American Society of Biomechanics



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## Newsletter

Volume: 31 - Number: 1, June 2018

From the President Wendy Murray

### **ASB Strategic Planning Preview**



Founded 1977

Happy Summer! It's that exciting time of year—when the academic calendar has wound to a close, we wish all new graduates well, and we turn our attention to conference season! One of the critical tasks on my to-do list is to prepare for the "Future

of ASB" event at the 2018 ASB Annual Meeting. This event is a discussion forum, soliciting member feedback about the future direction and priorities for ASB. The event is open to all ASB members, and is scheduled during lunch on Friday, August 10th in the Mayo Civic Center Presentation Hall. In the Winter Newsletter, I summarized one of the major topics our society needs to address: the growth of our Annual Meeting. I ended that column with a plea for participation, which is where I begin today. I hope that all members at the conference will attend! In addition, please keep your eye out for an invitation to participate in an ASB member survey. Over the past few months, President-Elect Brian Umberger and I have been working with the Social Science Research Center at Old Dominion University to generate a short, easy to respond to survey. This survey is intended to do a deeper dive into the views of the membership on a number of issues. You'll receive an invitation to participate in this survey shortly (if it isn't already in your inbox!). In August, I'll provide a brief, initial summary of these survey results. I expect the data we present in August to serve as a jumping off point for the discussion forum. Over the course of the next year, the Executive Board will continue to analyze the survey results and consider the member input from the forum. We also expect to follow up with a few focus groups for areas of high interest or areas that reveal divergent opinions. In his presidential year, Brian will be leading the efforts to turn all of this feedback into a well-considered, member-driven Strategic Plan. (You can see the 2007 Strategic Plan here). We are very much interested in your opinions about ASB and its future. The more you share your thoughts and opinions, the more our long-term decisions will reflect our membership!

The Annual Meeting marks transitions in Executive Board service each year. At the meeting, we have the opportunity to thank members whose term is complete, and to welcome new members who are both willing to volunteer their time and were elected to serve by our society. I'll leave Rochester as ASB Past-President, which includes one of the most inspiring and intimidating responsibilities of the

Continued on page 3...

## Student's Corner Katie Knaus

Hello from Virginia, where planning for the ASB annual meeting is ongoing. This year, there will be numerous student events, and exciting scientific content from posters to podiums, many of which will be presented by students! New this year will be competitions for the top scored student abstracts.





### **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.

For those attending, 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. Before the conference, mentees should contact their mentors to find a time to meet over coffee, lunch, or dinner that is convenient for both. Mentor matches can discuss a variety of topics that are helpful for the students such as educational, career, and professional objectives. Sign up during conference registration! I will be sending out additional information for those who express interest.

Before heading to the Opening Reception, start the conference by attending the **Student Welcome** on Wednesday 8/8 at 5:30pm. I will talk about student-related programming during the week that and give some tips for navigating the meeting. There will be some networking opportunities with other students to establish some friendly faces. On Thursday evening 8/9, head to downtown Rochester for the **Student Night Out** sponsored by National Biomechanics Day! During ASB's Night on the Town, stop by to relax with fellow students while exploring Thursdays on First & 3rd, Rochester's weekly summer market and music festival.

There will be a new **Career Networking Event** during lunch on Thursday 8/9, to provide a forum for ASB attendees who are recruiting for positions to connect with trainees on the job market. Grab a box lunch and come to this event to learn about specific job opportunities in industry, clinic, government, or academia. Other events of interest including the **Diversity Breakfast** on Saturday 8/11 and the **Women in Science Cocktail** on Thursday 8/9, both of which you need to sign up for during registration. These events focus on celebrating and promoting diversity in ASB and creating open discussions amongst biomechanists. Be sure to check in with the meeting website for recent updates on events at the conference!

I'd like to point out that there are multiple resources available on the ASB website that are especially helpful for students in every stage of their career. Also, we continue our effort to expand ASB's Facebook presence, which is largely thanks to the efforts of ASB students. Check out the highlights later in the newsletter from what's been happening on Facebook, and be sure to like and follow ASB's page!

Lastly, I'd like to thank the outstanding members to the ASB student advisory committee (Amanda Stone, Simi Oludare, Ana Ebrahimi, Andrew Vigotsky, Daniel Kuhman, Samuel Acuna, Ryan Alcantara, Erica Casto, Ryan Wedge, Chis Curran, Bhushan Thakkar, Amanda Westman, Hunter Wallace, and Christina Webber) for their hard work. Any suggestions for the student advisory committee or the annual meeting student events can be emailed to me.



## 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. Wendy Murray

3-year presidential term—chairing the Awards Committee(s!). Take a minute to review the ASB awards selection process(es!) summarized on our website (and in this newsletter), and you will understand why I'm thinking about it already. In addition to my role on the ASB Executive Board, for the past two years I've served as Director of Graduate Studies for the Department of Biomedical Engineering at Northwestern University. In that role, I organize a number of nominations and award selections for our PhD students every year. As a result, I've noticed that many students can be hesitant to pursue awards for themselves. At times, when I've asked an individual student why they didn't apply, they've expressed surprise that they would be considered, or even that they could nominate themselves. It's always amazing to me how many exceptional people don't consider "calls for nominations" to be directed at them. As you attend our conference (and hopefully, you get the chance to attend many others this summer as well), check out the award winners. Ask yourself: what am I most proud of about my work? Now, I'll ask you: have you ever considered nominating yourself for one of the ASB awards? For students, there is the coveted Pre-Doctoral Young Scientist Award. For faculty, the honors span a range of topics and career stages. One of the primary ways we succeed in science is by convincing others that our work should be taken seriously. Seriously considering our own work and career as award-worthy is just one of many ways we can learn to be more persuasive in tasks that are fundamental to our scientific independence and success. If you lack the confidence that your work is competitive with the top tier of research you see at awards sessions, seek feedback from colleagues you trust about what you do well and what you could improve. Seeking this type of feedback is something every successful scientist I know does regularly, especially when trying to figure out how to get a grant funded or a new paper passed a harsh review. If you aren't eligible for any of the nomination-based awards at this time, have you considered nominating a mentor, a senior scientist, or a colleague whose work you admire? Chances are high that, if you aren't sure your work is award-worthy, there's someone whose work you admire who hasn't considered themselves as an award nominee either. Now that our cadre of much-deserving award winners are chosen for the 2018 Annual Meeting, I challenge you to make my job a big headache next year because there are so many exceptional nominees, the award committees aren't sure how to decide!

I have the great fortune of attending World Congress of Biomechanics in July. If you see me there, please say hello. You can be sure I'll ask you if you are attending the ASB Annual Meeting in Rochester and that I'll remind you to fill out your ASB member survey ASAP. Also, do you know any good award nominees for 2019?



## Secretary/Membership Stacie Ringleb

We currently have 865 members (526 regular, 326 student members, and 14 emeritus,). To date, we have had 164 membership applications in 2018. In the past three years, we have continued to try to update our database to help meet the needs of the society. Some of the ways this information is used in-

cludes, but is not limited to: the formation of committees (e.g., award and program committees); helping the diversity, education and student committees better serve our members; and in grant applications that help fund our conferences. If you haven't updated your information please login to our membership portal and do so. For those that we have information for, the primary disciplines of our members are 47 biological sciences, 367 engineering and applied physics, 35 ergonomics and human factors, 230 exercise and sport sciences, and 154 in health sciences. We have 501 men, 309 women, and 9 members who didn't wish to identify their gender. This year, we allowed for our members to identify multiple races when identifying race. Our members identified as: 3 American Indian or Alaska Native; 83 Asian; 17 Black/African American; 2 Native Hawaiian/Other Pacific Islander; 16 Other; 645 White; 6 Asian and White; 1 Asian, White and Other; 2 Black/African American and White; 3 White/Other; and 35 who didn't wish to answer. For ethnicity, we have 46 Hispanic or Latino, 707 not Hispanic or Latino, and 38 who didn't wish to answer. Finally, we have 13 members with a disability, 771 without, and 28 who didn't wish to answer.

Starting in August, our membership will be managed through a database called Membership Toolkit. This database will be much more user friendly for both the board and the members. To prepare for this switch, we will be closing our current system to membership renewals and applications after online registration for the annual meeting closes on July 25th, and hope to have the new membership system live by the start of the annual meeting.

In closing, since this is my last newsletter article as secretary, I went back to look at what my predecessor, Andy Karduna, wrote in his final newsletter article. The advice he gave me was actually something that deserves to be passed down to my successor. To paraphrase what Andy told me, never tell someone it takes a few minutes to look something up in the membership database, otherwise you will be given too much work. To be more serious, I have enjoyed my time serving the society as secretary and chair of the membership committee, and I look forward to finding new ways to serve the society.

> "One, remember to look up at the stars and not down at your feet. Two, never give up work. Work gives you meaning and purpose and life is empty without it. Three, if you are lucky enough to find love, remember it is there and don't throw it away."

> > - Stephen Hawking





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## 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@lockhaven.edu



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President

### Treasurer Tamara Bush

Hello from your Treasurer!

SAVE THE DATE



ASB gives back to its members! So far this year, we have sponsored five regional meetings and five Grants-in-Aid. At this year's meeting we plan to award 18 travel grants and hono-

raria for the Hay, Borelli, Goel, Founders, Young Scientist, and Junior Faculty Research awards. Finally, Elsevier will sponsor two \$1,000 awards for Clinical Biomechanics and the Journal of Biomechanics which are selected at the meeting. Altogether, we return approximately \$40,000 to our members in the form of meeting support or awards. The majority of these funds are derived from membership dues and our corporate sponsorships. Thanks to all of you who support ASB!

The society also has regular expenses, these include software to manage our membership database, accountant fees, processing fees for use of credit cards for membership purchases, and security monitoring for our website and purchase site. The executive board also holds a mid-year meeting at the conference site to work out all meeting details and view the conference space. This year, the cost for the midyear meeting was \$7,575 with the majority of that cost being flights for our 13 board members. This is in line with what was spent in prior years.

Our checking account is healthy; it currently has \$65,000 in it. We also have set funds aside to be used as a starter loan for the 2020 meeting—yes, we are already working on the 2020 meeting location! Our hosts require down-payments on event locations prior to funds coming in from registrations. These funds are repaid once the conference registration process is underway.

**ASB2018** 

AMERICAN SOCIETY OF BIOMECHANICS

AT MAYO CLINIC

If you have any questions relating to ASB finances, feel free to contact me!



