

# June 2016



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# List of new members, June 2016

By Ed Chadwick | June 2016

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## 4th Symposium on Motor Control in Biomechanics at ISEK 2016

By Ed Chadwick | June 2016

Prof. Carlo J. De Luca and the [ISB Working Group in Motor Control](#) are pleased to announce that the 4<sup>th</sup> Symposium on Motor Control in Biomechanics will be held in **Chicago** (USA) on **July 5<sup>th</sup>** 2016 on the preconference day of the [XXI Congress of the International Society of Electrophysiology and Kinesiology \(ISEK\)](#).

The event will feature internationally renowned speakers presenting their work at the intersection of Motor Control and Biomechanics. See the event [flyer](#) for details.

**When:** July 5<sup>th</sup> 2016, 1:00 PM – 3:00 PM

**Where:** [XXI ISEK Meeting](#), Chicago, IL (USA)

**Registration and Fee:** Please visit the [ISEK website](#) for registration information (see Workshop 1B).

**Opening:** **Carlo J. De Luca** (Boston University & Delsys Inc., USA)

### Invited Speakers:

- **Joshua C. Kline** (*Delsys Inc., USA*) “*The empirically unsupported practice of estimating common synaptic inputs*”
- **Andrea D’Avella** (*Universita' di Messina and Santa Lucia Foundation, Italy*) “*Muscle synergies: biomechanical epiphenomenon or neural control strategy?*”
- **Paul Hodges** (*University of Queensland, Australia*) “*Probing muscle coordination with electromyography: Lessons from adaptation to pain*”
- **Patrick Crago** (*Case Western Reserve University, USA*) “*Augmenting voluntary reach and grasp in stroke survivors by functional electrical stimulation*”

**Who Should Attend:** Researchers and students with an interest in Biomechanics and Motor Control should attend. Participants will have the opportunity to discover the latest developments in these fields and discuss with experienced investigators.

Check our [website](#) for updates and registration information.

We look forward to seeing you in Chicago!

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We would like to thank the attendees of the 3<sup>rd</sup> Symposium on Motor Control in Biomechanics for another outstanding event.

The Symposium was held on Tuesday May 31<sup>st</sup> 2016 on the pre-conference day of the [Annual Meeting of the American College of Sports Medicine \(ACSM\)](#) in Boston, USA.

The Initiative, organized by prof. Carlo J. De Luca and the [ISB Working Group in Motor Control](#), featured the following internationally distinguished researchers:

- **Irene S. Davis** (Spaulding National Running Center, USA) *“Gait Retraining to Reduce Injury Risk in Runners”*
- **Jim Richards** (University of Central Lancashire, UK) *“Skin, Brain, Muscle, Movement: Can proprioceptive interventions such as taping and bracing change neuromuscular control?”*
- **Joshua Kline** (Delsys, Inc., USA) *“Transposed firing activation of motor units”*
- **Joseph Hamill** (University of Massachusetts Amherst, USA) *“Head and tibial acceleration as a function of stride frequency and visual feedback during running”*
- **Jason DeFreitas** (Oklahoma State University, USA) *“Using dEMG to assess motor unit adaptations with training”*
- **Alessio Puleo** (Politecnico di Torino, Italy) *“Is the notion of central fatigue based on a solid foundation?”*

See the event [flyer](#) for details.

Thank you all for participating and see you at our next event at [ISEK 2016!](#)

Symposium Organizers

Carlo J. De Luca, Boston University & Delsys Inc. (USA)

