#)

[Ground Reaction Force Prediction](#)

[Winning the GrandChallenge: Patient-Specific Knee Modelling](#)



Program Chair

Clare Milner



Our 40th annual meeting will soon be upon us and we are excited about the upcoming plans, from the scientific program to the special celebratory events recognizing this milestone in the society's history. We had over 650 abstract submissions this year, maintaining the recent growth of the annual meeting. We have invited three excellent keynote speakers, who will showcase the breadth and depth of cutting edge research in biomechanics.

Dr. Sheila Patek is an Associate Professor of Biology at Duke University in Durham, NC. Her world-renowned research program addresses the mechanics and evolution of ultra-fast movements in biological systems and the evolutionary mechanics of movement and communication.

Dr. Tibor Hortobágyi is a Professor in Movement and Healthy Ageing at the University Medical Center Groningen, the Netherlands, and is our International Society of Biomechanics Invited Speaker. His work examines acute and chronic neuromechanical adaptations to exercise in young and older adults, and seeks mechanisms to promote and maintain quality of life through exercise.

Dr. Duane Knudson is Professor and Chair in the Department of Health and Human Performance at Texas State University. Dr. Knudson is the International Society of Biomechanics in Sports Invited Speaker, and will present Application of Tennis Biomechanics in the Court and Beyond.

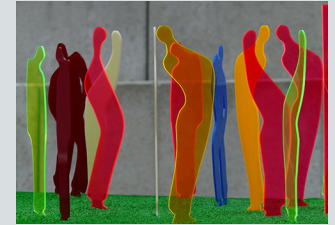
In addition to our plenary speakers, we will have our annual Borelli Award and Hay Award keynote lectures, plus Pre- and Post-Doctoral, Clinical Biomechanics, and Journal of Biomechanics award lectures. Parallel programming this year includes 7 symposia, 14 podium, and 14 thematic poster sessions in the following topic areas:

Symposia:

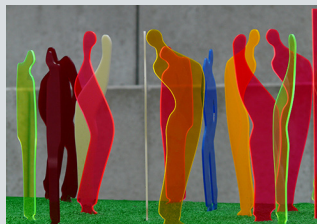
- Validation of Computational Models with Orthopaedic and Biomechanics Applications
- Minimal Footwear: It's Not Just for Running!
- Will the Real Loading Parameter Please Stand up?
- Are We Missing Something after Concussion? Identifying Lingering Balance Control and Cognitive Deficits and their Potential Consequences
- Study Population Diversity in Biomechanics: Is it Warranted?
- Teaching Biomechanics Symposium
- Quantifying Human Augmentation: State-of-the-Art & Future Challenges

Podium Sessions:

- Approaches for improving lower extremity prosthetics
- Biomechanics and neuromuscular control of gait
- Bone
- Comparative biomechanics
- Energetics of human movement
- Finite element analysis
- Gait
- Hip



**2016 Annual
meeting [website](#)**



**2016 Annual
meeting website**

Program Chair, cont.

Clare Milner

Podium Sessions, cont.:

- Modeling and simulation
- New developments in balance research
- Shoulder girdle
- Slips, trips and falls
- Upper extremity
- Upper extremity in sports
- Variability: informing our understanding of gait biomechanics
- Wrist and hand

Thematic Poster Sessions:

- Anterior cruciate ligament injury
- Balance training
- Concussion/traumatic brain injury
- Ergonomics
- Foot and ankle
- Gait in people with obesity
- Jumping and landing
- Knee
- Methods in gait analysis
- Muscle
- Orthoses and exoskeletons
- Running
- Upper extremity neuromechanics
- Variability in gait

I would like to thank members of the ASB community for their contributions to organizing the programming for the annual meeting. Over 120 members volunteered to review and help to evaluate abstracts for the meeting and contribute to ensuring the scientific merit of the program. Additionally, I would like to thank the following members of the program committee for all of their hard work: Stephen Charles (Brigham Young University), Jeremy Crenshaw (University of Delaware), Zac Domire (East Carolina University), Elizabeth Russell Esposito (Brooke Army Medical Center), Allison Gruber (Indiana University Bloomington), Max Paquette (University of Memphis), Steve Piazza (Pennsylvania State University), Sheri Silfies (Drexel University), Anne Silverman (Colorado School of Mines), Meghan Vidt (Arizona State University), John Willson (East Carolina University), and locally at Drexel University: Trey Brindle, Mike Bijman, Courtney Butowicz, Han Chen, Dave Ebaugh, and Margaret Finley.

We are looking forward to a great 40th annual meeting and hope to see you in Raleigh!

"We can lick gravity, but sometimes the paperwork is overwhelming."

- Wernher von Braun

Robert McNeill Alexander

Rodger Kram



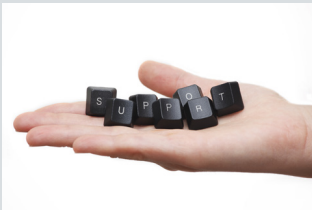
The field of biomechanics lost a giant on March 21 when R. McNeill Alexander (1936-2016) died at the age of 82 after a career spanning 50 years. Though bestowed with many lofty titles and awards (Commander of the Order of the British Empire, Fellow of the Royal Society, Muybridge Award from ISB, and Borelli Award from ASB), Prof. Alexander humbly introduced himself as “Neill”. While many of us specialize in just one aspect of biomechanics in just one species, Neill studied fish, birds, camels, kangaroos, humans, and dinosaurs among others. Though best known for his whole-organism locomotion research, Alexander also investigated the tissue level biomechanics of tendon and bone, and theorized about digestion, sound production, ecology, and migration.

As a Cambridge trained zoologist, Alexander approached biomechanics from an evolutionary perspective. His more than 285 career publications are characterized by careful empirical measurements, predictive analytical and quantitative models, and discussion sections that synthesized and generalized his findings. His laboratory at the University of Leeds (UK) was modest, and even cramped, but contained mechanical testing machines and freezers full of unusual animal specimens—a side benefit of his being an overseer of the London Zoo.

Two of Alexander’s scientific accomplishments stand out. Prior to the 1970s, tendons were thought of as rigid struts. However, in 1973, thermal/metabolic physiologists Terry Dawson and Dick Taylor discovered that kangaroos amazingly consume metabolic energy at the same rate whether they hop slowly or rapidly. Alexander’s paper in the *Journal of Zoology (London)* in 1975 provided a quantitative analysis of how much elastic energy must be stored and recovered from the long, slender Achilles tendon. In time, it became clear that nearly all running mammals, including humans, utilize tendons to store and recover elastic energy. In subsequent decades, Alexander quantified the elastic behavior of tendons, ligaments and other “springy bits” in many different animals. In my favorite of his 20(!) books, *Elastic Mechanisms*, Neill provides a very readable overview and synthesis.

Alexander’s biggest idea was his dynamic similarity hypothesis (*Journal of Zoology*, 1983). He posited that the ratio of inertial and gravitational forces fundamentally determine and constrain the way that small and large animals walk, run, trot, and gallop across their speed ranges. Doing his PhD work at Cambridge on fish buoyancy, under biomechanics pioneer Sir James Gray, familiarized Alexander with the dimensional analysis of fluid mechanics. Ship designers utilize the dimensionless Froude number (rhymes with “food”) to create and test scale models of large ships. Alexander adapted the Froude number to legged locomotion as the ratio of the centripetal force (mv^2/L) to the gravitational force mg (v is forward velocity and L is leg length) which simplifies to v^2/gL . Mice, mink, marmots, moose, and mammoths all use walking gaits at Froude numbers < 0.5 and switch from trotting to galloping at Froude numbers of 2-3. Delightfully, Alexander utilized Froude numbers and fossil footprints to estimate the speeds of dinosaurs.

On a personal level, Neill Alexander was a consummate British gentleman. Though 30 years our senior, when Claire Farley and I visited him in Leeds in



ASB Corporate Sponsors 2016

Corporate sponsor levels are aimed at encouraging affiliation by commercial organizations that market products which are used by the biomechanics research community, or companies that are otherwise engaged in activities that fall within the Society's general interest areas. Companies wishing to become a Corporate Member are encouraged to contact [Karen Troy](#), Treasurer.

The ASB Executive Board is pleased to recognize the following corporate sponsors:

Partner Level

Tekscan



Robert McNeill Alexander, cont.

Rodger Kram

1989, he deftly leapt to open every door. Neill possessed a mischievous sparkle in his eyes, a dry sense of humor and an absent minded professor persona. When he showed a slide of Darwin with a long grey beard that bore a striking resemblance to himself, Neill quipped that it was not a self-portrait. At conferences, Neill was sincerely interested in what students were researching and offered encouraging suggestions and insights. I was recently reminded of how at the Toledo ASB meeting, after receiving the Borelli award, he "held court" with students from Dan Ferris' lab. We would all be wise to recognize that inspiring the next generation of biomechanists is our most important legacy.



R. McNeill Alexander contemplating some fossil limb bones of a giant sauropod dinosaur (~early 1970s).

Diversity Committee

Kristin Zhao

Celebration of Diversity

Since its inception in 2014, the ASB Diversity Committee has been actively engaged in fulfilling the mission of building a professional community that respects and promotes diversity, inclusion, and learning from the diverse perspectives of our membership as we seek common goals for the biomechanics community. It is through the committee's various initiatives that we are committed to celebrating diversity and the many ways in which diversity improves our team efforts to conduct the highest level of research, educate students, and broaden our acceptance of individual differences. As the ASB Executive Board has faced challenges in this realm related to the passing of HB2 in North Carolina, we have remained firm in our commitment and efforts at supporting the membership. As attendees and society members, please feel free to reach out to ASB Executive Board members at any time, and especially during the conference, for support or guidance with concerns in this regard.