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Volume 31, Number 1

MAYO CIVIC CENTER

AUGUST 8-11

ROCHESTER, MINNESOTA

## Education Committee

The Education Committee has been hard at work as we reviewed Grant-in-Aid applications, oversaw regional meetings occurring throughout the spring, continued to promote the ASB Teaching Repository, and began to prepare for ASB 2018 in Rochester. A special thank you to all of the individuals who have served, in-

cluding: Louis DiBerardino, Erin Feser, Kim Fournier, Kaitlin Gallagher, Jessie Huisinga, Anne Martin, Scott Monfort, Erika Nelson-Wong, Patrick Ryder, Alex Shorter, Missy Thompson, and Lieselle Trinidad. As my final year in the position begins, I encourage anyone wishing to become more involved in ASB either by joining the Executive Board as the next ASB Education Committee Chair, or as a member of the committee, to email me to let me know of your interest.

The Grant-in-Aid sub-committee spent the late winter and spring reviewing ASB Graduate Student Grant-in-Aid applications. The purpose of this program is to support ASB student members pursuing biomechanics research by offering a source of research funding. We received 19 applications this year and were able to grant six awards totaling \$10,000. Congratulations to our 2018 awardees, we look forward to learning more about the results of their projects when they present their completed work next year in Calgary. (And be sure to check out the recently completed work of our 2017 awardees!)

- Emma Baillargeon, Northwestern University, Advisor: Dr. Eric Perreault. Quantifying age-related differences in shoulder muscle coordination in healthy adults
- Emily Gerstle, University of Wisconsin Milwaukee, Advisor: Dr. Stephen Cobb. *Transition step mechanics, how influential are age and fall history?*
- Alexa Johnson, University of Kentucky, Advisor: Dr. Joshua Winters. Connecting the Pieces: How low back pain alters lower extremity biomechanics and shock attenuation in active individuals
- Daniel Lidstone, University of Nevada, Las Vegas, Advisor: Dr. Janet Dufek. Effect of cerebellar TDCS on precision-grip isometric force control in children with autism spectrum disorder
- Lauren Sepp, Colorado School of Mines, Advisor: Dr. Anne Silverman. Performance and injury risk during running in people with a transtibial amputation
- Rachel Tatarski, The Ohio State University, Advisor: Dr. Stephanie Di Stasi. In vivo relationship between shear-wave velocity and joint-based estimates of muscle stiffness

Looking forward, we would like to encourage all graduate student members to consider submitting an application. In 2017 we received a record 32 applications, so this year we were down a bit. Applications are always due on January 15<sup>th</sup>. You and your advisor must be current ASB members at this time—so be sure to plan on renewing your membership. Graduate students wishing to become new ASB





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## Education Committee, cont. Kimberly Bigelow

members should apply in the fall to allow plenty of time. Note that the Grantin-Aid information on the ASB website will be updated this summer so before applying, read that carefully. We hope that the revisions and clarifications will help make it easy to submit a competitive proposal that abides by all guidelines.

The ASB teaching repository also continues to grow; it aims to be a resource for instructors to find ideas for lessons, labs, activities, and other educational needs (each called a "snippet"). We now have 427 registered members and 47 "snippets". The Teaching Repository's success does depend on the contributions of our members. The more contributions we have, the more likely members will continue to come to the repository, search for ideas, and find value in what is offered. Please think about the biomechanics courses you taught in 2017-2018 and use some "free time" this summer to add your most effective items to the repository. We are also working hard to make the Teaching Repository meet our members' needs; please send suggestions, ideas, wishes, or bugs to me and/or Patrick Rider. Finally, we are very excited to have been invited to present the Teaching Repository at World Congress of Biomechanics in Dublin this summer and look forward to expanding our reach—and contributors—internationally. There is a growing presence of outreach activities for National Day of Biomechanics 2019!

And finally, we are looking forward to highlighting, supporting, and discussing biomechanics education at ASB 2018! We were very excited to see 16 abstracts submitted to the conference (as opposed to just 2 a few years ago) focused on the scholarship of teaching and learning in biomechanics and other biomechanics education-related topics. Some of these abstracts will be highlighted in our Teaching Symposium at the 2018 conference. Others will be part of the poster sessions, so be sure to check them out. We hope that the increased presence of education-related abstracts will spur more discussion and sharing of ideas amongst ASB members. Perhaps you'll even find a new collaborator willing to try something new with you in your classrooms over the upcoming year (just in time for a 2019 abstract submission documenting what you tried and how it worked!) The members of the Education Committee and I will also be available throughout the conference and would be happy to discuss ideas and provide guidance, resources, and lessons learned from our own experiences, as well as listen to your ideas of how we can develop new conference programming to support your needs. The ASB Education Committee also supports the conference tutorials—so check out two great ones we lined up for this year: Issues of Scientific Rigor and Reproducibility facilitated by Dr. Jon Dingwell and Leadership Development: Difficult Conversations facilitated by Dr. Chris Hass. Space is limited so be sure to sign-up during registration.

If you have any ideas of how you would like our committee to better support the educational needs of our members, please email me to let me know. We hope to see a few other new initiatives implemented during the final year of my term and your ideas on what these will be are certainly welcomed!

### ASB Fellows Forum Kenton Kaufman, Paul DeVita

### Strategic Planning

Eds. note: in this article, two ASB Fellows (Kenton Kaufman and Paul DeVita), are joined by the presidential line (Chris Hass, Wendy Murray, and Brian Umberger)



Strategic planning is an organization's process of defining its strategy or direction. A society with a strategic plan is more likely to achieve its short and long term goals while maintaining a reputation of excellence. Critical to success is alignment on the objectives of the organization and the methods for achieving and measuring the society's goals. When clearly communicated this strategic plan supports an effective path forward and creates a common platform for agreement on core beliefs and principles.

Over a decade ago the Executive Committee of ASB devoted a portion of their meetings to developing a strategic plan for ASB. The goal was to develop a link between the present and a consensus vision of the Society's future. At the time this process was undertaken, ASB had a membership of approximately 700 members and the annual meeting had an attendance of roughly 450 individuals. The goal of the planning process was to have ASB recognized as a leading source of information and knowledge on biomechanics. With input from the ASB membership, ten multi-year goals and associated strategies were defined. Some of the goals built upon existing strengths of the Society at that time. Other goals were news goals that had not been previously undertaken. The strategic plan was ratified by the ASB membership at the 2007 ASB meeting held at Stanford.

The ASB membership has since grown to over 850 members and the annual meeting has almost 1000 participants. The growth of the society is a testament to the fact that a thoughtful strategic plan, coupled with strategic action by the leadership and membership of the society, yields positive results. The ASB Executive Board has a renewed interest in revisiting our strategic plan with President Wendy Murray and President-Elect Brian Umberger taking the lead. With growth, the Society is now at the crossroads where it is necessary to carefully chart a strategic plan for the next decade. This discussion has been initiated by seeking input with regard to the annual meeting structure. Other questions need to be answered in gathering input and formulating the strategy, such as:

- What are the organization's key values?
- What is considered "important" to the membership?
- What differentiates ASB from other similar societies in the eyes of the membership?
- What goals should be included or excluded in the next strategic plan?





## ASB Fellows Forum, cont. Kenton Kaufman, Paul DeVita

- What resources should be developed within ASB?
- What are the metrics of success for the organization? More members? Larger annual meeting? More national recognition? More research funding? Is success only defined by getting larger?

The essence of formulating a strong strategic plan is relating the organization to its membership. To aid in that effort, the executive board will be conducting a self-study of the society ahead of the annual meeting in Rochester this summer. As the strategic planning process proceeds, it is important that the membership define where they want to see ASB heading and communicate these visions to the Executive Board. We have made great progress over the past decade. It's exciting to think about where ASB will be in ten years!

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### Past-President Chris Hass

As the Past-President of the Society it was my honor and duty to direct the awards process this past year. This work involved creating and assisting the award committees, tallying their results, and discussing these results with the committees, and... the best part...calling the award recipients with the good news.

I must thank the 30+ dedicated ASB members for their generous and important contributions of serving on the award committees. Below I present to you the 2018 award recipients.

### Borelli Award: Roger Enoka, University of Colorado Boulder

The Borelli Award is the most prestigious honor given by the Society. The award recognizes outstanding career accomplishment and is awarded annually to an investigator who has conducted exemplary research in any area of biomechanics. The Borelli Award recipient for 2018 is Roger Enoka, PhD from the Department of Integrative Physiology at the University of Colorado Boulder. Dr. Enoka is a founding member of our Society, Fellow of the ASB, and has been a career-long supporter of our Society having served as President and Meeting Co-Chair among others. Dr. Enoka has also made substantial contributions to other Biomechanics and Neuroscience societies and organizations and conferences. Dr. Enoka's contribution in neuromechanics is outstanding and many argue that he has advanced the field more than any other person. Among his numerous experimental contributions, a major area of focus is related to hu-

man motor unit characteristics, their adjustments during various motor tasks and their adaptation to ageing, training and disuse. Dr. Enoka's publication record includes over 200 peer reviewed articles and over 40 book chapters. His Google Scholar h-index is 79 and his work has accumulated over 23,000 citations. Dr. Enoka has 64 papers each cited over 100 times and two papers cited over 1,000 times each. He has been highly funded through external agencies including the National Institutes of Health, National Science Foundation, the Department of Defense, and the Department of Education. While this funding record (>\$9 million) is excellent, Dr. Enoka values the knowledge, advancements, and training opportunities these funds produce more than actually obtaining the grants. He is committed to the development of future researchers and has trained over 80 undergraduate students performing independent studies, 23 doctoral students, 23 post-doctoral researchers, and 13 visiting professors. Despite these tremendous accomplishments, Dr. Enoka remains humble and reserved about his accomplishments. The Society is honored to recognize Dr. Roger Enoka as the 2018 Borelli Award winner and we are privileged to have him as a member, colleague, and friend.





**Borelli Award** Roger Enoka, University of Colorado Boulder



### 2018 Award Summary

#### Jim Hay Memorial Award

Rodger Kram, University of Colorado Boulder

Goel Award For Translational Research in Biomechanics

Kenton Kaufman, Mayo Clinic

### Past-President, cont. Chris Hass

### Jim Hay Memorial Award: Rodger Kram, University of Colorado Boulder

The Jim Hay Memorial Award recognizes originality, quality, and depth of biomechanics research that address fundamental research questions relevant to the extraordinary demands imposed in sport and exercise. The awardee delivers the Hay Memorial Lecture at the annual meeting highlighting how the study of biomechanical principles in the particular context of sport can inform our understanding of underlying mechanisms and optimal performance. Dr. Rodger Kram is the 2018 Hay Memorial Awardee. Dr. Kram has had a distinguished academic career with research interests focusing heavily on the physiology and biomechanics of terrestrial locomotion. More specifically he has pioneered our understanding of the partitioning of the rate of metabolic energy expendi-



ture into biomechanical constituents and the influences of internal and external forces on walking, running, cycling, and cross country skiing. Rodger has had a profound impact on the ASB serving as President, Meeting co-chair, and Fellow. He received the ASB Borelli Award in 2015. His Google Scholar H-Index is 54 with over 11,000 citations to his work. Most importantly, Dr. Kram is an exceptional role model for positivity, humility, ingenuity, and mentoring. He will provide his Keynote Lecture "Springs and the metabolic cost of running" during the 2018 Hay Symposium. Get there early: it will be a packed house.