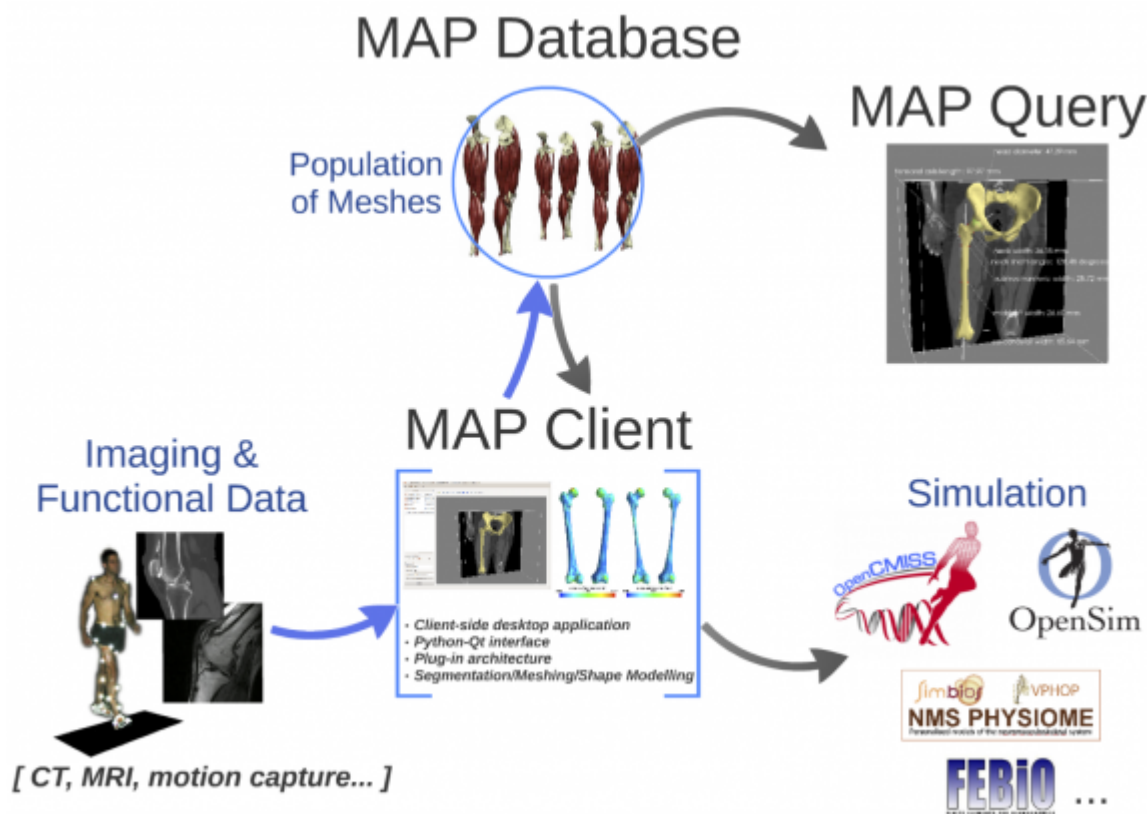
Paola Contessa, Delsys Inc. (USA)

# Introduction to The Musculoskeletal Atlas Project (MAP)

By Ed Chadwick | June 2016

Subject-specific computational models of the musculoskeletal system have tremendous potential for clinical and sporting applications. A common approach to generate musculoskeletal models is to scale a generic model to match subject-specific landmarks, which are typically taken from optical motion capture. However, simple linear scaling does not account for individual variation in bone geometry and inaccurate landmark identification can result in non-physiological segment lengths. Furthermore, joint centres and joint axes in scaled generic models are often not adjusted to match an individual subject. Another approach is to generate subject-specific models from medical imaging data, although this process is time-consuming, costly, and requires a high level of expertise involving specialised software.

Data reduction methods, such as Principal Component Analysis, or PCA, can be used to efficiently characterise the morphological variation of bones across a population, sometimes referred to as a 'shape model'. Shape models have excellent potential to assist in the generation of subject-specific musculoskeletal models. Our research group at the Auckland Bioengineering Institute has developed an open-source software platform, called the Musculoskeletal Atlas Project (MAP), to enable biomechanics researchers to rapidly generate musculoskeletal models using population-based scaling (see the [following webinar](#) on customising OpenSim models). The main advantage of using a shape model to perform geometric scaling is that the resulting musculoskeletal model is constrained by an underlying model of physiological anatomy and the joint centres and axes can easily be re-calculated and embedded into the model. The surface geometry output from the MAP Client can be used with various software platforms for simulation, such as OpenSim, FEBio, OpenCMISS, etc (see Figure).