Diversity Travel Awards

As reported in the last newsletter, 22 inaugural-year Diversity Travel Awards, supported by a grant from NIH, were given to undergraduate, graduate, post-graduate, and faculty recipients. Additionally, invited speakers gave engaging presentations at the Women in Science and Diversity Breakfasts in Columbus, Ohio. We are encouraged to continue these traditions at the ASB annual conference in Raleigh, NC, as feedback from membership and travel award recipients was encouraging and inspiring. Samuel Acuña, PhD student at the University of Wisconsin–Madison, one of the inaugural Travel Award recipients, reported “My overwhelming take away from the conference was just an incredible sense of motivation and excitement for biomechanics.” His enthusiasm for the conference and scientific exchange was palpable, and followed him back to his host institution. His interactions at the conference allowed him to explore new directions in his research and raise the quality of his research to the next level. We are committed to supporting the careers of other new or existing researchers in biomechanics. The 2016 application deadline has passed; please encourage your students and colleagues to monitor the ASB website for announcement of the 2017 award application deadline.

Women in Science and Diversity speakers for 2016

We are excited to host two accomplished speakers in Raleigh, NC this year. The Women in Science breakfast speaker will be **Dr. Mary Wyer**. Dr. Wyer is Associate Professor of Psychology/Women's & Gender Studies at NC State University. She has been teaching, writing, and doing research about women, inequality, and science for over 20 years, and most recently completed a third edition of the textbook, *Women, Science, and Technology* (Routledge 2014). She has secured over \$1.2M in funding from the National Science Foundation for these efforts, including an NSF ADVANCE Leadership Award (2002-2005) for innovative approaches to addressing the underrepresentation of women in science. Most recently, she was awarded NC State University's Equity Award (2014) for her commitment to diversity in teaching, research, and service. The Diversity Breakfast speaker will be **Dr. Robin Cogger**. Dr. Cogger is the Dean of the College of Engineering (COE) and a Professor of Mechanical Engineering at North Caro-





Diversity Committee, cont.

Kristin Zhao

lina Agricultural and Technical State University in Greensboro, NC. Dr. Cogger's research expertise is in solving design and performance problems related to tissue engineered organs, with special emphasis on liver replacement devices and their safe storage for off-the-shelf availability. Her work has been supported by grants from the National Institutes of Health, the National Science Foundation, and the Whitaker Foundation; and has resulted in numerous publications in the areas of liver tissue engineering and cryopreservation, one patent, and two additional patent applications. Dr. Cogger is a Fellow of the American Society of Mechanical Engineers and of the American Institute for Medical and Biological Engineering. She is also a member of the Board of Directors of FIRST – an organization founded to inspire the interest and participation of young people in engineering, science and technology.

ASB Interest Groups

The Diversity Committee and the conference organizers would like to encourage groups of individuals to self-organize during the conference to expand your circle of collaborators, friends, mentors, and mentees. These interest groups could be self-organized around a shared research interest, personal interest, etc. If you are planning an interest group meeting and would like to invite membership, please contact [Kristin Zhao](#) prior to the conference so that the meeting location and time can be added to the conference app.

Update on ongoing Diversity and Inclusion efforts

The membership records continue to be updated regarding race and ethnicity of our membership, in order to provide more sensitive services and programs to our members. As part of this effort, the Executive Board has drafted a society confidentiality statement relating to the handling of sensitive membership data; the final accepted version will be shared on the society website. Additionally, for the 2016 annual meeting, we requested appropriate descriptions of study participants in submitted abstracts (such as sex and age). We believe providing this information will promote sound science and research justice, by including study populations that reflect the national population. These descriptors will be encouraged in future year's submissions, to encourage investigators to consider understudied populations and health disparities.

"Art is I; science is we."

- Claude Bernard

President-elect

Chris Hass



Never too much of a good thing

Since we turned off the lights in Columbus, your executive board and a group of dedicated members have been planning for ASB 2018. That statement is correct. The planning of our annual meeting actually begins at least 2 years before the opening gavel. One of the main reasons for this “early” start is the growing size of our meeting. Meeting attendance has increased by almost 50% over the last 6 years (932 attendees in Columbus). That means we have started to outgrow the quaint university auditoriums and lecture halls of our past. Further, the membership’s enthusiasm for multiple parallel podium sessions, thematic posters, and posters that are displayed for several days requires a venue possessing a variety of large-space options. This winter and spring, the board solicited meeting proposals from the membership and worked with a professional planning company to research, evaluate, and identify the ideal venue to showcase our science. We received four strong bids; and, after much deliberation, I am happy to announce that...

Sorry, you will have to come to Raleigh to hear the big announcement.

When the teacher becomes the student

In our last edition, I wrote to the membership about the power of mentorship. ASB has a strong belief in and tangible programming aimed at optimizing educational and professional experiences through professional development. For instance, at ASB 2016 we again will have noteworthy participation in our mentorship program, a “best practices in laboratory management” tutorial, and an insightful Fellows and Founders session, where we will, no doubt, be inspired by the sages of our field. These programs and events are successful because faculty and senior scientists meaningfully engage and launch sustained conversations about purpose. When I mention purpose, I refer not only to the question “What is the purpose of...” which we have all been asked when it comes to our scientific endeavors. I include in this interpretation the “Why?” What motivates us to the core of our being to engage in the unknown of scientific discovery and the process of cultivating transformative higher learning. Without understanding our individual purpose, we can become prey to the hungry negativity surrounding higher education and sponsored research. Daily, we are faced with barriers—some old, some new—that impede our success. State-level support of universities is at an all-time low and research funding is stagnant in the face of growing pressures to replenish university coffers with research dollars. Many students are academically adrift while functioning under a consumer mentality. It is easy to become discouraged. Recently, after a couple of less-than-perfect data collections, new administrative policies that have become a thorn in the side of our work, and a major setback for one of our beloved patients, I was frustrated. I walked into the lab, shared some of these frustrations, questioned why we want to do this anymore and left casually, saying that I needed a pep talk. I received an email early the next morning from one of my senior doctoral students Matt Terza that explains his Why for the work we do. You can read it [here](#). When we think of mentor-mentee relationships, we often, but perhaps naively, think of them as a one-way street. However, wisdom is not unidirectional and often the teacher can become the student.



Optotrak Certus[®]

Research Credibility Starts with Measurement You Can Trust

The Optotrak Certus[®] optical motion tracking system captures full-body motion over a large tracking volume with unrivaled temporal accuracy and resolution. System features such as pre-calibration, automatic marker identification, and minimal lag put the focus on flexible and reliable 3D motion tracking.

The Optotrak Certus[®] measures position coordinates as 3D data points, without the use of averaging, filtering or other black-box calculations. The result is noiseless, high quality kinematic data you can trust – every time.



certus.ndigital.com



Meeting Chairs

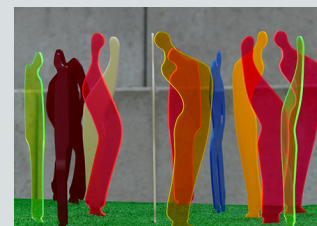
Katherine Saul, Gregory Sawicki

ASB 2016 is rapidly approaching and we are looking forward to making it the best meeting yet in honor of our 40th anniversary celebration. The meeting will be held in Raleigh, NC, hosted by North Carolina State University, from August 2-5, 2016. The Raleigh Convention Center and the attached Marriott Raleigh City Center hotel are right downtown, next door to the Red Hat Amphitheatre music venue, numerous restaurants and bars, and free museums. The banquet will be held at the outstanding Nature Research Center of the NC Museum of Natural Sciences, located within a mile from the conference hotel, featuring a three-story HD theater and numerous scientific exhibits open only to our event. Come take your photo with the statue of Sir Walter Raleigh and the giant globe; enjoy local breweries, NC barbecue, and handcrafted chocolate; and enjoy all that Raleigh has to offer. Extend your stay to see North Carolina's beautiful beaches, the Yadkin Valley wine region, or enjoy our Appalachian mountains.

As many of you know, legislation recently passed in North Carolina (House Bill 2) raised concerns about fair and equitable treatment of all people. As discussed in more detail in the [full statement from the Executive Board](#), the American Society of Biomechanics is committed to building a professional community that respects and promotes diversity and inclusion. As the 2016 meeting hosts, we have been working closely with our hospitality partners and facilities to ensure a safe, welcoming, and productive meeting this summer. The official statements from NC State, City of Raleigh, our meeting facilities, hotel, and area hospitality partners reiterating their respect and support for inclusion of ALL visitors aligns with ASB's Diversity and inclusion mission, and reflects our experience that the meeting site and partners will be welcoming to our guests. We will continue to work with our hotel, conference venue, and other providers to address this issue and make sure all visitors have appropriate accommodation, including ensuring there are unisex restrooms available (there will be 4 in the convention center). In addition, please see the [online resources](#) provided by the Greater Raleigh Convention and Visitors Bureau (GRCVB) for LGBTQ travelers, including a list of LGBTQ-friendly restaurants and other establishments. These are not the only restaurants and establishments in our community that are LGBTQ friendly, but those that have responded to the GRCVB so far, and the list is being regularly updated. We appreciate the support of the membership for the 2016 meeting.