#### Goel Award For Translational Research in Biomechanics: Kenton Kaufman, Mayo Clinic

The Goel Award, created in 2016, recognizes outstanding accomplishments in translational biomechanics research, entrepreneurship, and societal benefit. The award is named after Dr. Vijay Goel, the Borelli Award winner in 2014 and is given annually to an ASB member. The Award was initiated by Dr. Goel's loving and devoted family. The Goel Award selection is based on originality, quality and depth of the candidate's research, and the commercial and societal benefits emanating from this research. The Goel Award recipient for 2018 is Dr. Kenton Kaufman. Dr. Kaufman is the W. Hall Wendel, Jr., Musculoskeletal Research Professor at the Mayo Clinic. He is a Professor



of Biomedical Engineering, Director of the Orthopedic Biomechanics/Motion Analysis Laboratory, and serves as Consultant to the Departments of Orthopedic Surgery, Physiology and Biomedical Engineering. Dr. Kaufman has dedicated his career to the study of human mobility and to the development of clinical solutions for individuals who have mobility impairments. He has a Google Scholar h-index of 66 with over 19,000 citations to his work. Dr. Kaufman has served as

## Past-President, cont. Chris Hass

President of GCMAS and ASB and received the 2013 ASB Borelli Award. He is also a Fellow of ASB, AIMBE and ASME. Dr. Kaufman has been awarded over six patents linked to mobility, its related disorders and restoration of mobility function. His nominators noted that "Dr. Kaufman produced the first microprocessorcontrolled design in a class of devices now called stance control orthoses. Ken's vision and innovation led the expansion of this entire class of devices, of which there are currently over 10 stance control orthosis products in the marketplace." This just one of several examples where Dr. Kaufman's vision and innovation has impacted our field. We are honored to have him as the 2018 Goel Awardee.

### Founders' Award: Dan Ferris, University of Florida

The Founders' Award is named in honor of the Society's original members and is given to recognize "scientific accomplishment in biomechanics and excellence in mentoring" and is open to investigators of all disciplines within ASB. While sci-

entific accomplishment is part of all ASB awards, the mentoring component is part of the legacy of Jim Hay, one of the Society's original Founders and a pillar in the development contemporary Biomechanics. of The Award is focused on mid-career. The Founders' Award recipient for 2018 is Dr. Daniel Ferris. Dan is currently the Senior Associate Chair of the J. Crayton Pruitt Family Department of Biomedical Engineering, and the Robert W. Adenbaum Professorship in Engineering Innovation in the Department of Biomedical Engineering at the University of Florida. He has published more than 90 peer-reviewed journal

papers and his current Google Scholar h-index is 44. Dan has secured over \$13 million in extramural funds from a diverse array of governmental and private funding agencies, including the National Institutes of Health, National Science Foundation, Army Research Laboratory, Christopher Reeve Paralysis Foundation, Paralyzed Veterans of American Spinal Cord Research Foundation, and American Heart Association. As noteworthy as Dan's scientific accomplishments are, Dan's record as a mentor is even more impressive, running the gamut from coaching youth sports to shepherding junior faculty through the pre-tenure period. Dan has mentored 67 undergraduate students, 13 masters students, 12 doctoral students (plus 7 currently in the laboratory), 10 post-doctoral scholars (plus 1 currently in the lab), 7 assistant professors, and 3 assistant research scientists. Dan has also served as an informal mentor and role model to far more individuals. In these partnerships Dan has excelled. Dr. Ferris' promotor wrote, "Dan is my academic father and is my number one role model within professional life". Further, his promoters commented that "aside from all the practical guidance on conducting good science and navigating the career path, the things I carry with me today



### 2018 Award Summary

**Founders' Award** Dan Ferris, University of Florida



### 2018 Award Summary

#### Young Scientist Pre-Doctoral

Jack Martin, University of Wisconsin-Madison

### Young Scientist Post-Doctoral Award

Jennifer Nichols, University of Florida

#### Junior Faculty Research Award

Natalie Holt Northern Arizona University

## Past-President, cont. Chris Hass

from the time I spent working with Dan are the intangibles. Dan has always cared about my well-being, my family, and my happiness before anything else." We are so pleased to recognize such a truly well-rounded and outstanding individual for this year's Founders' Award.

### Young Scientist Pre-Doctoral Award: Jack Martin, University of Wisconsin-Madison

This award recognizes early achievements by promising young scientists prior to the award of their PhD. Selection is based upon submitted materials including a letter of nomination, curriculum vitae, description of research interests, representative published papers, and an abstract submitted to the 2018 meeting. The Young Scientist Pre-Doctoral Award recipient for 2018 is Jack Martin from the University of Wisconsin-Madison. Mr. Martin works in the UW Neuromuscular Biomechanics Lab under the direction of Dr. Darryl Thelen. He completed his BS in Chemical and Biological Engineering from Colorado State University and MS training in Kinesiology and Materials Science at the University of Wisconsin-Madison. He has published five peer-reviewed journal articles, one of which is a first-author paper in Nature Communications. Jack has made exceptional progress on the conception, design, development and validation of an innovative sensor to noninvasively assess tendon and ligament loads. The title of the abstract submitted for this award is "In situ calibration of the tendon shear wave speedstress relationship."

### Young Scientist Post-Doctoral Award: Jennifer Nichols, University of Florida

This award recognizes early achievements by promising young scientists who are within five years of receiving their PhD. The Young Scientist Pre-Doctoral Award recipient for 2018 is Dr. Jennifer Nichols from the University of Florida. Dr. Nichols completed her BS in Mechanical Engineering from Tufts University and then went on to receive her PhD in Biomedical Engineering and an MA in Medical Humanities and Bioethics at Northwestern University. She conducted her postdoctoral research in the Department of Orthopaedics at the University of Utah. She received external funding for her research from the National Institutes of Health (NIH NRSA F31 AG041627) and the Orthopaedic Research Education Foundation (OREF) in conjunction with the Orthopaedic Research Society (ORS). Her musculoskeletal and orthopaedic biomechanics research strives to create predictive, biomechanical simulations to improve functional ability and quality of life for individuals suffering from musculoskeletal disorders. Beyond research, Dr. Nichols is an active teacher and mentor. She has taught across the fields of mechanical engineering, biomedical engineering, physical therapy, responsible conduct of research, and clinical ethics. Dr. Nichols is a talented presenter and will present her current work "Identifying biomechanical wrist impairments with machine learning: a feasibility study" at this year's meeting.

### Junior Faculty Research Award: Natalie Holt, Northern Arizona University

The Junior Faculty Research Award is a \$5,000 grant that can be used to generate pilot data and support early-career investigators. The JFRA recipient for 2018 is Dr. Natalie Holt in the Department of Biology at the University of Northern Arizona. Dr. Holt's award application is titled "The effect of skeletal muscle ac-

## Past-President, cont. Chris Hass

tivation on the force-length relationship: implications for crossbridge theory and musculoskeletal modelling." This study aims to determine the relative contributions of changes in intracellular calcium concentration and compliance to the activation-dependent shift in optimum length, and map these shifts to changes in actin-myosin overlap. Look for the results of this work at the 2019 annual meeting.

### Research Travel Grant: Jackie Morgan, Virginia Commonwealth University

A Research Travel Grant is offered to foster collaborative research and interaction among scientists by helping to offset the cost of travel to a host institution. Ms. Jackie Morgan will be the lead investigator for a pilot study which is part of a larger collaborative research project between the University of Memphis and Virginia Commonwealth University. Ms. Morgan's proposed project is to examine training effects on dynamic postural control and gait complexity in high school cross country runners.

### Clinical Biomechanics Award: Announced at the annual meeting

This award recognizes outstanding new biomechanics research targeting a contemporary clinical problem, and is sponsored by Elsevier Science, Ltd., publishers of Clinical Biomechanics. The award finalists were selected based on peer review of the submitted abstracts for the 2018 Annual Meeting. The finalists' presentations will be in a podium session that will be held Friday, Aug. 10, from 9:30-11am, with the winner announced at the closing ceremony. Here are the finalists:

### 1) Knee Adduction Moment is Greater with Time Since Injury in Individuals with Lower Limb Loss

<sup>1,2</sup>Rebecca L. Krupenevich, <sup>1</sup>Ross H. Miller, <sup>2</sup>Lien T. Senchak, <sup>2-4</sup>Brad D. Hendershot, <sup>2-4</sup>Alison L. Pruziner

<sup>1</sup>University of Maryland, College Park, MD, USA

<sup>2</sup>Walter Reed National Military Medical Center, Bethesda, MD, USA
<sup>3</sup>DoD-VA Extremity Trauma and Amputation Center of Excellence, USA
<sup>4</sup>Uniformed Services University of the Health Sciences, Bethesda, MD, USA

2) Contact Stress Over-exposure Correlates with OA Development in Acetabular Fractures

Kevin N. Dibbern, Tai C. Holland, Holly D. Thomas-Aitken, Tyler CarlLee, Michael C. Willey, Jessica E. Goetz, J. Lawrence Marsh, Donald D. Anderson University of Iowa, Iowa City, IA

3) Breast Cancer Treatment Type and Post-treatment Duration Influence Pectoralis Major Recruitment

Tea Lulic, Bhillie D. Luciani, Rebecca L. Brookham, Clark R. Dickerson Department of Kinesiology, University of Waterloo, Waterloo, ON, Canada

### Journal of Biomechanics Award: Announced at the annual meeting

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 award finalists were selected based on peer reviews of the submitted abstracts for the 2018 Annual Meeting.