Overview of the Musculoskeletal Atlas Project. The MAP Client receives input and provides an interface to an underlying database and model repository. Output from the MAP Client includes models compatible with other simulation software.

The MAP platform is based around a workflow manager, called the [MAP Client](#), which is a cross-platform application that can be used to create *workflows* from a collection of workflow *steps*. Each workflow step is simply a plugin, which performs tasks of varying complexity (e.g. segmentation, mesh fitting, registration, PCA-based fitting, etc). The entire code base is written in Python to enable easy sharing. Indeed, the central idea for the MAP Client is to allow users to develop and share their own plugins that can be used in a workflow. The requirements for developing a workflow step have been kept as low as practicable thus allowing plugin creators to concentrate on the practical implementation of the step rather than conforming to the plugin API. Additionally the Plugin Wizard tool greatly simplifies the first stage in creating a workflow step and generates a considerable amount of the skeleton code required. You can learn more about MAP by browsing the documentation at <https://map-client.readthedocs.io/en/latest/> or by downloading the code from GitHub: <https://github.com/MusculoskeletalAtlasProject/mapclient>

Having a plugin based framework makes it possible for groups to share their workflows and workflow steps without requiring a lot of extraneous software. Also having users create and share their plugins increases the flexibility of the MAP Client and distances users from relying on an external team of developers. Imagine an active ISB community of MAP Client users that can share their code, experience, and ideas. Perhaps organized sessions and workshops at the next ISB conference to learn about new methods and share workflows?

Please get in touch to let us know what you think, if you are interested to learn more about the Musculoskeletal Atlas Project, and would like to contribute or get started.

*Thor Besier* ([t.besier@auckland.ac.nz](mailto:t.besier@auckland.ac.nz))

Informatics Officer, ISB

Auckland Bioengineering Institute and Dept of Engineering Science, University of Auckland

## Get in touch to contribute to EDC projects sponsored by ISB

By Ed Chadwick | June 2016

In the last issues of ISB Now we have presented many details of the current projects and the report of advances made in EDC countries working with the ISB. In this issue our main goal is to invite you to contribute to an EDC project. All the EDC projects [listed in the ISB website](#) are eligible for further support. While financial support is most likely linked to the support of companies, there are others kinds of support that all of us can provide.

If want to learn more about how to help, [please contact me](#). We can help you to be in touch with the project coordinator and suggest you possibilities of help. In the end, both sides will be benefited. Sometimes, spending a few hours reviewing a research project for grant application might be not a big deal for a contributor, but it will significantly help the EDC applicant when they are raising funding for research. There are many researchers across the globe that are already contributing to EDC projects, join the team!

This is all for now. We are looking forward to presenting you more information in the next ISB Now.

Felipe Carpes.

# ISB Travel Grant: Study in Cape Town

By Ed Chadwick | June 2016

With support from the International Society of Biomechanics International Travel Grant, I spent 5 months at the Blast Impact and Survivability Research Unit (BISRU) at The University of Cape Town (UCT) in Cape Town, South Africa. This opportunity provided me with both a global research experience and growth on a personal and scientific level.

My research at BISRU was experimentally focused; exactly what I had been hoping for as much of my research had been computationally based. I designed an experiment for the penetration of skin in radial tension by means of knife wound. From this quasi-static experiment, I obtained force-displacement data as well as used digital image correlation to obtain stress maps of the tested sample. Through development of the project hypothesis, design of the experimental set-up and fixtures, collaboration with the Mechanical Workshop to build the fixtures, and execution of the tests, I gained experience in many aspects of the design process. The data obtained and material properties learned from this experiment will be applied to the design of dynamic skin penetration testing and further the understanding of the biomechanics of knife wounds - the leading cause of homicide in many countries.