We encourage attendees to plan on an early arrival in order to catch our kick-off events on the NC State Centennial Campus during the first day of the meeting on August 2nd. In the morning we will showcase the best of the submitted biomechanics educational activities/demos developed by our membership for the ASB40 Outreach Expo at the NCSU Hunt Library. We anticipate large crowds of local student groups and members of the general public will be in attendance to enjoy and learn about biomechanics. In the afternoon, bus service will run from the downtown Raleigh meeting site so that attendees can get to NC State and check out some of our most exciting lab spaces on NC State's Centennial campus. We will also offer guided tours through the ultra-modern Hunt Library.

In light of our 40th anniversary celebration, we are planning a number of displays



**2016 Annual
meeting [website](#)**



2016 Annual meeting website

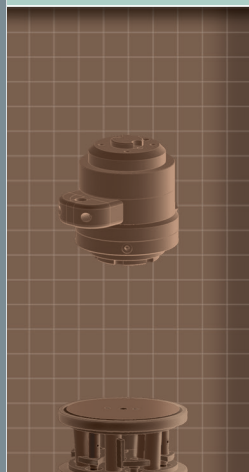
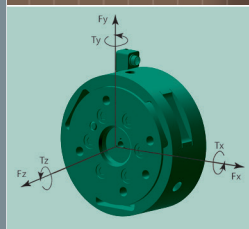
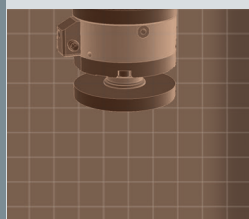
Meeting Chairs, cont.

Katherine Saul, Gregory Sawicki

and activities to honor our past and celebrate our future. We are featuring a Founders and Fellows Forum over lunch on Wednesday, where you'll have an opportunity to hear perspectives on the history and future direction of biomechanics from a terrific panel. We also plan for displays of memorabilia, photos, and memories of the formation of the society, past meetings, and your experiences with ASB. Please help by submitting your memories and questions for the Founders and Fellows Forum during online registration. We are also very interested in old photos or artifacts; please contact asb2016ncsu@gmail.com with any memories you'd like to share. Finally, we are offering 40th anniversary ASB pullovers in both men's and women's styles for sale during online registration (only \$25). We will only be taking orders online, so don't miss out!

After the positive response last year, we will be continuing the use of the mobile app as the primary program at the conference (along with the printed mini-program featuring schedule-at-a-glance). The app gives you the ability to browse the schedule and abstracts and create your own itinerary, and will hold all the information you need to navigate the meeting at your fingertips. The app is also available in a web browser for those without mobile devices, and all types of mobile devices are supported.

More information about the meeting is available at our [website](http://www.asb2016ncsu.com). Registration is open, and regular pricing is available until July 18.



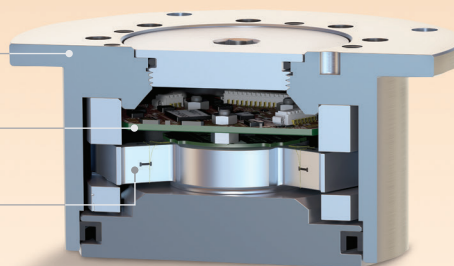
ROBOTIC END-EFFECTORS

Measure all six components of force and torque in a compact, rugged sensor.

Interface Structure—high-strength alloy provides IP60, IP65, and IP68 environmental protection as needed

Low-noise Electronics—interfaces for Ethernet, PCI, USB, EtherNet/IP, PROFINET, CAN, EtherCAT, Wireless, and more

Sensing Beams and Flexures—designed for high stiffness and overload protection



The F/T Sensor outperforms traditional load cells, instantly providing all loading data in every axis. Engineered for high overload protection and low noise, it's the ultimate force/torque sensor. Only from ATI.

See it now at www.ati-ia.com/as.

40th Annual Meeting of the
American Society of Biomechanics
August 2-5, 2016
Raleigh, NC • NCState



Visit us at
Booth #23



www.ati-ia.com
919.772.0115

ASB 2017, Boulder, CO

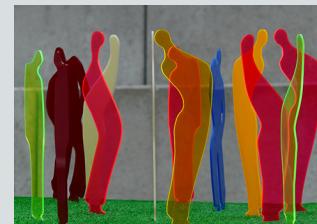
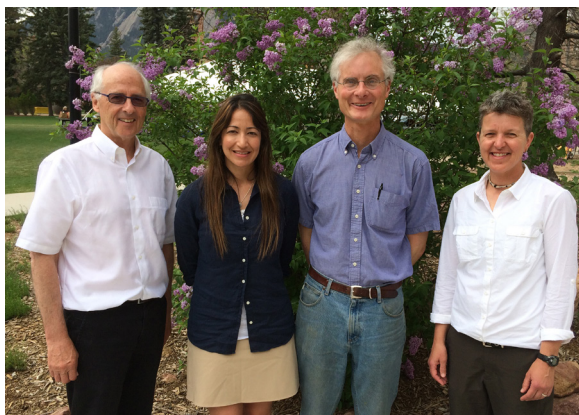
Roger Enoka, Rodger Kram, Alaa Ahmed, and Alena Grabowski

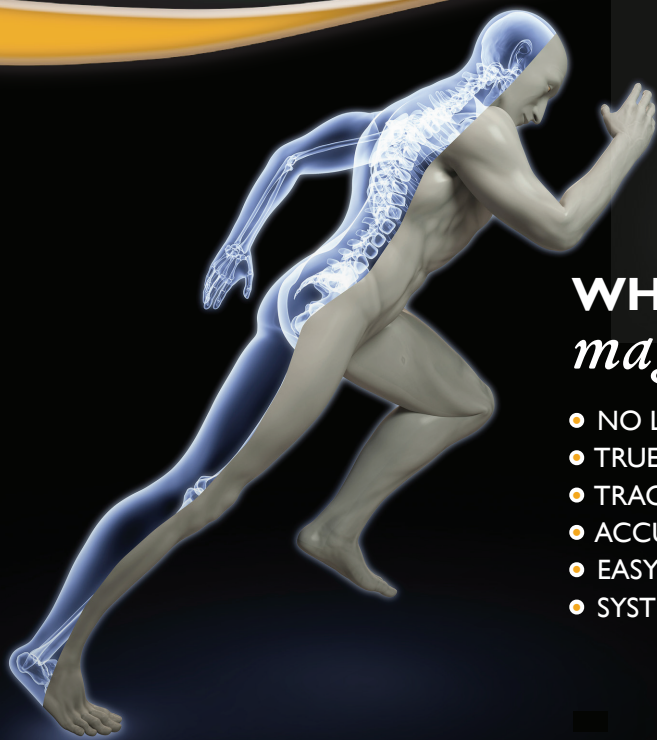
We are all looking forward to ASB40 in Raleigh later this summer, but be sure to plan ahead for ASB 2017. We will be hosting next year's meeting August 8-11 on our beautiful University of Colorado campus in Boulder, 5,430 feet (1655 m) above sea level at the foot of the Rocky Mountains. The weather in Boulder in August is generally very pleasant. The average high temperature is 85° F, but the overnight low dips to 57°. If you pack a Patagonia fleece for when you sit outside at a café after dinner, people might even guess you are a local. The relative humidity is typically < 10% in the summer.

Conference atmosphere will be Rocky Mountain casual. Neckties are strictly forbidden on campus, but Hawaiian shirts, shorts, and sandals are encouraged. Because the conference will be held on campus, meeting-room space is somewhat limited and the number of conference attendees will be limited to 1,000. However, the venue is exceptional and will include lunch being served at our campus dining commons that features 10 micro-restaurants offering sushi, Persian, vegan, Italian, Mexican, and kosher culinary experiences. Also, the major podium presentation venues are classrooms where every seat has a good view and our plenary sessions will be in the acoustically wonderful Macky auditorium.

In addition to the excellent scientific program to be organized by Steve Piazza, we are planning a range of activities that will allow you to enjoy the outdoors, farm-fresh cuisine, and the 19 microbreweries in Boulder. We encourage you to plan some time to take a hike, go for a run, ride a bike, or even rockclimb one of the Flatirons—our signature geological landmarks. With 300 miles of bike paths, Boulder is one of the top 10 friendliest bike cities in the US. Consider bringing your own bike or renting a B-cycle, our bike-sharing program; it's the easiest way to get around. After a day at the conference, head over to Pearl Street and spend some time in the pedestrian-only zone that is home to many fine restaurants. Or, if you are on a student budget, walk to "the Hill" for a burrito, sub, or pizza.

Despite the many attributes of hosting the conference on our college campus, we need to emphasize again that we can only accommodate 1000 attendees. It is critical that you register for the conference as early as possible to avoid the risk of not being able to attend. Also, you might consider spending some vacation time in Colorado either before or after the conference. It's a great time of year to go hiking or backpacking in Rocky Mountain National Park or to attend a concert at the famous Red Rocks outdoor amphitheater.





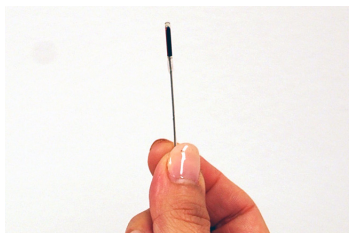
WHY RESEARCHERS TRUST *magnetic motion tracking*

- NO LINE-OF-SIGHT RESTRICTIONS
- TRUE POSITION & ORIENTATION DATA (6DOF) IN REAL-TIME
- TRACKER SPEED UP TO 240 HZ
- ACCURACY OF 0.75 MM RMS
- EASY TO SET-UP, EASY TO USE
- SYSTEMS STARTING AT LESS THAN \$3K

MACRO OR MICRO—WE TRACK IT ALL!