### 2018 Award Summary

**President's Award** TBD at annual meeting

#### Research Travel Grant

Jackie Morgan Virginia Commonwealth University

Clinical Biomechanics Award

TBD at annual meeting

Journal of Biomechanics Award TBD at annual meeting

### Student Travel Awards

Andrew Vigotsky, Northwestern University

Lauren Sepp, Colorado School of Mines

Craig Kage, University of Minnesota

Christopher Curran, East Carolina University

Jessica Aviles, Virginia Tech

Rachel Tatarski, The Ohio State University

Kate Spitzley University of Oregon



### 2018 Award Summary

#### Student Travel Awards, cont.

Chelsea Rugel, Northwestern University

Russel Johnson, University of Massachusetts, Amherst

Katie Farina, Appalachian State University

Ke Song, Washington University-St. Louis

Lauren Schroeder, University of Tennessee

Gustavo Sandri Heidner, East Carolina University

Marissa Papp, University of Southern California

Joshua Leonardis, University of Michigan

Anthony Anderson, University of Washington

Angel Gonzalez, University of Nebraska-Omaha

### **ASB Fellows**

Elizabeth Hsiao-Wecksler, University of Illinois

Andrew Karduna, University of Oregon

Maury Nussbaum, Virginia Polytechnic Institute and State University

## Past-President, cont. Chris Hass

The finalists' presentations will be in a podium session that will be held Friday, Aug. 10, from 9:30-11am, with the winner announced at the closing ceremony. Here are the finalists:

### 1) Hip Extensor Fatigue Alters Hip and Knee Coupling during Step Downs: A Randomized Controlled Trial

Nicholas J. Beise, Michelle L. Fischer, Taylor L. Stecklein and John H. Hollman Mayo Clinic College of Medicine and Science, Rochester, MN, USA

2) Glenohumeral Joint Stability during Dynamic Pushing and Pulling Daniel C. McFarland, Emily M. McCain, Michael N. Poppo, and Katherine R. Saul

North Carolina State University, Raleigh, NC, USA

3) Learning Locomotor Stability in Novel Environments <sup>1,2</sup>Mary A. Bucklin, <sup>2</sup>Mengnan/Mary Wu, <sup>2</sup>Geoffrey Brown, <sup>2,3</sup>Keith E. Gordon <sup>1</sup>Northwestern University Department of Biomedical Engineering <sup>2</sup>Northwestern University Department of Physical Therapy and Human Movement Sciences <sup>3</sup>Edward Hines Jr. VA Hospital

### **Student Travel Awards: 18 Recipients**

Student Travel Awards are offered to help students attend the ASB annual meeting. To be eligible, one must be an ASB student member and must have authored an abstract for presentation at the annual meeting. Applications included a cover letter, CV, a letter from student's advisor, and an accepted abstract. We had over 40 applications this year and we are able to fund 18 of them. The award winners are: Andrew Vigotsky (Northwestern University), Lauren Sepp (Colorado School of Mines), Craig Kage (University of Minnesota), Christopher Curran (East Carolina University), Jessica Aviles (Virginia Tech), Rachel Tatarski (Ohio State University), Kate Spitzley (University of Oregon), Chelsea Rugel (Northwestern University), Russel Johnson (University of Massachusetts, Amherst), Katie Farinak (Appalachian State University), Ke Song (Washington University-St. Louis), Lauren Shroeder (University of Tennessee), Gustavo Sandri Heidner (East Carolina University), Marissa Papp (University of Southern California), Joshua Leonardis (University of Michigan), Anthony Anderson (University of Washington), Angel Gonzalez (University of Nebraska-Omaha).

### Fellows of the ASB: Elizabeth Hsiao-Wecksler, Andrew Karduna, and Maury Nussbaum

In 2011, ASB created the status of Fellow to recognize scientific achievement and service to the Society and to encourage continued service in leadership roles. The Society currently has 34 Fellows and we will induct three individuals as new Fellows in 2018 at Rochester. The 2018 Fellows are Elizabeth Hsiao-Wecksler, PhD, from the University of Illinois, Andrew Karduna, PhD, from the University of Oregon, and Maury Nussbaum, PhD, from Virginia Polytechnic Institute and State University.

Congratulations to the ASB Award recipients and the new ASB Fellows for 2018.



Home to Mayo Clinic and located in the United States' Upper Midwest region, Minnesota's Rochester is a thriving city of just over 100,000. Distinguished by its culture of caring, spirit of innovation, and fascinating history, Rochester, MN is also renowned for its scenic beauty, relaxing pace, and abundant dining, shopping, and entertainment options. https://www.experiencerochestermn.com/







### Mayo Clinic Heritage Hall

Heritage Hall, a museum and welcome center, is open from 8 am-5 pm, Monday through Friday, at no charge. It is located in Mathews Grand Lobby, street level of the Mayo Building. Visit the website for more information or for a virtual tour.

http://history.mayoclinic.org/tours-events/mayo-clinic-heritage-hall.php

### **Plumber Building**

This Mayo Clinic building was constructed in 1928. The 3rd floor Historical Suite houses original offices of the Mayo Brothers, Drs. Will and Charlie, as well as Board of Directors meeting room, Mayo Hall & Medical Libraries. The carved and painted beamed ceiling in the main reading room, Mayo Hall, on the 14th Floor, as well as the ceilings on many Plummer floors are especially beautiful architectural features in Rochester. The 15th floor features large portrait paintings of Mayo's most prominent figures.

http://history.mayoclinic.org/tours-events/plummer-building.php (\*Please note that guided tours at Mayo Clinic are available only to patients and their companions.)

### **Rochester Arts Center**

A cultural center for innovation and creativity through contemporary art. Through world-class exhibitions and programs, the center presents a welcoming, integrated, and diverse experience that encourages questioning, creativity, and critical thinking. 40 Civic Center Drive SE / 507. 282. 8629

### **Rochester Downtown Farmers' Market**

A growers-only market, bringing healthy and delicious foods throughout the year. Located Downtown and open rain or shine May-October. 4th Avenue SE / 507. 273. 8232



### **Soldiers Field Veterans Memorial**

Memorial features the Wall of Remembrance - a granite, circular wall honoring over 3,000 service men and women from SE Minnesota who gave their lives in service to their country. 3rd Ave and 7th St. SW

http://www.soldiersfieldveteransmemorial.org/index.htm

### Silver Lake Boat and Bike Rentals

Renting bikes, kayaks, paddleboats, and canoes. Paddle around Silver Lake, canoe or kayak down the Zumbro River, or bike through the city for a sightseeing experience. Located on the shore of Silver Lake in the downtown area. <u>http://www.silverlakefun.com/</u>

### Nice Ride Rochester

A standard rental service offering bikes for rent for a flat fee by the hour, or by the day. Rental bikes are designed for all types of riding, from short errands to longer rides of ten or more miles. The local area offers great places to ride, with over 85 miles of paved trails. All bikes come fully outfitted with everything needed for a biking adventure. Rentals available at People's Food Co-op 7/days a week or Peace Plaza Visitor Kiosk (limited hours).

https://www.niceridemn.org/rochester/





#### **Rochester Trolley and Tour Company**

Experience Rochester's premier sightseeing tour in classic Trolleys. Offering a wide range of various guided public tours in and around the area. See Rochester's Historical Sites, Old Order Amish Country, Wine Trail & Microbrewery, Scenic Mississippi River Valley, Holiday tours, and more, all aboard one of five Trolleys. Primary boarding located at the Rochester Marriott Hotel downtown.

101 1st Avenue SW / 507. 421. 0573

### Nightlife & Bars

When the sun sets, the fun is just beginning in Minnesota's Rochester. Plan an after-dark gathering at one of Rochester's lively hot spots for dining and nightlife, meet for craft beers at a local brewery, or laugh until your sides split at a comedy club. If a change of scenery sounds appealing, then head to a rooftop patio bar to eat, drink, and dance with some breathtaking views of the city skyline and the area's natural beauty. https://www.downtownrochestermn.com/explore/dining /nightlife-and-bars



## Communications Committee

Summer greetings from Pullman, Washington. Just over a month before we meet in Rochester MN. As we get closer to our meeting, the webpage, Facebook page, and Twitter feed will become more active with meeting related information. You can stay up to date more easily if you stay connected with us through social media.

We especially encourage students (and faculty with students) to check out our Facebook page as student related posts have become more active over the last 6 months. Additionally, follow us at @AmSocBiomech so you can get live updates in Rochester this summer.

Another one of our efforts described in the last newsletter has been to collect interesting biomechanics pictures from our members and post on the scrolling photo banner of the ASB homepage. Having new photos keeps our website fresh, and providing your photos gets your research some free press. It is a win-win. So, if you have some interesting photos and are willing to share, let me know. Here is exactly what we are looking for:

- An eye-catching biomechanics figure/picture.
- The pictures need to be 980 wide x 310 tall size to properly display in the ASB banner, so you can make it this size or we can crop the picture as long as the original meets the minimal dimensions of 980 wide x 310 tall.
- A 1-sentence caption of the picture, with the name of the author and lab/ school affiliation.
- See the current ASB homepage for examples.
- No previously published pictures.
- No recognizable faces.
- Make sure the PI has given consent to posting the picture on the ASB website.

This will be my last newsletter article as communications chair. Tarang Jain from Northern Arizona University will be taking over as Communications Chair at our summer meeting. Below is a list of Communications Committee accomplishments since I have been in office. I hope to remain active on the Communications Committee and continue helping sustain these activities. I remain appreciative to all the committee members that have helped.

- I am particularly proud that we have (from the past two conferences) been able to share keynote presentations on our website. These can be found on the Videos and Presentations page. I hope we can continue this tradition. For those that miss the conference, for various reasons ranging from work to not yet knowing a biomechanics career is in their future, this page will hopefully serve to document some of the most influential biomechanists.
- Along with a documentation of our history, and with a majority of the effort from Bil Ledoux, we have all the past conference information now documented on the Past Conferences page.
- Besides documenting keynotes, my other major initiative coming into office was to update the Graduate Program webpage. Once we got all links working, we have been regularly checking for broken links. If you have a graduate program or lab not posted yet, let us know.





Find us on Facebook or Follow us on Twitter

Facebook: American\_Society\_of\_ Biomechanics

### Twitter: @Am-SocBiomech



### Communications Committee, cont. **Robert Catena**

- We created a Member Obituaries page on our website. If you become of aware of other ASB members passing, please let us know so that we can honor them on our website.
- We have created a new ASB regional meeting page that allows students to find a nearby student-focused conference. Please inform your students.
- We have made an effort to expand ASB outreach through Twitter. Regular contributions are made and we are now at +3200 followers on Twitter. That is almost triple our conference attendance. Our messages are going out to many more worldwide biomechanics enthusiasts!



## National Biomechanics Day Paul DeVita

## 11,000+ High School Students Celebrated Biomechanics on NBD 2018





### 2018 National Biomechanics Day website

Hello Biomechanists and Everyone Else All Around The World,

National Biomechanics Day is completing its third season and its popularity and success continue to astound us. We had over 11,000 high school students and 350 teachers participating in NBD 2018 events truly around the world. After three years we have now excited over 20,000 young people about Biomechanics. Here's what NBD looks like in Hong Kong, Portugal, Malaysia, and the US.