I am thankful for the support of my supervisors at BISRU, Professor Gerald Nurick and Dr. Reuben Govender as well as all of the help from the graduate students. By attending weekly presentations by the graduate students, I also learned about the other projects that are currently being undertaken in the lab. While there is a range of research happening, survivability remains the underlying goal of BISRU and continues to drive the lab with human protection in mind.

My experiences outside of the laboratory were as equally impactful during my trip. I joined the UCT Gymnastics club and SHAWCO, the Students' Health and Welfare Centres Organisation, where once a week I joined in traveling to disadvantaged communities to tutor middle school students in mathematics. I found the best part of Cape Town to be its diversity. I was able to get to know people from all around the world and with the mountains, ocean, and colorful city, I was always learning and exploring through new adventures outside of the research lab. I believe one of the most important things I learned was how to work with and appreciate the unique abilities and traits of different people. This experience opened the door for global collaboration and I encourage other students to take advantage of any opportunity to perform research abroad.

I would like to thank the International Society of Biomechanics for the opportunities they provide students through programs such as the International Travel Grant. Without it this grant, I would not have had this once-in-a-lifetime opportunity that has further strengthened my passion of biomechanics and helped me become both a better researcher and a better person.

Melissa Boswell, University of Akron.

# Fellows update: Ron Zernicke

By Ed Chadwick | June 2016



Ron Zernicke was one of the inaugural fellows of the ISB. Ron Zernicke is Professor and Dean in the School of Kinesiology, and a Professor in the Departments of Orthopaedic Surgery and Biomedical Engineering at the University of Michigan. He was the founding Director of the University of Michigan Bone & Joint Injury Prevention & Rehabilitation Center.

Ron received his baccalaureate degree from Concordia University Chicago, and his MSc and PhD were from the University of Wisconsin-Madison. He joined UCLA in 1974, and was Professor and Chair of the Department of Kinesiology. At UCLA he received the UCLA Award for Distinguished Teaching. In 1991 he moved to the University of Calgary, where he was the Executive Director of the Alberta Bone and Joint Health Institute, the Wood Professor in Joint Injury Research in the Faculty of Medicine, Professor and Dean of the Faculty of Kinesiology, and Professor in the Schulich School of Engineering. He was awarded the City of Calgary Community Achievement Award (Education), the University of Calgary Award for Outstanding Achievement in Graduate Supervision.

His research focuses on: (1) the adaptation of bone to exercise, disuse, diet, and disease; and (2) joint injury and post-traumatic osteoarthritis. He has received research grants from agencies such as the Arthritis Society of Canada, Alberta Heritage Foundation for Medical Research, Alberta Ingenuity Fund, Adidas AG, Canadian Space Agency, Natural Sciences and Engineering Research Council of Canada, Canada Foundation for Innovation, Alberta Innovation and Science, Canadian Institutes for Health Research, Lew Reed Spinal Cord Injury Foundation, the Fraternal Order of Eagles, National Aeronautics and Space Administration, National Science Foundation, and National Institutes of Health.

Ron's achievements have been recognized in a variety of ways. He was Alumnus of the Year for Concordia University Chicago (1991). He received an honorary Doctor of Science degree from the University of Waterloo (2008). He has been president of the Canadian and American Societies of Biomechanics. He has received research awards from: NASA (Cosmos Achievement Award), Society for Physical Regulation in Biology and Medicine (Yasuda Award for Outstanding Research Paper), American and International Societies of Biomechanics (Delsys Award), Canadian Society for Biomechanics (Career Award), Canadian Orthopaedic Research Society (Founder's Medal for Best Research), and Canadian Institutes for Health Research (Partnership Award). He is an elected fellow of the Canadian Society of Biomechanics, American Society of Biomechanics, American College of Sports Medicine, and National Academy of Kinesiology.