G4™—WIRELESS TRACKER
For Complete Freedom Of Movement



1.8 MM OD



FINGER TRACKING

MICRO SENSOR 1.8™—6DOF SENSOR
For Small Scale Tracking



FITS IN CATHETER TUBING

US & CANADA: 1.800.357.4777 | 802.655.3159 | POLHEMUS.COM



ASB 2015 Grant-in-Aid

Richard Brindle: “Hip Abduction Strength and Lower Extremity Neuromuscular Control in Female Runners Exhibiting Large Hip Adduction Angles”

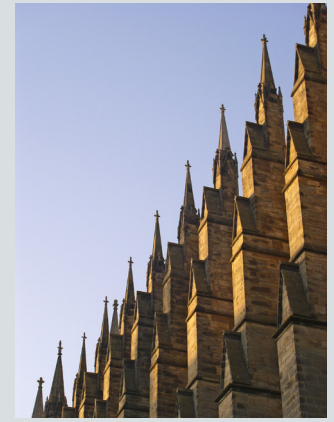
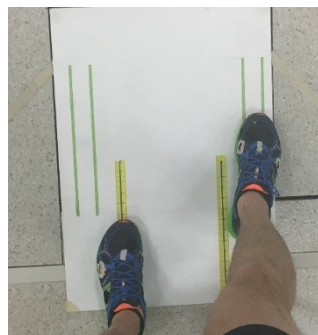
The focus of this dissertation is to determine if hip abduction strength or lower extremity neuromuscular control deficits exist between women with a large or a small peak hip adduction angle during running. Currently, I have completed a preliminary study to establish the test-retest reliability and construct validity of a new test of lower extremity neuromuscular control. This lower extremity neuromuscular control test is based on Fitts' law, which describes the tradeoff between speed and accuracy, represented by the index of performance.¹

Twenty participants visited the Gait Laboratory at Drexel University on two separate days spaced at least a week apart to perform the lower extremity neuromuscular control test (26 ± 6 years; 1.66 ± 0.06 m; 62.2 ± 8.0 kg). During the test, participants reciprocally tapped two side-by-side targets on the ground in front of them with the tip of their shoe for ten seconds (Figure 1 and 2). Three target width conditions (small, medium, and large) were tested in single and dual task conditions. The number of taps during one accurate trial from each condition was used to calculate the index of performance.

Only results for the large target width condition are reported here. The intra-class correlation for the lower extremity neuromuscular control test was 0.54, the standard error of measurement (SEM) was 0.5 bits/s, and the minimal detectable difference was 1.5 bits/s. The lower extremity neuromuscular control test is a reliable measure of neuromuscular control since the relative size of the SEM to the mean is small. The index of performance increased during the dual task condition compared to the single task condition, which indicates decreased neuromuscular control (dual task = 6.4 ± 2.5 bits/s; single task = 4.3 ± 0.7 bits/s). Decreased neuromuscular control was expected during the dual task condition, therefore the lower extremity neuromuscular control test has construct validity. This preliminary study established that the new test of lower extremity neuromuscular control has both test-retest reliability and construct validity. The lower extremity neuromuscular control test with large targets will be used in my dissertation study. The funds from the American Society of Biomechanics Grant-In-Aid will be used to cover participant expenses for the dissertation study.

¹Fitts P. (1954). J Exp Psychol, 47(6) 381-91.

Figure 1: The lower extremity neuromuscular control test; targets are the small spaces between the green lines.



Drexel University

Advisor: Clare Milner



ASB 2015 Grant-in-Aid, cont.

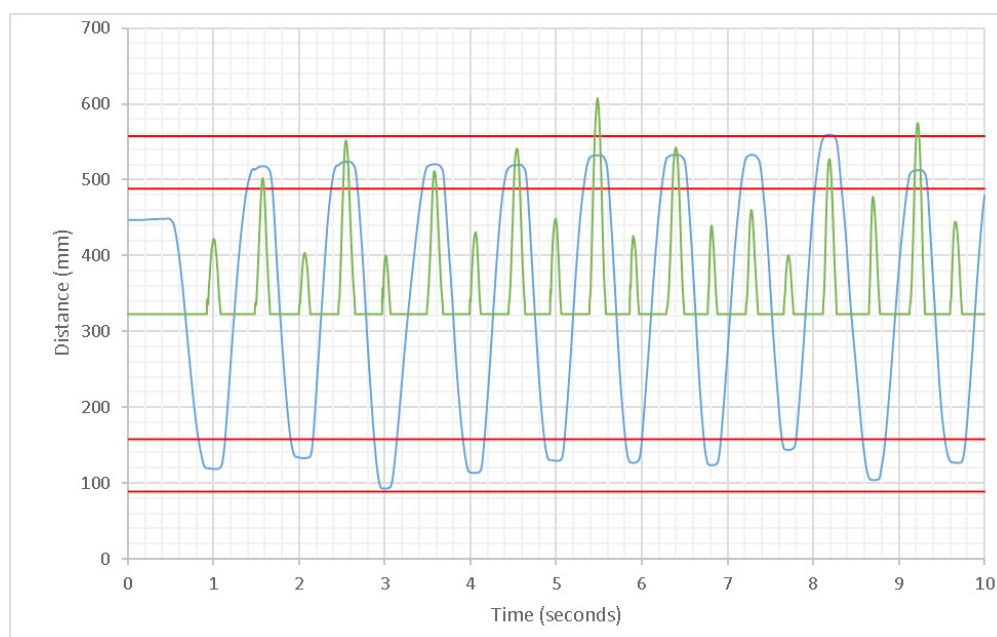


Figure 2: Example of an accurate trial of the lower extremity neuromuscular control test; red lines indicate target borderlines; blue line indicates shoe tip position; green line indicates the ground reaction force which was used to identify points of contact.

**University of
North Carolina
at Greensboro**

**Advisor: Sandra J.
Shultz**

Justin P. Waxman “The Relationship Between Hamstring Musculo-Articular Stiffness and Biomechanical Factors Indicative of Anterior Cruciate Ligament Loading During Functional Unilateral and Bilateral Landing Tasks”

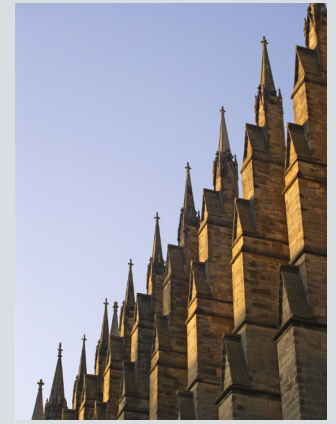
It is believed that some noncontact anterior cruciate ligament (ACL) injuries may be prevented through intervention strategies aimed to target modifiable injury risk factors; however, the most appropriate factors to target have yet to be fully elucidated. In this regard, hamstring musculo-articular stiffness (KHAM) is a modifiable characteristic that may play a critical role in protecting the ACL during functional athletic movements by helping resist biomechanical factors indicative of ACL loading, such as proximal tibia anterior shear force and anterior tibial translation and acceleration. Uninjured individuals with higher KHAM have previously been shown to display biomechanical characteristics associated with lesser ACL loading compared to individuals with lower KHAM. However, current evidence regarding the influence of KHAM on knee joint biomechanics is limited to studies of open-kinetic-chain perturbations and double-leg landing tasks, which may not adequately represent the situations in which noncontact injuries commonly occur. Additionally, previous studies have included men and women in the same analyses without accounting for between-sex differences that potentially influence these reported relationships. Therefore, the primary purpose of this study was to determine the true extent to which KHAM predicts biomechanical factors indicative of ACL loading.

Using a sex-stratified cross-sectional research design, we recently completed data collection on 80 highly physically-active college individuals (40 men, 40 women). All participants visited the Applied Neuromechanics Research Laboratory, on the

ASB 2015 Grant-in-Aid, cont.

campus of University of North Carolina at Greensboro, for a single testing session which included a 5-minute warm-up followed by lower-extremity strength, KHAM, and double- and single-leg stop-jump landing assessments ([click for videos](#)). Unfortunately, we are still in the process of data reduction and statistical analysis, so we are unable to share any results at this time. However, we are very excited to share our findings with the ASB community at the 2017 meeting in Denver, CO.

We would like to sincerely thank ASB and the GIA review committee for making this study possible. The funding received for this work was used to compensate our participants for their time and effort, as well as purchase additional 3D motion capture markers and various other supplies necessary for data collection.





**University of
Massachusetts
Amherst**

**Advisor: Katherine
A. Boyer**

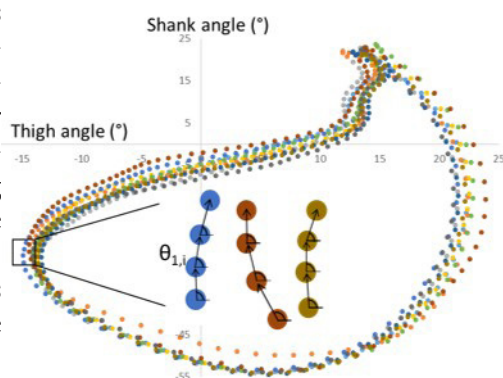
ASB 2015 Grant-in-Aid, cont.