Well, even dinosaurs could benefit from motion capture! We also enhanced our worldwide presence through social media. Please spend a few moments viewing, liking, forwarding, and retweeting The Global Phenomenon that is NBD:

### Instagram NBD Twitter NBD Facebook NBD NBD Website

You can search through these sites with #NBD2018, @BiomechanicsDay, #NationalBiomechanicsDay and variations on these themes to see NBD 2018 all over the world.

Without doubt we continue to promote our mantra: NBD 2018 was the single greatest day in biomechanics: there were more smiles on more faces in more biomechanics labs than ever before. Let's all thank each other for contributing so successfully to our mission which is to increase the impact of Biomechanics on society through introducing high school students to our science.

I would like to highlight three new initiatives that occurred in NBD 2018. National Biomechanics Day greatly expanded around the world this year. We had 20 international NBDs in 2017 and 52 international NBDs this year. While the usual suspects including New Zealand, Brazil, Australia, and the United Kingdom continued to NBD (that's a verb) in 2018, many other countries joined the movement. Armenia, Canada, and Chile had NBD events, as did China, the Czech Republic and Germany. Iran, Malaysia, Pakistan, Portugal, and Singapore had NBD events. Turkey will have an NBD later this year! We are sure to develop



## National Biomechanics Day, cont. Paul DeVita

further along international lines and have NBDs in more nations in 2019.

NBD greatly expanded its efforts in diversity and inclusiveness. We are partnering with ASB member Dr. John Drazan and his initiative, Science of the Slam and 4<sup>th</sup> Family to bring Biomechanics to under-represented young populations through community sports leagues. Through ASB members Drs. Brooke Odle and Courtney Shell, NBD is now associated with the W.E.B. DuBois Scholars Institute at Princeton University. Also, through the individual efforts of ASBers Joanie Bechtold, Diversity Committee Chairperson Robin Queen, and Novel representative Susan Diekrager, NBD-related, Biomechanics-STEM outreach events were organized in Minneapolis, in New York City at iFAB 2018, and one will be held this August in conjunction with the ASB meeting at the Mayo Clinic. We will continue to develop our DE&I initiatives.

Through the efforts of many people and organizations around the world, we had numerous and fun NBD competitions. ASB Student Rep Katie Knaus directed the student competitions for the second year. Awards were given for Best NBD Content and Greatest NBD Impact. ASB member Lisa MacFadden organized and directed the Art In Biomechanics competition and received numerous beautiful entries. The International Society of Biomechanics in Sports and Laura-Anne Furlong ran a Two Minute Tweet competition in which entries discussed their research in short videos. The Clinical Movement Analysis Society (CMAS) with Colm Daly ran a Stick Figure Charades competition that had hilarious entries of "biomechanical interpretations of famous movies." The British Association of Sport and Exercise Sciences had a free membership drawing for any NBD participants. Thanks, Sandy Willmott.

The phenomenal success of National Biomechanics Day is due to the generous contributions of so many individual people, institutes, societies, and enterprises. We thank so much the ASB for its support and wonderful NBD-enthusiasm. ASB Executive Board members tirelessly promote NBD and perform many behind the scenes support-efforts and ASB members massively participate in NBD events. Brazilian, International, Canadian, Czech Biomechanics Societies along with the International Society of Biomechanics in Sport, American Kinesiology Association, British Association of Sport and Exercise Sciences, and Clinical Movement Analysis Society all sponsor NBD and have expanded the impact of Biomechanics. Instrument manufacturers AMTI, Bertec, Delsys, Kistler, Noraxon, Novel, The Motion Monitor, Qualisys, Vicon/IMU, and Xsens all sponsor NBD as they do so many Biomechanics societies and conferences. Today we specifically highlight Delsys' recent recognition of NBD as one of the "impactful scientific events" of the past year." I personally thank the many members of the NBD Organizing Committee who have contributed to our social media blitz, our increased efforts in diversity and inclusiveness, our website and registration efforts, fundraising, international development, and the growth of dance science. Most importantly, NBD thanks with great sincerity and appreciation YOU, the biomechanists around the world creating National Biomechanics Day events in all their varied forms. Every participating biomechanist, student and faculty, academic and industrialist, researcher and applier generously donated your time and effort to unify our science and show it to young people and young people liked it. YOU are creating the Biomechanists of the future through your contributions to NBD.

2018 National Biomechanics Day website

## 2017 Junior Faculty Research Award

### Changes in the Osteovascular Niche Following Ischemic Stroke in Mice

Stroke patients experience dramatic bone loss and high rates of bone fracture not explained by immobility alone, yet the pathophysiology of this bone fragility remains largely unknown. Stroke-related deficits in bone mineral density have been associated with reduced limb arterial elasticity, and sufficient blood supply is critical for bone maintenance. However, the effects of stroke on the vascular environment within bone (osteovasculature) remains unexplored. The purpose of our study is to determine the functional, structural, and cellular changes in osteovasculature that occur following ischemic stroke and elucidate biomarkers associated with these changes.

We performed either a middle cerebral artery occlusion (stroke, n=16) or sham surgery (n=12) in skeletally mature male C57Bl/6J mice. During a 4-week recovery, half of the mice received daily treadmill exercise therapy. Blood flow in the proximal tibia was monitored weekly in vivo using laser Doppler flowmetry. At the end of the study, tibias and femurs were harvested and assessed for 1) vascular and bone microstructure; 2) endothelial and osteoprogenitor cell activity; and 3) proteomics.

Tibial blood flow was ~30% lower in stroke than sham mice for two weeks, and exercise restored it to sham sedentary levels by the second week. At study end, stroke mice had ~40% higher vessel volume per medullary volume than sham mice in the distal femur (Figure), perhaps an adaptive countermeasure for the early decreases in bone blood flow. In sedentary groups, trabecular bone microstructure

was similar between stroke and sham mice. Exercise increased bone volume fraction and trabecular thickness relative to sedentary but only in sham mice. Mechanisms for this reduced bone adaptation in stroke mice are not yet understood. Ongoing work includes examining the coordinated activity of bone and endothelial cells with immunohistochemistry and using discovery proteomics to identify both systemic serum proteomic signatures and bone-specific biomarkers that may be altered during early stroke recovery.



This funding has enabled us to optimize IHC and proteomics methods and will help to complete these aspects of the study. These results will provide new information about the osteovascular changes at the cellular and molecular level following stroke, which may lend insights into the development of bone fragility in stroke patients.

Acknowledgement: This work was performed primarily by PhD student Nicholas J. Hanne.





## 2018 Annual meeting website

### Program Chair Silvia Blemker

Our 42<sup>nd</sup> annual meeting (August 8-11 in Rochester, MN) is fast approaching! It has been a lot of fun putting together a program that highlights the awesome science being done in our field. For those of you who are curious what the wall of a Program Chair's office looks like, see the attached photo! I



am deeply thankful for all the roughly 200 individuals who shared their precious time, energy, and expertise to review the roughly 700 submitted abstracts. The result will be an excellent conference that highlights the diverse and cutting-edge nature of our field.

The final program includes invited keynote lectures, research symposia, traditional podium sessions, rapid podium sessions, thematic poster sessions, traditional poster sessions, lab tours, tutorials, award sessions, a "future of ASB" session run by President Murray, and a career networking event. I am super excited about the two invited keynotes. The first keynote lecture will be given by Dr. Gabrielle Kardon, Professor of Genetics at the University of Utah and



expert in the developmental biology of the musculoskeletal system. The second keynote lecture will be given by interdisciplinary team at the Mayo Clinic which is conducting a clinical trial for a breakthrough treatment of spinal cord injury, including Kendall Lee, MD (Neurosurgeon), Peter Grahn, PhD (Engineer), and Kristin Zhao, PhD (Biomechanist, as well as our Conference Chair).

We look forward to our recurring annual award presentations and competitions (Clinical Biomechanics and Journal of Biomechanics—there are three finalists for each award this year), and the Society's honorary awards: the Borelli Award, Jim Hay Memorial Award, Goel Award, Founders' Award, Young Scientist Predoctoral Award, and Young Scientist Post-doctoral Award.

New this year will be multiple student award competitions. Abstracts submissions by students who opted during the submission process were considered for the BS, MS, or the Doctoral finalist categories. The finalists were determined based on the abstract scores and reviews, per our peer review process. The 36 Doctoral finalists will present in one of three rapid podium competitions (which will run in parallel with each other, but unopposed by any other sessions) and in an afternoon poster session, and three Doctoral winners will be selected. The 9 BS and 11 MS finalists will present in an afternoon poster session. Winners will receive a plaque and a monetary award. If you are interested in helping judge the student awards, please email me. We hope that these new competitions elevate the level of energy and excitement around the next generation of biomechanists in our field.

Meeting information is available through the meeting website. The detailed program will be posted very soon, but in the meantime feel free to contact me if you have any questions. See you in Rochester!

## Meeting Chair Kristin Zhao

The ASB 2018 annual meeting will be held August 8-11 in Rochester, Minnesota at the Mayo Civic Center, hosted by the Mayo Clinic. The meeting will highlight the newly-renovated Civic Center facilities, with vendors, posters, and dining all within the same large ballroom, and posters displayed through-



out the conference. Together, Silvia Blemker, the Program Chair, and I hope that you will join your colleagues and friends in Minnesota and enjoy the program that will include the following:

- Approximately 1000 participants.
- A program hosted at the newly-renovated Mayo Civic Center, which is located within walking distance of the world-renowned Mayo Clinic, home to cutting-edge research, education, and clinical practice.
- Accessible and convenient downtown experience with multiple hotel and restaurant options for visiting and networking during the conference.
- Tours of several laboratories at Mayo Clinic, including:

The Motion Analysis Laboratory, directed by Kenton Kaufman

The Biomechanics Laboratory and Testing Core, directed by Timothy Hewett The Tendon and Soft Tissue Biology Laboratory, directed by Peter Amadio The Biomedical Imaging Resource Laboratory and Core, directed by David Holmes III

The Assistive and Restorative Technology Laboratory, directed by Kristin Zhao
Several student and professional events are planned and include (please visit the conference website for these and more events):

**Student Welcome to the ASB Meeting** (Wednesday, August 8<sup>th</sup>): Welcome to all students attending ASB! Come for a brief presentation by the Student Rep outlining tips for having a successful conference and highlighting student events and activities. Afterwards there will be an opportunity to network with students from other labs before the Opening Reception, where you can meet and greet old and new colleagues.

**Student Night Out** (Thursday, August 9<sup>th</sup>): Gather with other students to relax, network, and mingle in downtown Rochester during ASB's 'Night on the Town.' More details coming soon!