From 1987 to 1999 Ron was a member of the ISB Executive Council, and from 1993-1995 served as the President. He was also a co-organizer of two ISB congresses (Los Angeles 1989, and Calgary 1999).

## Conference navigation tips for students!

By Ed Chadwick | June 2016

Conference season is well underway! For a busy graduate student, attending any form of academic



meeting can be a stressful experience but also a very rewarding one. In this issue of the Student Section, I've tried to compile some hints and tips that I hope you'll find useful.

## 1. Finding the right meeting

There are so many meetings to choose from! I didn't realize this until I started compiling material for the ISB social media channels. As an Australian studying in America, I was well aware of the upcoming [10<sup>th</sup> Australasian Biomechanics Conference](#), and the [40<sup>th</sup> Annual Meeting of the American Society of Biomechanics](#), as well as some other meetings hosted by our ISB Affiliated Societies.

However, I was surprised to find a lot of smaller meetings that were very applicable to my own research. Through talking with my PhD advisor, I learnt of the Biomechanics and Neural Control of Movement ([BANCOM 2016](#)) meeting - a six day-long event to be hosted at a serene lodge on the edge of a beautiful lake in Ohio (USA). If this wasn't enough to lure me, when I read the list of invited speakers, I couldn't have been more excited!

Of course, being a graduate student doesn't come without its time/cost limitations so this will definitely narrow the window of opportunities. That being said, you may find a gem every now and again if you know where to look. Your advisor, and other biomechanics-related mentors could be a good place to start. If they are aware of the nature of your work, they may be able to point you in the right direction. Due to their larger networks, they are often on mailing lists for such events.

You can also connect with us via our social media channels ([Facebook page](#), [Student Members Facebook Group](#), [Twitter feed](#) and [LinkedIn group](#)). I try to keep these updated with meeting information such as dates and locations, abstract deadlines etc. The primary search tool I use for compiling these notifications is the Biomch-L Events and Conferences Forum:

<http://biomch-l.isbweb.org/forums/4-Events-and-Conferences>

## 2. Financing the trip

Beyond the opportunities available to you through your University, there are a range of awards/grants that exist to financially support domestic and international student travel. For example, you are probably aware that the ISB offer [Congress Travel Grants](#) for our biennial meeting (applications will be due in Dec 2016, for ISB2017). We also offer [Technical Group Travel Grants](#), for student members presenting at our Technical Group meetings.

Many of our affiliated societies also offer similar grant opportunities for student members to attend their meetings - examples from 2016 include the [International Society of Biomechanics in Sports](#), the [American Society of Biomechanics](#), the [Canadian Society for Biomechanics](#), the [European Society of Biomechanics](#) and the [German Society for Biomechanics](#).

You may also find instances where your national society offer travel grants to a variety of international meetings. For example, this year the [Australian and New Zealand Society of Biomechanics](#) offered their student members the opportunity to apply for financial support to attend the International Society of Biomechanics in Sports (ISBS), the American Society of Biomechanics (ASB), the European Society of Biomechanics (ESB) or the International Society of Electrophysiology and Kinesiology (ISEK) meetings.

[Delsys](#) and the [AMTI Force and Motion Foundation](#) also offered student travel grants this year. I aim to promote all of the above on our social media channels, but you can also search for available funding by visiting the relevant conference and/or Biomechanics Society websites.

If you have any questions about the ISB Travel Grant Program please feel free to get in touch!

### 3. Presenting your research

#### **Oral Presentations**

For this, I found a fantastic blog on *Scitable* (by Nature Education). I've summarized the main points below but if you have the time, I'd definitely recommend reading the entire post as it includes lots of good tips.