Jocelyn F. Hafer: “The Effect of Age and Physical Activity Status on Inter-segment Coordination”

Mobility impairment is a major concern for many older adults as age-related deterioration of gait mechanics contributes to limitations in ambulation and can lead to decreased quality of life. Recent studies of movement coordination and age suggest that older adults may use a different motor control strategy than young adults to organize their movement and to respond to challenges. These studies indicate healthy older adults have different coordination and decreased coordination variability as compared to young adults during walking and in response to perturbations such as different gait speeds or a balance perturbation. The overall aim of this project is to determine how inter-segment coordination and its variability differ between younger and older adults, and whether modifiable risk factors such as habitual physical activity impact this difference. Examining how movement coordination differs with age or habitual physical activity level will expand understanding of how the human neuromuscular system ages as well as what impact preventative interventions may have on the aging of this system.

The first task in this study was to determine how many strides of data were necessary to reliably calculate coordination variability as the number of strides used in the literature varies by study. We found that 10 strides of data were needed to obtain a reliable measure of coordination variability for several segment couples including pelvis vs. thigh, thigh vs. shank, and shank vs. rearfoot. Our preliminary analyses of differences in coordination and its variability by age and physical activity include 5 sedentary older adults (age 61 ± 4 years), 5 highly active older adults (age 60 ± 3 years), and 5 younger adults (age 28 ± 3 years, matched by physical activity level to the highly active older adults). With this data there is a trend ($p < 0.1$) toward differences in sagittal plane pelvis vs. thigh coordination between younger adults and both groups of older adults. While there may be differences in segment coordination between groups, there are no significant differences in coordination variability between groups ($0.89 > p > 0.39$). These preliminary findings suggest that there may be a difference in the organization of segment movement (segment coordination) but not in the flexibility of this movement (coordination variability) in older active or less active individuals compared to younger adults. Determining how control of the motor system changes (or is maintained) with age or lifestyle will expand our knowledge of age-related changes in mobility and may provide targets for interventions aimed at improving function in older age.

Figure 1. Segment coordination and its variability were calculated using a modified vector coding technique. Coordination was quantified as the phase angle, or angle (θ) with respect to the right horizontal formed by the vector connecting consecutive gait cycle points (i) in a stride cycle (1, 2, ..., 10) on an angle-angle plot. Coordination variability was quantified as the standard deviation of this phase angle across 10 strides of data.

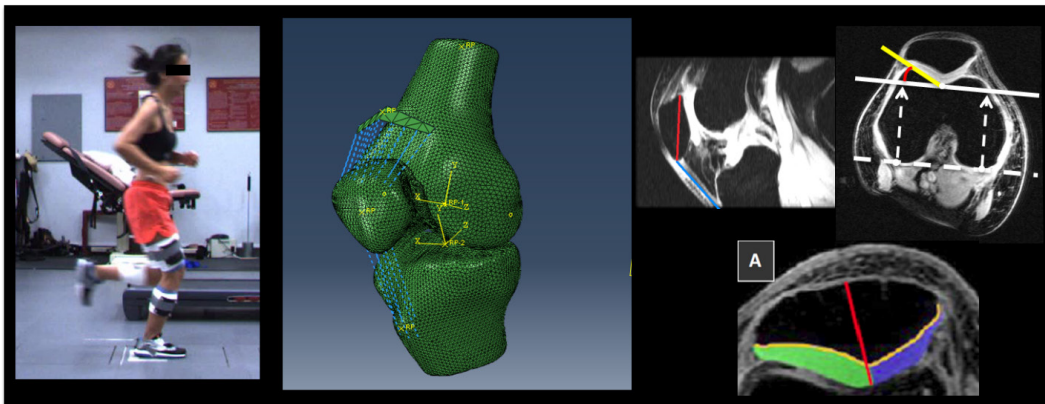


ASB 2015 Grant-in-Aid, cont.

Tzu-Chieh (Jennifer) Liao: “Influence of Patellofemoral Joint Morphology and Lower Extremity Biomechanics on Patellofemoral Joint Stress”

Patellofemoral pain (PFP) is a common condition seen in orthopedic practice, accounting for approximately 25-40% of all knee injuries. A commonly cited hypothesis as to the cause of PFP is increased patellofemoral joint (PFJ) stress. Given that stress is defined as force per unit area, the primary causes of elevated PFJ stress are decreased contact area and/or increased PFJ forces secondary to altered PFJ structure and/or altered lower extremity biomechanics. The purpose of this study was to quantify the interrelationship among structural factors, biomechanical factors, and elevated PFJ stress in runners with PFP.

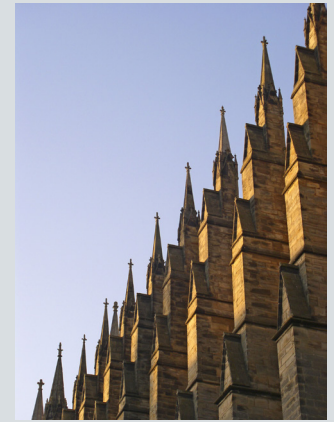
Ten female runners with PFP and ten controls participated in this study. Using joint geometry obtained from MRI scans, and tibiofemoral kinematics obtained from biomechanical testing, subject-specific finite element models were created, and patella cartilage stress was quantified at peak knee flexion during stance phase of running. PFJ morphology (patella cartilage thickness, patella height, lateral trochlear inclination) and lower extremity kinematics (knee frontal plane rotation, knee transverse plane rotation, knee extensor moment) were the independent variables of interest. Compared to the control group, individuals with PFP exhibited greater peak hydrostatic pressure (19.8 vs. 14.8 MPa, $p=0.022$). Among the predictor variables of interest, only knee external rotation was significantly associated with peak hydrostatic pressure ($r=0.57$, $p<0.01$). A secondary analysis revealed that knee external rotation in the PFP group was the result of femur internal rotation as opposed to tibia external rotation. Our findings suggest that altered knee kinematics as opposed to abnormal bony structure may underlie elevated patellofemoral stress in runners with PFP.



Charalambos “Bobby” Charalambous: “The Associations between the Motor Cortical Control and the Task-Specific Biomechanics of the Paretic Soleus after a Stroke”

I received an ASB Grant-in-Aid award while at the Medical University of South Carolina. I recently defended my dissertation, and now I am a post-doctoral researcher in the Department of Physical Therapy at University of Delaware.

My overall research interest is the neurophysiological and biomechanical control of human walking in both neurologically intact and impaired adults. The focus



**University
of Southern
California**

**Advisor: Christo-
pher M. Powers**

**Medical Univer-
sity of South
Carolina**

**Advisor: Jesse C.
Dean**

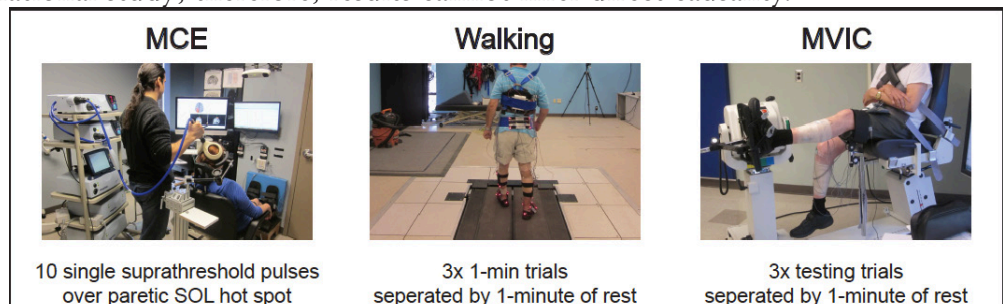


ASB 2015 Grant-in-Aid, cont.

of my dissertation work was on the relationships between the motor cortical control and neuromechanical function of the paretic soleus (SOL) after stroke. Mechanical demands of a task differentially modulate the motor corticospinal excitability (MCE) of SOL in healthy adults; SOL MCE is dissimilar between the stance phase of walking and isometric plantarflexion contraction. While stroke detrimentally affects the integrity of the neuromotor axis, likely causing the contributions of the descending drive to the paretic SOL to be weaker than in healthy controls, we would expect this task-dependence of cortical control to be retained. However, it is still unclear how this impaired motor cortical control is related with specific neuromechanics that provide insight into the function of paretic SOL in a specific task. Therefore, my dissertation research investigated the associations between motor evoked potential (MEP) latency, a metric of MCE, and measures that characterize the neuromechanical function of the paretic SOL during walking and maximum voluntary isometric contraction (MVIC).

Fourteen people (6F, age $[62 \pm 13]$ years), post-stroke $[35 \pm 27]$ months], 12 ischemic) participated in this project. Participants were seated on a chair and relaxed their paretic SOL in MCE test, walked over a treadmill at their self-selected, and maximally contracted the plantarflexors (including SOL) in their paretic ankle in MVIC test. We calculated resting MEP latency as a measure of SOL MCE, the propulsive impulse and average stance phase EMG as measures of SOL walking neuromechanics, and maximum isometric torque and EMG as measures of SOL MVIC neuromechanics. All measures were collected only from the paretic SOL.

MEPs of the paretic SOL during MCE testing were recorded only from 10 participants (four participants had undetectable MEPS), whereas neuromechanical assessment of the paretic SOL during walking and MVIC was successfully completed in all participants. Therefore, only data collected from participants that responded to TMS were included in the correlational analyses. Results demonstrated that MEP latency was not associated with either neuromechanical measure of the paretic SOL during walking and MVIC. Findings suggest that the neuromechanical function of paretic SOL during a functional (walking) and isolated voluntary (MVIC) tasks may not be solely controlled by ipsilesional descending command; other forms of control may be associated as well. Therefore, neurophysiological approaches that target the modulation of the excitability of SOL motor area to improve the neuromechanical function of the paretic SOL after stroke may not in isolation yield the desired effects. Conversely, approaches that target other parts of the neuromotor axis in isolation or in conjunction with neuromodulation of the paretic SOL might be more suitable. Lastly, my dissertation project was a correlational study; therefore, results cannot infer direct causality.