**ASB Mentoring Program**: Participating students will be assigned a mentor (with whom they can meet during the annual meeting) matched according to their professional and educational goals. Please sign up for the program during conference registration. Notification of mentor/mentee matches will be sent out before the conference and it is the student's responsibility to communicate with their assigned mentor to coordinate a time and place to meet. Sign-ups for the mentoring program will be available during conference registration until July 1. If you do not sign up during registration or will not be registering before the deadline but are still interested in participating, please contact Katie Knaus.

**ASB Career Networking Event**, open to all ASB members (Thursday, August 9<sup>th</sup>): If you want to learn more about specific job opportunities in biomechanics, come to this event! Speak with potential employers seeking to recruit for positions in industry, clinic, government, or academia, including post-doc and grad school positions. More details coming soon! **Future of ASB Event** (Friday, August 10<sup>th</sup>): ASB President, Wendy Mur-



2018 Annual meeting website



## 2018 Annual meeting website

### Meeting Chair, cont. Kristin Zhao

ray, will be leading a discussion about the future of the Society. ASB leadership will discuss potential changes to the annual meeting structure and the newly launched self-study. Grab a boxed lunch from the Ballroom and come join the conversation.

Several inclusivity events will occur again this year including: a Diversity Outreach Event (Wednesday, August 8<sup>th</sup>) featuring sports biomechanics to introduce research and the scientific method, a Women in Science Cocktail (Thursday, August 9<sup>th</sup>), which will focus on the practice of negotiation in both industry and academics, and a Diversity breakfast (Saturday, August 11<sup>th</sup>), which will highlight a panel of industry and academic leaders discussing avenues for success.

We look forward to your participation at the annual conference and welcome any comments or suggestions - please email me!

### Diversity Committee Robin Queen

It has been a busy year for the Diversity Committee since the annual meeting in Boulder. Throughout this year, the Diversity Committee has partnered with 4<sup>th</sup> Family to host STEM outreach events in Minneapolis, MN in February and then a National Biomechanics Day outreach event in New York City as part of the iFAB (International Foot and Ankle Biomechanics) meeting in April. These events were highly successful and a wonderful learning experience for all involved. The work that the Diversity Committee has done with 4<sup>th</sup> Family over the last



year has allowed us to plan and develop the outreach event for the 2018 ASB Annual Meeting in Rochester. We hope that everyone will plan to arrive in Minnesota to participate in the ASB outreach event that will be held on August 8, 2018 starting at 8:30am. This will be an amazing opportunity for ASB members to engage with the local community and demonstrate to children the fun of science and how we can use science to answer sports performance questions. The Diversity committee is actively planning the ASB Women in Science (WIS) event, which will be an interactive cocktail again this year with a focus on negotiation skills. This event will be held on August 9, while the Diversity breakfast will occur on the morning of August 11 and will focus on avenues for career success in academics and industry.

The Diversity Committee is thrilled to report that we were able to award 15 Diversity Travel awards for students to attend and present his/her work during the 2018 annual meeting. Through the hard work of this committee, which includes Matt McCullough (NC A&T University), Joan Bechtold (University of Minnesota), Susan Diekrager (Novel Electronics), and Ajit Chaudhari (The Ohio State University), we have been able to plan for an exciting 2018 annual meeting. We hope that everyone will consider joining us for at least one of the Diversity events during the 2018 annual meeting. Please feel free to reach out to me or any member of the committee at any time with suggestions or concerns during the year as well as throughout the 2018 Annual Meeting.

### President-elect Brian Umberger

The executive board has spent the past year initiating a strategic planning process to build upon the success of the original strategic plan that was adopted in 2007. The original strategic plan may be found in the History and Mission section of the ASB website. The first step in our current planning initiative



One major issue we will need to consider as part of the strategic planning exercise is how we run the Society. In the last newsletter, I wrote about the increasing reliance on professional conference organizers due to the increasing size of the annual meeting. There are many advantages to turning the organization of the logistic aspects of the meeting over to professionals. However, as we go that route, care must be taken to maintain the feel of annual meeting and keep conference fees in check.

Similar to issues regarding the size of the annual meeting, as the size of the ASB membership has grown, along with the amount of programming we offer, so too has the administrative load on the executive board. Much of our time is spent on administrative tasks, leaving little time to work on improving processes or focus on our vision for the Society. Based on my preliminary research, many (perhaps most) other professional societies that are reasonably similar to ASB (e.g., size, scope, focus) use a professional management service to help run the society, the annual meeting, or both. One of the many advantages of having a consistent administrative presence involved with the executive board would be slowing the leak of institutional knowledge that inevitably occurs as most people serve on the board for 2-3 years and then rotate off.

Just as with relying more on conference organizers to help run the annual meetings, any move to engage an association management service to help run the Society would require careful attention to ensure that the character of ASB is not lost, and that annual dues remain modest. I look forward to seeing many of you in Rochester this summer and hearing your thoughts on these and other important issues that affect ASB and its members.





### ASB Corporate Sponsors 2018

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 Tamara Reid, Treasurer.

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

Partner Member Tekscan





## ISB / ASB 2019, Calgary, Canada Abstract Submission opens November 1, 2018. Abstract Submission closes January 31, 2019. Notification of acceptance will be sent by April 15, 2019. Early Registration is November 1, 2018 - May 15, 2019. Regular Registration begins May 16, 2019. Footwear Satellite Symposium will be July 28-30, 2019. Muscle Satellite Symposium will be 2 days between July 27-30, 2019. ISB / ASB Meeting will be July 31-August 4, 2019. https://www.isb2019.com/

## ISB / ASB 2019 Calgary

July 31 - August 4, 2019

## Highlights from the ASB Facebook page

There has been a lot happening on ASB social media in the past few months. Some of the highlights include:

## Interview with a Biomechanist



In a series of interviews, Ryan Wedge caught up with faculty members to discuss careers in academia:

**Dr. Ross Miller,** Assistant Professor in Kinesiology at the University of Maryland, offers insight into deciding if and where to do a post-doc, staying productive when funding is tight, and more!



Dr. Karl Zelik, Assistant Professor in Mechanical and Biomedical Engineering and Physical Medicine & Rehabilitation at Vanderbilt, provides some great guidance on applying for grant funding, collaboration, and more!



Dr. Allison Gruber, Assistant Professor in Kinesiology at Indiana University Bloomington, gives advice in choosing a post doc, balancing research, teaching, and funding, and more!



Chris Ertel, a Biomechanical Research Scientist at Brooks Running Company, studies the effects of running footwear on lower-limb injuries and running performance. In an interview by Ryan Alcantara, he discusses his career in industry. Dr. Darryl Thelen,

Professor in Mechanical and Biomedical Engineering at UW Madison, shared advice on landing a



university faculty position. This great resource assembled by Samuel Acuna is available on <u>ASB Career webpage.</u>

usses his is available on ASB Career webpage. Tell us who we should interview or volunteer!



## Student Spotlight



### Alexis Nelson,

undergraduate student at the University of Memphis studying exercise, sport, and movement, discusses how she got involved in research early



Colin Smith, recent PhD graduate in Mechanical Engineering at UW Madison advised by Dr. Darryl Thelen, gives advice to undergrads studying in biomechanics

## Read ASB students' answers to questions about their school/research experience!

Jen Zellers, PhD student in Biomechanics & Movement Science at the University of Delaware advised by Dr. Karin Gravare Silbernagel, shares how her background in PT guides her research

Shalaya Kipp, recent MS graduate in Integrative Physiology at CU Boulder advised by Dr. Rodger Kram, talks about how running intersects her passions and research





Let us know about ASB students we should spotlight!

## Featured Biomechanics





Learn about cool things happening in biomechanics!

Learn about the biomechanics and motor control involved in figure skating jumps. Simi Oludare explores why the triple axel is so difficult.

The Winter Olympics gave us lots of biomechanics to talk about! Check out these articles and videos about some of the biomechanics in curling, skating, and snowboarding.





Learn more about <u>personalized running shoes</u> that are customized for individual biomechanics! Daniel Kuhman discusses options for elite athletes to recreational runners.

Learn about an exciting <u>new technology</u> for non-invasively assessing muscle-tendon loading during human movement, published in Nature: "Gauging force by tapping tendons".

Share Share something that you are excited about!



## Want to contribute? Contact the Student Representative

Special thanks to the Student Committee for Biomechanics Advocacy for creating new content!

## ASB Regional Conferences

### 2018 Mid-South Biomechanics Conference

The inaugural Mid-South Biomechanics Conference (MSBC) hosted at the University of Memphis between February 22<sup>nd</sup> and 23<sup>rd</sup> was a tremendous success! The MSBC included 155 registrants, eight sessions with a total of 37 oral presentations, two tutorials, four invited speakers, one keynote speaker, three different roundtable discussions (careers in biomechanics, choosing graduate school, and getting involved in National Biomechanics Day), social activities, a women in science breakfast, and student presentation awards. For more information, see the MSBC website. The organizing committee has decided to host MSBC for the second time in 2019. Details and a final date for the conference will be announced in August or September.

We would like to thank all the attendees and presenters, volunteers, invited speakers, and all of our sponsors: The American Society of Biomechanics, OptiTrack, Bertec, Qualisys, Tekscan, The FedEx Institute of Technology at the University of Memphis, Delsys, The School of Health Studies at the University of Memphis, and Novel.



2018 Human Movement Science and Biomechanics Research Symposium – The University of North Carolina at Chapel Hill

For the past ten years, students, faculty, researchers, and clinicians from regional institutions have attended the symposium to present and discuss current research in an open and friendly environment. In the past, over twenty student and faculty presentations were given each year, with a focus on student presentations. This year, we had 55 student presentations split up into two poster and three podium sessions. Further aims of the symposium are to encourage collaboration between researchers, and to provide vocational information to students. The formal interactions during the presentations and the informal discussions that took place during the luncheon and social are key to fostering continued collaborations.



### 2018 Mid-South Biomechanics Conference

University of Memphis

Memphis, Tennessee February 22 - 23, 2018

2018 Human Movement Science and Biomechanics Research Symposium

### The University of North Carolina

Chapel Hill, North Carolina March 9, 2018

**ASB Newsletter** 

## ASB Regional Conferences, cont.

This symposium was highlighted by a keynote address given by a respected and established researcher in the field of Human Movement Science, Dr. Craig Garrison from Texas Health Sports Medicine. Dr. Garrison is the Director of Research and Professional Development and oversees the residency program at the Texas Health Sports Medicine. Dr. Garrison presented on the rehabilitation process for anterior cruciate ligament injury and surgical reconstruction and factors that affect the long-term outcomes.

The 2018 symposium was a huge success and we look forward to continue to grow and expand in the years moving forward.