ASB Regional Conferences

2016 Human Movement Science and Biomechanics Research Symposium

The 2016 University of North Carolina at Chapel Hill Human Movement Science and Biomechanics Research Symposium was held in Blue Zone February 26, 2016. This is an annual research symposium organized by the students in Doctoral Program for Human Movement Science in Department of Allied Health Science in School of Medicine and in Department of Exercise and Sports Science. A record high 150 graduate students and faculty members in rehabilitation science, exercise science, biomechanical engineering, athletic training, and physical therapy from The University of North Carolina at Chapel Hill, The University of North Carolina at Greensboro, Eastern Carolina University, The University of North Carolina at Charlotte, Duke University, North Carolina State University, and High Point University, attended the meeting. A record high 66 abstracts were presented and discussed. Dr Louis DeFrane from Duke University was the invited keynote speaker. His keynote presentation on biomechanics of anterior cruciate ligament injury was well received and was a highlight of the symposium.



2016 Human Movement Science and Biomechanics Research Symposium

University of North Carolina at Chapel Hill

February 26, 2016



Rocky Mountain American Society of Biomechanics Regional Meeting

Estes Park, Colorado

April 15-16, 2016

ASB Regional Conferences, cont.

Rocky Mountain American Society of Biomechanics Regional Meeting

The 2016 Rocky Mountain American Society of Biomechanics (RMASB) regional meeting was held in Estes Park, CO on April 15-16, and it was a resounding success! Over 120 attendees from 32 institutions in 15 states and 5 countries gathered together for 20 podium and 42 poster presentations, creating a wonderfully diverse conference and one of the largest in the history of RMASB. In addition to the impromptu midnight snowball fight, the meeting was highlighted by incredible scientific presentations by graduate and undergraduate students, poignant discussions spanning the breadth of biomechanics topics, engaging vendor booths and demonstrations, and an outstanding keynote presentation by Dr. Greg Sawicki.

We met each of the primary goals for the 2016 regional ASB conference: 1) to provide a low-stress environment where undergraduate and graduate students could practice presenting their research and receive constructive feedback, 2) to foster research collaborations between scientists within the Rocky Mountain and Greater Plains regions, 3) to encourage ASB membership, and 4) to ignite student and faculty interest in the 2016 ASB National meeting to be held in Raleigh, North Carolina, and the 2017 meeting to be held in Boulder, Colorado.

Generous sponsorships allowed us to support four student awards for the best graduate and undergraduate podium and poster presentations as well as fund the conference proceedings. Congratulations to the following students:

Amy K. Hegarty (Colorado School of Mines): Delsys Best Graduate Podium Presentation

Awad M. Almuklass (University of Colorado, Boulder): Tekscan Best Graduate Poster Presentation

Asher H. Straw (University of Colorado, Boulder): Motion Lab Systems Best Undergraduate Podium Presentation

Travis Vanderheyden (University of Nebraska, Omaha): Bertec Best Undergraduate Poster Presentation

We wish to thank each of our sponsors in helping us successfully host this year's meeting: American Society of Biomechanics, Colorado School of Mines, Regis University, University of Colorado Anschutz Medical Center, University of Nebraska Medical Center, Bertec, Delsys, Motion Lab Systems, Novel, Tekscan, and Vicon.



ASB Regional Conferences, cont.



Northwest Biomechanics Symposium 2016

A broad range of high quality research was presented at the 12th annual Northwest Biomechanics Symposium, held June 3rd and 4th in Vancouver, British Columbia, Canada at the University of British Columbia, in collaboration with Simon Fraser University. This student-focused conference included 60 podium and poster presentations on topics from gait and locomotion to trauma and injury to cellular biomechanics, with excellent discussions and questions from audience members. Dr. Tom Daniel of the University of Washington gave an engaging ASB Keynote Address on molecular views of muscle contraction, radial motions, and forces. The conference had registrants from at least twelve institutions in British Columbia, Alberta, Washington State, Oregon, Idaho, and Montana, plus a number of industry members. Overall, NWBS 2016 provided a positive and educational environment for students to present their work, and discuss biomechanics more broadly, and encouraged interaction and collaboration between institutions in the region. The organizers (Agnes d'Entremont and Peter Crompton at the Univer-

2016 Northwest Biomechanics Symposium

University of British Columbia

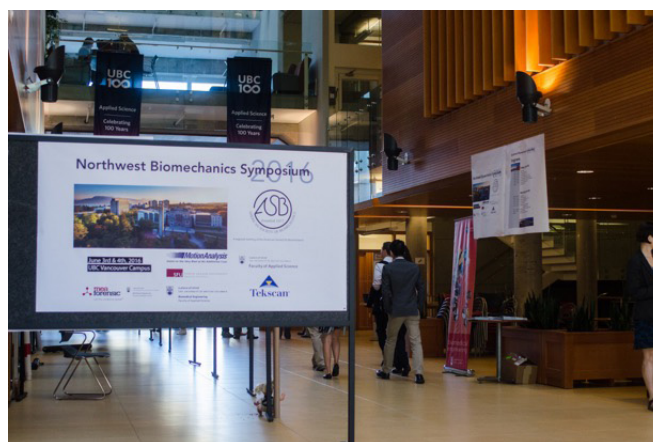
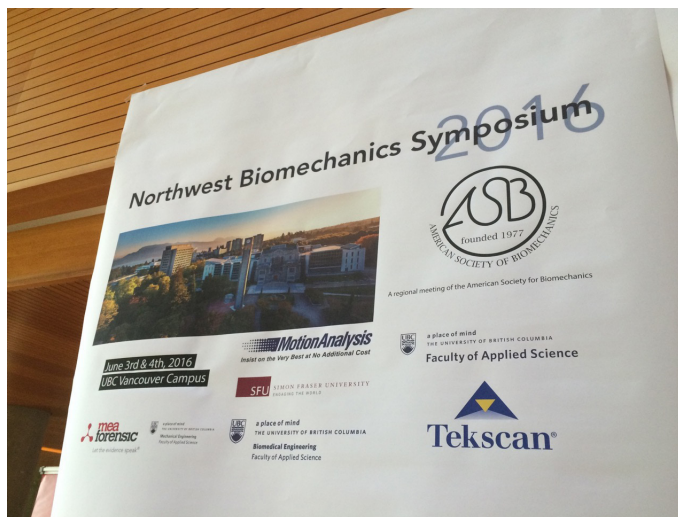
June 3-4, 2016





ASB Regional Conferences, cont.

sity of British Columbia, James Wakeling at Simon Fraser University) are grateful for the continued support from ASB for this meeting.



What Do You Think About This?

Ross Miller, Brent Edwards

Welcome readers to the new newsletter section titled, “*What Do You Think About This?*” in which one biomechanist presents a current idea and another tells what he or she thinks about it. The idea behind this idea was to create scientific discussion within the newsletter since discussion is the heart of science. I asked [Ross Miller](#) and [Brent Edwards](#) to submit an interesting bit of data and to discuss it. We hope you think this discussion is interesting. Please let us know, perhaps through email, or biomch-L, or Twitter, or whatever means you prefer, What You Think About This.

Please also let me know if you would like to submit a discussion idea for the next newsletter. Two people works well but more in either camp is fine too. If you do not have another person in mind, perhaps we can identify someone. You can include some new data to support your idea. We are not thinking this precludes the data being published in a journal but rather this forum is like presenting a bit of new data at a presentation.

So, What Do You Think About This?

[Paul DeVita](#)

Models on Top of Models

Hello Brent:

Mathematical and computational modeling has become an increasingly more prevalent component of biomechanics (Figure 1). Use of the term “model” often brings to mind high-dimensional musculoskeletal models or finite element models, but a model by the most general scientific definition is a system that represents part of a more complex system. A common application of models in biomechanics is to produce data that would be impossible or impractical to obtain directly from the original system. Examples include inverse dynamics, kinematic analysis, and linear regression. In other words, nearly every central method we use is a model.

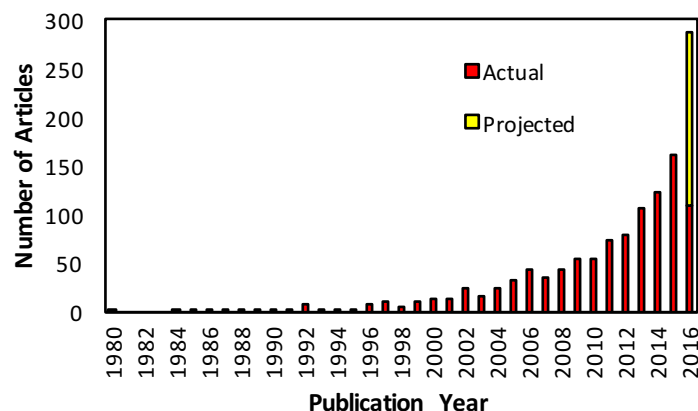


Figure 1: Histogram of research articles returned by PubMed for search terms “biomechanics models”, sorted by year.

As various modeling approaches in biomechanics gradually become more mature,





What Do You Think About This?