## 8<sup>th</sup> Annual Regional Meeting of the Rocky Mountain American Society of Biomechanics

The 8<sup>th</sup> Annual Regional Meeting of the Rocky Mountain American Society of Biomechanics (RMASB) was held at the YMCA of the Rockies in Estes Park, CO on April 13-14, 2018. Over 120 registrants attended the meeting from California, Colorado, Nebraska, Utah, and Wyoming. At the meeting, 20 podium and 56 poster presentations were delivered mostly by undergraduate and graduate students. Dr. Jill McNitt-Gray from University of Southern California delivered the keynote speech and provided an excellent overview of her work in sports biomechanics.

The registration for the meeting was once again free for attendees staying at the YMCA, enabled by the generous support of the sponsors, which included the American Society of Biomechanics, Bertec, Delsys, Motion Labs, Qualisys, Tekscan, Vicon, University of Northern Colorado, and University of Wyoming.





### University of Wyoming

Estes Park, Colorado April 13 - 14, 2017

## ASB Regional Conferences, cont.

Eight students were selected by faculty votes for the best presentation awards:

**Best Doctoral Student Podium Presentation Award** Erik Summerside, University of Colorado Boulder

**Best Doctoral Student Poster Presentation Award** Diba Mani, University of Colorado Boulder

**Best Master's Student Podium Presentation Award** Shalaya Kipp, University of Colorado Boulder

**Best Master's Student Poster Presentation Award (two-way tie)** Ryan Alcantara, University of Colorado Boulder Andrew Monaghan, Colorado State University

**Best Undergraduate Student Podium Presentation Award** Christian Carmack, University of Colorado Boulder

**Best Undergraduate Student Poster Presentation Award (two-way tie)** Michael Samelson, Colorado State University Caleb Ocheltree, Colorado State University

### ASB East Coast Meeting 2018

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The ASB East Coast Regional Meeting held at Penn State Berks in Reading, PA April 20-21, 2018 was well attended with 110 student, faculty, and industry participants. The two-day meeting consisted of three hands-on workshops, six podium sessions, two poster sessions, and a keynote address. The meeting was sponsored by ASB, Bertec, Qualisys, AMTI, Vicon, and Boas. Sponsorship allowed for low registration fees: \$55 for normal registration and only \$12 for student registration. Additionally, several student prizes were awarded, making the conference attractive for both students and faculty alike.

The meeting was a huge success. Participants expressed their appreciation to the organizers for taking the initiative to host a regional meeting and enjoyed the opportunity to present their work and converse with the local biomechanics community. Survey results indicated that participants enjoyed the conference and were extremely likely to attend if subsequent ASB East Coast Regional meetings were held.

### 14<sup>th</sup> Annual Northwest Biomechanics Symposium

The 14th Annual Northwest Biomechanics Symposium (NWBS) was held on May 4-5, 2018 at Western Washington University in Bellingham, WA. It was a successful and well-attended symposium. We had a total of 151 registrants, 131 on-line and 20 on-site registration (35 Faculty, 35 PhD students, 31 Master's students, 27 Undergrad students, 16 students (degree level not specified), 5 guests, and 2 industry). There were 8 people who did not attend but pre-registered online. The institutions represented were: Biola University, Boise State University, California State University-Northridge, Central Washington University, Simon Fraser University, Montana State University, Oregon State University, Oregon



### ASB East Coast Meeting 2018

### Penn State Berks

Reading, Pennsylvania April 20 - 21, 2018

### 14<sup>th</sup> Annual Northwest Biomechanics Symposium

Western Washington University

Bellingham, Washington May 4 - 5, 2018

**ASB Newsletter** 

## ASB Regional Conferences, cont.

State University-Cascades, Seattle Pacific University, Shanghai University of Sport, University of British Columbia, University of Washington, University of Idaho, University of Oregon, VA Puget Sound Health Care System, Washington State University, Western Washington University, and Willamette University.

There were a total of 84 abstracts submitted that were divided into 40 podium and 43 poster presentations and one abstract that was withdrawn by the principal investigator. We distributed awards to the best podium and poster student presenters. Below is a list of the winners:

**Graduate Student Podium Presentation Winner** Evan Day, University of Oregon

Undergraduate Student Podium Presentation Winner Christopher Prasanna, VA Puget Sound

Graduate Student Poster Presentation Winner Alyssa Spomer, University of Washington

Undergraduate Student Poster Presentation Winner Karley Benoff, University of Washington

Dr. Irene Davis, a past-president and fellow of the American Society of Biomechanics, served as the keynote speaker for this year's NWBS. On behalf of the organizing team, we wanted to thank the ASB for the continued support to the Northwest Biomechanics Symposium. We would also like to thank the following industry supporters: Tekscan (Gold), Delsys (Gold), Qualisys (Silver), and MEA Forensic (Awards), and the following Western Washington University units: Kinesiology and Physical Education Program, Department of Health and Human Development, Provost's Office, College of Humanities and Social Sciences, and Graduate School.



## ASB 2017 Grant-in-Aid

**Daniel Feeney:** "Variability in common synaptic input to motor neurons modulates both force steadiness and pegboard time in young and older adults"

We investigated the associations between manual dexterity, force steadiness (coefficient of variation for force), and variability in an estimate of the common synaptic input to motor neurons innervating the wrist extensor muscles during steady contractions performed by young and older adults. The discharge times of motor units (C and D below) were derived from recordings obtained with high-density surface electrodes while participants performed steady isometric contractions at 10% and 20% of maximal voluntary contraction (MVC) force (A and B in the figure below). The steady contractions were performed with a pinch grip and wrist extension, both independently (single action) and concurrently (double action). The variance in common synaptic input to motor neurons was estimated with a state-space model of the latent common input dynamics. There was a statistically significant association between the coefficient of variation for force (solid line in panels E and F) during the steady contractions and the estimated variance in common synaptic input (dashed line in panels E and F) in young ( $R^2 = 0.31$ ) and older ( $R^2 = 0.39$ ) adults, but not between either the mean or the coefficient of variation for interspike interval of single motor units with the coefficient of variation for force. Moreover, the estimated variance in common synaptic input during the double-action task with the wrist extensors at the 20% target was significantly associated with grooved pegboard time ( $R^2$  = (0.47) for older adults, but not young adults. These findings indicate that longer pegboard times of older adults were associated with worse force steadiness and greater fluctuations in the estimated common synaptic input to motor neurons during steady contractions.



University of Colorado, Buffalo

Advisor: Roger Enoka



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### University of Southern California

Advisor: Christopher Powers

## ASB 2017 Grant-in-Aid, cont.

**Kyungmi (Jasmine) Park:** "The Influence of Lower Extremity Kinematics and Patellar Position on Patellar Tendon Stress in Persons with Patellar Tendinopathy"

Patellar tendinopathy is a common condition among athletes who participate in sports that involve repetitive jumping and landing movements. Excessive patellar tendon loading has been considered to be the primary cause of patellar tendinopathy. Causes of increased patellar tendon loading can be characterized as biomechanical (e.g., lower extremity kinematics and kinetics) and/or structural (e.g., patellar position). In terms of biomechanical causes of patellar tendinopathy, previous studies have reported greater knee flexion, knee internal rotation, and hip adduction during landing in this population compared to healthy controls. With respect to the structural causes of patellar tendinopathy, lateral patellar tilt has been reported in persons with patellar tendinopathy suggesting that patellar malalignment may contribute to abnormal stresses in the patellar tendon. In addition, several studies have shown that the vertical position of the patella can influence the transmission of force from the quadriceps muscle to the patellar tendon. Persons with patellar tendinopathy have been reported to have a more vertically positioned patella suggesting that these individuals may experience greater patellar tendon loading per unit of quadriceps force. Although altered lower extremity biomechanics and patellar position may be risk factors for patellar tendinopathy, a comprehensive analysis of these factors in the context of patellar tendon loading has not been performed. Therefore, the overall purpose of my dissertation was to examine the interrelationships among lower extremity biomechanics, patellar position, and patellar tendon principal stress in persons with patellar tendinopathy. Results regarding the influence of biomechanical factors on patellar tendon stress were presented at the 2017 ASB meeting in Boulder, CO, and the results with respect to the influence of the structural factors (patellar position) will be presented at the 2018 ASB meeting at the Mayo Clinic, Rochester, MN. Through the generous support of the American Society of Biomechanics Grant-in-Aid program, I was able to pay for the magnetic resonance (MR) scans for this study.

One female with patellar tendinopathy and 2 pain-free females participated in the preliminary study. Subject-specific finite element (FE) models were created, simulating the maximum knee flexion during the stance phase of running. Lower extremity kinematics and quadriceps force data at the time of peak knee flexion were assigned to the FE model. Variables of interest were peak maximum principal stress in the patellar tendon, knee flexion angle and knee extensor moment, femur and tibia rotations in the frontal and transverse planes, patellar tilt, and patellar height (based on Insall-salvati ratio). Preliminary results indicated that the individual with patellar tendinopathy exhibited greater peak maximum principal stress in the patellar tendon compared to the pain-free control subjects (96.8 MPa vs  $79.0\pm3.0$  MPa). The individual with patellar tendinopathy exhibited greater femur and tibia rotations in the transverse plane (Femur: 3.8° vs -0.7±1.8°; Tibia:  $15^{\circ}$  vs  $5.0\pm2.7^{\circ}$ ; internal rotation+). Based on the preliminary data, transverse plane rotations of the femur and tibia would appear to influence the elevated peak maximum principal stress in the individual with patellar tendinopathy. As such, it is reasonable to hypothesize that lower extremity kinematics will be the best predictors of elevated patellar tendon principal stress. However, additional data will be needed to provide a better understanding of the interrelationship

## ASB 2017 Grant-in-Aid, cont.

among biomechanical factors, structural factors, and elevated patellar tendon stress in persons with patellar tendinopathy.





**Ying Fang:** "How Does Ergometer Setup and Rowing Speed Affect Biomechanics during Rowing on an Adapted Ergometer Designed for People with Spinal Cord Injury"

Funds from ASB's Grant-In-Aid were used to investigate the effect of rowing speed, knee range of motion (ROM), and seat position on lower extremity loading during functional electrical stimulation assisted rowing (FES-rowing) on an adapted ergometer. FES-rowing is used in spinal cord injury (SCI) rehabilitation to improve musculoskeletal and cardiovascular health. A primary goal is to mechanically load the bones in the legs as a means of preventing disuse osteoporosis. In FES-rowing, a normal rowing ergometer is adapted to ensure the safety of SCI users. Specifically, two stoppers are added on the seat rail to limit the seat movement, which prevents knee hyperextension; a seat backrest is added and the user wears a seatbelt with shoulder straps for stabilization; and a knee stabilizer is placed between the legs during rowing to prevent knees from separating apart. Recent data show that SCI rowers generate only 20% of the foot force produced Worcester Polytechnic Institute

**Advisor: Karen Troy** 

## ASB 2017 Grant-in-Aid, cont.

during able-bodied (AB) rowing, which limits the benefit of this exercise in preventing bone loss. We hypothesized that ergometer setup and rowing speed affect force generating at the foot. If an optimized setup exists to passively maximize loading, SCI rowers could benefit from it.