Ross Miller, Brent Edwards

the prevalence of combining multiple models in a single study has also grown. As an example, consider the data below, which were produced using a sequence of four models: (1) inverse dynamics was used to estimate resultant joint forces and moments from gait lab measurements; (2) these resultants were input to a static optimization model to estimate muscle and joint contact forces; (3) these forces were input to a finite element model to estimate tibiofemoral cartilage stresses; (4) these stresses were input to a cumulative damage model to estimate the fatigue life of cartilage when it was conditioned to different loading histories (sedentary, conditioned to walking, conditioned to running). The models indicated that a sedentary person older than age 47 who began walking 10,000 steps/day would develop knee osteoarthritis within a year (Figure 2). This risk was delayed to age 67 for cartilage conditioned to walking, to age 70 for cartilage conditioned to moderate running (10 miles/wk), and to age 61 for cartilage conditioned to extreme running (100 mi/wk). The results suggest that cartilage conditioning earlier in life is important for protecting the knees from osteoarthritis later in life, with the caveat that it may be possible to run “too much”.

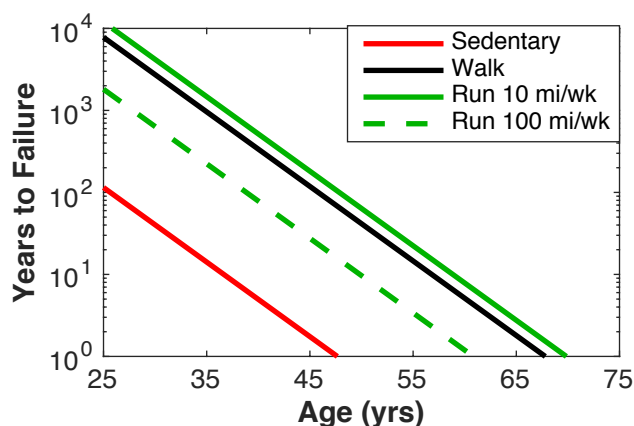


Figure 2: Years until the initiation of knee osteoarthritis when walking 10,000 steps/day as a function of age, cartilage conditioning, and running mileage

These results could have an important public health message, but the approach used raises some complex questions that will need to be addressed by the biomechanics field as the practice of “multi-scale modeling” or more generally “multi-modeling” becomes more widespread. First, how should a modeling approach like this be validated? Ideally all four models are independently validated and the compatibility of their inputs/outputs is verified, but is it actually possible to do this in an objectively standardized fashion (and in 3000-4000 words)? Second, if such results are submitted for publication, who should review them? The ideal reviewer is an expert in four different domains of modeling, plus osteoarthritis. Authors can get away without having such an impressive breadth and depth of expertise by doing team science, but it seems a reviewer is asked to be an expert in all of these things.

-Ross Miller, University of Maryland

What Do You Think About This?

Ross Miller, Brent Edwards

Hello Ross:

This is an issue that I have been struggling with for a while now. Not only must we as biomechanists be experts in experimentation and multiple domains of modeling, we must now be experts in knowledge translation if we want our findings to reach the broader audience and have a meaningful public health impact. The verification and validation (V&V) process is a necessary means to garner acceptance from the biomechanics community, but for some models this is easier said than done. For example, organ and tissue level finite element models are perhaps the most accurate of all models currently used in biomechanics because their outputs can be directly compared to measurements from cadaveric experimentation. Musculoskeletal models cannot be directly validated in humans, but agreement with kinematic movement patterns, electromyographical measures, and instrumented prostheses provides indirect evidence of their accuracy. However, the integration of information across multiple models and V&V for simulations of mechanical fatigue and various biological processes, such as your cumulative damage model to estimate the fatigue life of conditioned cartilage, poses a significant challenge. In these circumstances a strong theoretical basis combined with agreement with clinical observations and epidemiology may be the only option.

Your model predicts that an extreme runner that goes on to develop osteoarthritis will do so approximately 6 years earlier than the healthy walker. Are there clinical observations to support this notion? I suspect predictions of such absolute accuracy would be a challenge for your model, as these would be heavily dependent on the accuracy of your cartilage stress predictions and highly sensitive to your assumptions of physical activity and what you deem as cartilage conditioning. A more practical approach would be to focus on the relative accuracy of your model between various conditions. For example, can your model predict the 20% to 50% prevalence rate of individuals with osteoarthritis 10 years after knee injury, or that obese women and men have 4 to 5 times the risk of knee osteoarthritis than non-obese? If so, your model may hold the keys to a valuable precision medicine approach, able to accurately predict a treatment or prevention strategy for a particular disease that will work for an individual or specific subset of individuals.

It is important to note that I do not see these models as ever replacing well-designed randomized controlled trials, but their ability to investigate causal mechanisms should be seen as a strength on par with the level of evidence given to animal studies. After all what is an animal model, but a simplified representation used to better understand the more complex human system? Perhaps we need a rating system of hierarchical evidence such as that used to quantitatively assess the clinical value of a research study, but one that is specific to the various modeling approaches used by the biomechanics community. Forming the base of the evidence pyramid might be a phenomenological model based on empirical observations where the quality of evidence increases with validation metrics for each independent model from indirect and, better still, direct measurements from in vitro and in vivo experimentation. Clearly, an assessment of the sensitivity of





What Do You Think About This?

Ross Miller, Brent Edwards

the integration of information across individual models would be a next logical step in the process. The quality of evidence would increase further still with cross-validation metrics and agreement with epidemiological literature. At the top of this pyramid might be a validated mechanistic model capable of predicting relative changes under novel conditions as seen in a prospective study. I am aware that similar rating systems have been proposed for the validation of specific modeling approaches, such as the finite element method (e.g., Viceconti et al., 2005, *Clinical Biomechanics*, 20, 451-454), but not for the multiscale modeling approach you describe above. The question of who should peer review this type of work, I suspect, will be an interesting debate moving forward. It may boil down to a debate on the purpose of peer review, which will inform the expertise needed by reviewers.

-Brent Edwards, University of Calgary



Umbrellas are for Tourists

William Ledoux

As I put the finishing touches on this newsletter, I'd like to thank all of the ASB Executive Board members who provided content, some for multiple articles (yes, I mean you Paul), as well as Rodger Kram, who has (unfortunately) contributed obituaries to each of the last issues. I'd also like to thank the 2015 ASB Grant-in-Aid winners who have all made progress on their work and submitted timely, detailed summaries of their research. Finally, all three of the ASB regional meetings that were held this year sent highlights of their events, including pictures. The end result was 50 pages of content, which I think must be a record for ASB newsletters. As mentioned previously in this space, I'd like to solicit content from any ASB member—feel free to send in book reviews, or if you are so moved, please contact me about submitting something about a recently deceased biomechanist. In that spirit, I'd like to acknowledge the excellent submission from Ross Miller and Brent Edwards for the newsletter's new section entitled "What Do You Think About This?" Paul DeVita gets full credit for dreaming up this idea and for soliciting the content from Ross and Brent—the newsletter was just the vehicle. Stay tuned next fall when another as of yet unnamed new feature will debut, in this case a topic of choice from one of our ASB Fellows. Both of these new content formats will only be successful if we received continued content from the ASB membership - so if either of these piques your interest, then please contact me about submitting for a future newsletter.

The other topic I'd like to discuss concerns the ASB Archives. Thanks to many generous contributions from members, we have managed to get physical copies of 24 of the first 25 proceedings. (If you happen to have a copy from 1983's meeting in Burlington, VT, please let me know ASAP!) We are hoping to have these completely scanned and available on the ASB website later this summer. And since 2002, the proceedings have been electronic, with limited program booklets available for each meeting. We are working on having hard copies available from each meeting (1977 to 2015) to allow users to browse at their leisure. As a teaser, here is a review of the first ASB meeting held in Iowa City, Iowa, on October 18-19, 1977, with some pre-meeting events on the 17th. There was a two-sided registration trifold that listed many of the details of the meeting (see page 47), but the entire proceedings, including the front cover (see page 48), were only 23 pages. Interesting to note that many of the features of our current meetings were included back then too, including: a pre-meeting meeting of the Executive Board (i.e., the ASB Organising committee), social hours (but much later - 8:00 to 10:30pm!), numerous keynote speakers (Albert Burstein, Doris Miller, and Carl Gans), and, of course, the ever popular ASB business meeting. Jim Hay, the chairman of the ASB Organizing Committee, opened the conference at 8:30am. There were then 6 scientific sessions (chaired by Don Chaffin, Al Schultz, Dick Brand, Jim Hay, F. Gaynor Evans, and Gary Soderberg), with 20 total abstracts, from locations such as: the Universities of Washington (n=3), Michigan (n=2) and Maryland (n=2), as well as Duke University (n=2), the VA Palo Alto (n=2), and even the VA Puget Sound! Cost wise, the registration was \$25, and that included "instruction, coffee and two luncheons." A limited number of rooms were available at the Iowa House Motel - \$14.50 for a single, and \$19.00 for a double room. All day parking, for those not staying at the Iowa House, was available for \$1.50 and the shuttle to the airport cost \$6. Hope you enjoyed this look back!



		Cinematographic Studies of Body Movement," Jerome V. Danoff and Andrew Dainis (University of Maryland)
8:50		"A Method of Detecting Implant Loosening Using X-Ray Photogrammetry," Frederick G. Lippert III (Veterans Administration Hospital, Seattle), Sandor A. Veress and Ndukwé Ndukwé (University of Washington), and Richard Harrington (Veterans Administration Hospital, Seattle)
9:10		"Electronics in Motion: Tri-Plan Analyzer," Joseph Ellis (California College of Podiatric Medicine)
9:30		"Power Produced by Maximal Velocity Elbow Flexion," Jerome V. Danoff (University of Maryland)
9:50-10:05		Coffee
10:05-11:25		<i>Sixth Scientific Session (Mechanical Properties and Force Analyses)</i> Chairman: Gary L. Soderberg (The University of Iowa)
10:05		"A Comparison of Body Segment Inertias Using a Modelling Approach," Robert K. Jensen (Laurentian University)
10:25		"A Study of Tendon Stiffness at Physiological Strain Rates," Wayne C. Herrick, Herbert B. Kingsbury, and David Y. S. Lou (University of Delaware)
10:45		"Thermal Effects of Orthopaedic Bone Cutting," W. R. Krause (Montreal General Hospital)
11:05		"Use of a Biomechanical Model to Investigate an Occupational Injury of the Wrist," Thomas J. Armstrong, Don B. Chaffin, F. Gaynor Evans, and David A. Sonstegard (University of Michigan)
11:25-11:30		Closing Remarks President, American Society of Biomechanics
11:30- 1:00		Luncheon, Oriental Room, Iowa Memorial Union
1:00- 2:30		Tour of Biomechanics Laboratories in Departments of Orthopaedic Surgery, Physical Education, and Physical Therapy
1:00		Meeting, Executive and Organizing Committees

Registration Form

AMERICAN SOCIETY OF BIOMECHANICS

October 18-19, 1977

Iowa City, Iowa

Name

Address

City State ZIP

Please reserve housing for me at the Iowa House as follows:

Arrival Date Departure Date

..... Single room (\$14.50)

..... Double room (\$19.00)

(I plan to share a room with)

..... I plan to arrive after 6 p.m. Please accept my guarantee for payment of this room reservation.

DO NOT SEND PAYMENT FOR HOUSING.

I plan to attend the following activities:

..... Social hour, 8:00 p.m., Monday, October 17

..... Lunch, 12:00 noon, Tuesday, October 18

..... Social hour, 5:00 p.m., Tuesday, October 18

..... Lunch, 12:00 noon, Wednesday, October 19

..... Biomechanics Laboratories Tours (Physical Education, Orthopaedic Surgery, Physical Therapy), 1:00 p.m., Wednesday, October 19

I enclose a check, payable to The University of Iowa, for \$25 for registration. No partial registration fees.

Please return to: Director of Conferences
Iowa Memorial Union
The University of Iowa
Iowa City, Iowa 52242

GENERAL INFORMATION

Course Location

Illinois Room of the Iowa Memorial Union.

Fee

The registration fee of \$25 includes registration, instruction, coffees, and two luncheons. Other meals, lodging, and other costs are not included. There are no partial fees.

Housing

A limited number of rooms will be available in the Iowa House Motel which is located with the Conference Center in the Iowa Memorial Union. The rooms are air-conditioned and contain twin beds, private bath, telephone, radio, and TV. Rooms will be assigned on a first-come, first-served basis. Please indicate your housing needs on the registration form. (Do not send payment for housing.)

Parking

Iowa House guests are provided reserved parking at no additional cost. For those not staying in the Iowa House, all-day parking is usually available in the parking ramp for \$1.50 per day, payable to the ramp cashier upon departure.

Travel

Commercial airline service (United and Ozark) to Iowa City is through the Cedar Rapids airport, 20 miles north of Iowa City. Charter Coaches Limousine Service provides door-to-door service from the airport to any location in Iowa City (\$8.00 one way). The Iowa City Municipal Airport is available for private planes. Iowa City is immediately south of Interstate 80 for those anticipating ground travel.

PROGRAM

(Unless otherwise stated, all meetings will be held in the Illinois Room, Iowa Memorial Union.)

Monday, October 17

2:00 p.m. Meeting, Organizing Committee, Hoover Room

8:00- 9:00 Registration, Triangle Club, Iowa Memorial Union

8:00-10:30 Social, Triangle Club, Iowa Memorial Union

Tuesday, October 18

8:00- 8:30 Registration, Big Ten Lounge, Iowa Memorial Union

8:30- 8:45 Introduction

James G. Hay (The University of Iowa), Chairman, A.S.B. Organizing Committee
8:45-10:15 *First Scientific Session*
Chairman: Donald B. Chaffin (University of Michigan)

8:45 Keynote Lecture: "Failure Characteristics of Human Bone," Albert H. Burstein (Hospital for Special Surgery, New York)

9:35 "The Compressive Behavior of Trabecular Bone," Dennis R. Carter (University of Washington) and Wilson C. Hayes (University of Pennsylvania)

9:55 "Stresses in the Walls of an Osteonal Remodelling Cavity and Their Possible Physiologic Significance," R. Bruce Martin and James H. Morris (West Virginia University)

10:15-10:30 Coffee

10:30-12:00 *Second Scientific Session*

Chairman: Albert B. Schultz (University of Illinois, Chicago Circle)

10:30 Keynote Lecture: "Biomechanics of Sport Research—What Should the Future Hold?" Doris I. Miller (University of Washington)

11:20 "Prediction of Distal Extremity Motion Following Relaxation of Knee Muscle Forces," Sally J. Phillips, Elizabeth M. Roberts, and T. C. Huang (University of Wisconsin)

11:40 "The Use of Orthotic Devices to Modify Foot Mechanics," B. T. Bates, S. L.

1ST ANNUAL MEETING

AMERICAN SOCIETY

of BIOMECHANICS

October 17-19, 1977

The University of Iowa
Iowa City, Iowa

James, and L. R. Osternig (University of Oregon)

12:00- 1:00 Luncheon, Oriental Room, Iowa Memorial Union

1:00- 2:30 *Third Scientific Session*
Chairman: Richard A. Brand (The University of Iowa)

1:00 Keynote Lecture: "Biomechanical Interpretation in Functional Morphology," Carl Gans (University of Michigan)

1:50 "The Structural Mechanics and Ecology of the Reef Coral *Acropora reticulata*," Frederick Vosburgh (Duke University)

2:10 "Helical Fiber Systems and Body Mechanics," Steve Wainwright (Duke University)

2:30- 2:45 Coffee

2:45- 3:45 *Fourth Scientific Session (Fluid Mechanics)*

Chairman: James G. Hay (The University of Iowa)

2:45 "Two Dimensional Finite Element Analysis of Flow in Curved Tubes," Gautam Ray and K. B. Chandran (Tulane Medical Center)

3:05 "Noninvasive Determination of Urethral and Bladder Pressures during Voiding," Dhanjoo N. Ghista and Inder Perikash (Veterans Administration Hospital, Palo Alto)

3:25 "Mechanocardiography: Determination of Regional Cardiac Elasticity and Left Ventricular Chamber Pressure-Flow Patterns as Diagnostic Indices," Gautam Ray (Southern University) and Dhanjoo N. Ghista (Veterans Administration Hospital, Palo Alto)

3:45- 5:00 *American Society of Biomechanics Business Meeting*

5:00- 6:00 Social Hour, Triangle Club, Iowa Memorial Union

Wednesday, October 19

8:30- 9:50 *Fifth Scientific Session (Analyzing Human Motion)*

Chairman: F. Gaynor Evans (University of Michigan)

8:30 "A Least-Squares-Fit Technique for Determining Joint Center Locations during

1st Annual Meeting

American Society of Biomechanics

ABSTRACTS

Iowa City, Iowa, October 18-19, 1977



Events Calendar

Dan Gales



NOTE:

For other listings of international conferences, please visit either the ISB's [web-site](#) or [Biomch-L](#).

Society for Industrial and Applied Mathematics

July 11-14, 2016

Boston, Massachusetts, USA

Abstract deadline: past

www.siam.org/meetings/ls16/

International Society of Biomechanics in Sports

July 18-22, 2016

Tsukuba, Japan

Abstract deadline: past

isbs.org/isbs-2016

Canadian Society for Biomechanics

July 19-22, 2016

Hamilton, Ontario

Abstract deadline: past

engconf.mcmaster.ca/index.php/CSB/CSB2016

International Symposium on the 3-D Analysis of Human Movement

July 18-21, 2016

Taipei, Taiwan

Abstract deadline: past

www.geocities.ws/3d-ahm/

American Society of Biomechanics Annual Conference

August 2-5, 2016

Raleigh, North Carolina, USA

Abstract deadline: past

asb2016.asbweb.org

IEEE Engineering in Medicine and Biology Society

August 16-20, 2016

Orlando, Florida, USA

Abstract deadline: past

embc.embs.org/2016/

Human Factors and Ergonomics Society International Annual Meeting

September 19-23, 2016

Washington, DC, USA

Abstract deadline: past

tinyurl.com/zzu8esv

International Symposium on Computer Methods in Biomechanics and Biomedical Engineering

September 20-22, 2016

Tel Aviv, Israel

Abstract deadline: July 29, 2016

CMBBE2016.com

International Conference on NeuroRehabilitation

October 18-21, 2016

Segovia, Spain

Abstract deadline: past

www.icnr2016.org

Symposium of Hand and Wrist Biomechanics International

October 24-28, 2016

Buenos Aires, Argentina

Abstract deadline: past

www.hwbi.org/2016

Orthopaedic Research Society Annual Meeting 2017

March 19-22, 2017

San Diego, California, USA

Abstract deadline: August 29, 2016

www.ors.org/2017annualmeeting/

International Society of Biomechanics 2017 Congress XXVI

July 23-27, 2017

Brisbane, Australia

Abstract deadline January 13, 2017

www.biomech2017.com

World Congress of Biomechanics

July 8-12, 2018

Dublin, Ireland

Abstract deadline: TBA

wcb2018.com

ASB40

40th Annual Meeting of the American Society of Biomechanics



2016 Raleigh, NC

August 2-5, 2016 <http://asb2016.asbweb.org>