Ten male and ten female subjects with no rowing experience participated in this study (age:  $26.5\pm3.8$ , height:  $1.7\pm0.1$  m, mass:  $70.0\pm14.8$  kg). They rowed at 12 conditions, which included 3 speeds (25, 35, and 40 strokes per minute (SPM)), 3 knee ROM (70°, 90°, and 120°), and 3 seat positions (forward, middle, and rear). An adapted rowing ergometer (a) was used for the rowing test. A ten-camera motion capture system was used to collect kinematics data. A six-axis force sensor was mounted under the right foot stretcher of the ergometer (b). Single-axis load cells were mounted at the stoppers (c) and the handle (d) to measure the hand pulling force and the impact force between the seat and stoppers. The raw kinematics and forces and moments were calculated. Three repeated measures analyses of variance were used to examine the each of the three factors (speed, ROM, position).



There was no sex effect in any variable. Peak foot reaction force reached 0.45 BW, and rowing setup could change loading by 0.23 BW. Rowing at higher speeds generated significantly larger foot force, hand force, and peak extension moments at the hip, knee, and ankle. Rowing with larger knee ROM led to significantly larger foot force, and peak extension moments at the knee and hip. Rowing with

## ASB 2017 Grant-in-Aid, cont.

a forward seat position caused significantly larger foot force, and peak extension moment at ankle and knee. We observed two patterns in the foot force versus time curve among all subjects. One pattern showed continuously large force throughout the first 30% of the cycle (n=7), while another showed a peak at the beginning of the rowing cycle (n=13). Further analyses indicated that the use of hip extensor muscles may contribute to lasting force generation at the foot (pattern 1). In summary, ergometer setup has a large effect on lower extremity loading. However, even with the optimal setting, foot force was 50% less than rowing on non-adapted ergometers. The added seat back and seatbelt constrained trunk extension, which may be the factor that limits foot force production. This knowledge can be transferred to the SCI population to further improve the FES-rowing program. We appreciate the support from the American Society of Biomechanics Grant-In-Aid, which allowed us to purchase the sensors necessary for this study.

**FJ Goodwin:** "Neuromechanical contributions to lower extremity stiffness during running and hopping in healthy runners."

We analyzed the neuromechanical contributions to lower extremity stiffness during running and hopping in 70 healthy young runners. Our data suggests that greater lower extremity stiffness during running (Figure) is associated with greater knee extensor musculotendinous stiffness, lesser hip internal rotation range of motion and greater running velocity. Additionally, we found that self-selected frequencies and higher, that greater lower extremity stiffness during single leg hopping is associated with greater ankle plantarflexor musculotendinous stiffness, greater ankle plantarflexor muscle activation and greater hopping frequency. These data demonstrate that greater musculotendinous stiffness and greater muscle activation are associated with greater lower extremity stiffness during dynamic activities. However, running and single leg hopping demonstrate different movement patterns with running predominantly influenced by knee musculature and single leg hopping predominantly influenced by ankle musculature.





### University of North Carolina

Advisor: Troy Blackburn



### Northwestern University Advisor: Sabrina Lee

## ASB 2017 Grant-in-Aid

Andrew Vigotsky: "In vivo relationship between joint stiffness, joint-based estimates of muscle stiffness, and shear wave velocity"

The muscles and tissues surrounding a joint mediate its biomechanical properties. Joint-level properties are often assessed to make inferences about muscle properties. While practical, this approach provides little information about the individual muscles that cross a joint. Alternatively, shear wave (SW) ultrasound elastography can be used to assess the mechanical properties of individual muscles; however, we do not understand how these SW measures relate to joint or muscle stiffness. Therefore, the purpose of this work was to quantify the relationships between 1) ankle joint stiffness and SW velocity, 2) joint-based estimates of muscle stiffness and SW velocity, and 3) joint-based estimates of muscle stiffness.

To assess these relationships, ten healthy, young adults performed plantar flexion tasks at three different activations (0, 20, and 40% of maximum voluntary contraction) in two different positions (knee flexed, 90°, and extended, 0°). We measured SW velocity in the soleus and medial gastrocnemius and assessed ankle joint stiffness for each activation and position. System identification techniques were used to isolate the stiffness component of the joint's resistance to rotation, and a biomechanical model with experimental inputs was used to estimate muscle stiffness from joint stiffness. A hierarchical linear model was used to quantify withinparticipant relationships. Both soleus ( $R^2 = 0.88$ ) and medial gastrocnemius ( $R^2$ = 0.95) SW velocity increased with ankle joint moment. The two knee positions allowed for independent investigation of the soleus and medial gastrocnemius as evidenced by a) low collinearity (r = -0.33) and b) differences in the momentshear wave slope between positions in the medial gastrocnemius, but not soleus. Soleus and medial gastrocnemius SW velocities had a strong relationship with joint stiffness ( $R^2 = 0.96$ ; RMSE = 14.6 N•m/rad), but not joint-based estimates of muscle stiffness ( $R^2 = 0.10$ ; RMSE = 10538 N/mm). Joint-based estimates of muscle stiffness were not strongly related to ankle joint stiffness ( $R^2 = 0.15$ ; RMSE = 10254 N/mm). The weak relationships observed between joint-based estimates of muscle stiffness and a) SW velocity and b) joint stiffness suggest the need for improved modeling approaches. Our results demonstrate that changes in muscle SW velocity are related to changes in joint stiffness in healthy, young adults, and suggest that SW ultrasound elastography may be useful for assessing the etiology of changes in joint stiffness by providing muscle-level specificity.



Figure Legend: Ankle joint stiffness (color) as a function of soleus (SOL, x-axis) and medial gastrocnemius (MG, y-axis) shear wave velocity.

## Umbrellas are for Tourists William Ledoux

Hello ASB newsletter readers! If you've made it this far, you are either a dedicated newsletter reader, or a fan of my column. I know, it is likely the former. But one thing you may have noticed in this edition is that the content is a little tighter. We still have the same features, but we've tried to focus each con-

tribution. Altogether, the newsletter is about 3/4 the size of last summer's edition (42 vs 56 pages). The summer edition is always longer than the winter due to the inclusion of the 4 Grant-in-Aid summaries from the year before, the reports from the 5 regional meetings, and more recently, the Junior Faculty Research Award. Additionally, we still incorporated the usual content, including the president's article, an update from the student representative, and status reports from the secretary/membership chair and the treasurer. The education committee chair reviewed the winning Grant-in-Aid proposals, and our Fellows, with some help from the presidential line, discussed the status of the ASB's new strategic plan. The award winners were announced by our past-president, and we provide a summary of things to do while in Rochester at the annual meeting. The communications chair reviewed recent changes to our website, and the success that was National Biomechanics Day was summarized. The program chair and the meeting chair highlighted our upcoming meeting, while the diversity chair touched upon some of the ASB's work in that important area. The president elect revisited the strategic plan and we provided a summary of recent ASB FB postings. The newsletter ends with our event's calendar. Altogether, a nice summary/review of many of the ASB's ongoing work and future endeavors. I hope you continue to enjoy the newsletter and find the content useful.

## <u>From the ASB Archives</u>

This issue's Archives contribution is an oral history. After the last ORS meeting in New Orleans, I received an email from my colleague, and former ASB president, Don Anderson. He had had a casual conversation with Rick Sumner, who is the current president of the ORS, about the origins of the ASB logo. This led to an email thread between the three of us and Tom Andriacchi. Rick and Tom were both in Chicago together at Rush University Medical Center in the mid 80's when Tom was serving on the ASB board as Secretary/Treasurer. Both recalled that during that time period Tom had asked Judy, Rick's wife, to design the circle ASB logo that we use today. I spent a little time combing through the conference archives, and the first version of the logo (blue on gray) that I found was on the 1988 proceedings, which were in Chicago at the University of Illinois at Urbana-Champaign. Other versions of the logo are included for your viewing pleasure.











## Events Calendar

Fifteenth International Symposium on the 3-D Analysis of Human Movement July 3-6, 2018 Salford, United Kingdom Abstract deadline: past www.geocities.ws/3d-ahm/

23<sup>nd</sup> European College of Sport Science July 4-7, 2018, Dublin, Ireland Abstract opens: past *ecss-congress.eu/2018/18/index.php* 

2018 World Congress of Biomechanics July 8-12, 2018, Dublin, Ireland Abstract deadline: past wcb2018.com

American Society of Biomechanics 42<sup>nd</sup> Annual Conference August 8-11, 2018 Rochester, Minnesota Abstract deadline: past *asb2018.asbweb.org* 

International Shoulder Group Meeting (technical group of the ISB) August 12-13, 2018 Rochester, Minnesota *isbweb.org/isg* 

20<sup>th</sup> Biennial Meeting of the Canadian Society for Biomechanics August 14-17, 2018 Halifax, Nova Scotia, Canada Abstract deadline: past *csb2018.ca* 

**36<sup>th</sup> International Society of Biomechanics in Sport** September 10-14, 2018 Auckland, New Zealand Abstract deadline: past *isbs.org/isbs-2018* 



Human Factors and Ergonomics Society International Annual Meeting October 1-5, 2018 Philadelphia, Pennsylvania Abstract deadline: past www.hfes.org

National Association for Kinesiology in Higher Education Annual Conference 2019 January 9-12, 2019 Savannah, Georgia Abstract deadline – August 15, 2018 www.nakhe.org/conferences

**Orthopaedic Research Society Annual Meeting 2019** February 2-5, 2019 Austin, Texas Abstract deadline: August 27, 2018 *www.ors.org/2019annualmeeting* 

Gait and Clinical Movement Analysis Society March 26-29, 2019 Frisco, Texas Abstract deadline: tba www.gcmas.org/2019\_annual\_conference\_information

XXVII Congress of the International Society of Biomechanics and American Society of Biomechanics 43rd Annual Conference July 31-August 4, 2019, Calgary, Canada Abstract deadline: January 31, 2019 www.isb2019.com

### NOTE:

For other listings of international conferences, please visit either the ISB's website or Biomch-L.

# AMERICAN SOCIETY OF BIOMECHANICS ANNUAL MEETING ATMAYO CLINC

ROCHESTER, MINNESOTA AUGUST 8–11





asb2018.asbweb.org