<http://www.nature.com/scitable/topicpage/oral-presentation-structure-13900387>

- *“Written documents are for convincing with detailed evidence; oral presentations, on the other hand, are for convincing with delivery — both verbal and nonverbal.”*
- Be selective with the material you include, allow adequate time for Q&A and try to anticipate questions.
- For your introduction, lead with an attention grabber, a presentation outline and a statement of the principal message.
- Describe only methods you feel will help to convince the audience of your principal message.
- Consider the body of the presentation as a tree-structure (vs. a chain-structure). Select two to five key statements that support your principal message, and two to five sub points that support each key statement.
- Strongest arguments should be placed first and last, with weaker arguments between.
- End with *“a review, a conclusion, and a close”*: review the presentation, conclude with the principal message and other applications of your results. Close by *“indicating elegantly and unambiguously to your audience that these are your last words. Although there are many ways to do so, one that works well is to make the link back to your attention getter: By referring back to your initial question, analogy, picture, etc., you indicate that you have completed the loop”*.

#### **Poster Presentations**

If you are presenting a poster this conference season, the following link will take you to a very useful video. I've outlined the key points below, but it's definitely worth a watch:

<https://www.youtube.com/watch?v=vMSaFUrk-FA>

- *“Don't read your poster! Use your poster as a visual tool.”*
- Prepare a 2-3 minute talk, predict questions like: “what was your research about?” and “what were the main findings?”
- Only highlight the most important information on the poster, and don't be afraid to bring handouts to supplement potential discussion points.
- Creating a small handout summarizing your poster may be useful if your abstract was not included in an abstract book.
- Have contact details ready for follow up discussions, especially relevant if you cannot answer a question on-the-spot (e.g. business cards).
- Be honest if something is outside the scope of your research.
- Always prioritize the viewer over social interaction with friends etc.

## 4. Networking

In the latest instalment of the 'Advice to Students' project, Prof. Brian Davis (a former ISB President), conveniently discusses approaching a 'big name' at a conference. You can view the video [here](#). It's often daunting to do this, especially when there are no mutual contacts to make the initial introduction. However, Prof. Davis was one of the kindest people I had the pleasure of meeting at ISB2015 in Glasgow, and his words left a lasting impression. *'Never be afraid to go up to some big name in the field, introduce yourself, and ask for their opinion on almost anything'*. At first, I was a little sceptical, and doubted that any well-known Professor would take time out of their Conference schedule to speak with me. However, I dived in at the deep end to test this theory and was very pleasantly surprised by the welcoming reception I received. I picked up some good advice and new perspectives on my work, gained a greater understanding of the industry, learned the difference between an American and Canadian accent (thanks Prof. Joe Hamill!), and had a lot of fun along the way. We've all got to start somewhere!

Finally, I'd like to share something I've come to realize over the past few years of graduate school - your peers are the next generation of 'big names'. At large meetings, it is easy to get 'tunnel vision' as you look to establish 'big name' connections. However, try not to lose sight of the amazing resource we have in each other. The students you meet at your next conference may be future collaborators, travel companions for upcoming meetings, peer mentors, a source of information about the industry in different countries, etc. I'm personally looking forward to meeting many of you this time next year in Brisbane!

Before I sign off, I'd just like to say a huge thank you to everyone who took the time to respond to the online survey I posted in April. It was great to get your feedback and I am actively working to transform our resources to better suit your needs. At our upcoming ISB Executive Council meeting (in August), I look forward to representing the Student Membership and tabling ideas for new initiatives to enhance your member experience. It will take a little time to get things 'up and running', but keep an eye out for some exciting updates in the future!

Kind regards,

Kirsty McDonald

[isb.studentrepresentative@gmail.com](mailto:isb.studentrepresentative@gmail.com)

## President's Blog, June 2016

By Ed Chadwick | June 2016

I am sure that many of you who reside in the northern climes are gearing up for midsummer parties and the holiday season, while those of us down-under are facing winter storms and a potential bout of the flu.

Mind you, winter in Brisbane is not that cold, with the average daytime temperature for June and July being 20°C (70°F) with little to no rainfall. This bodes well for next year's ISB Congress, The [XXVI Congress of the International Society of Biomechanics](#), that will be held in Brisbane between the 23<sup>rd</sup> to the 27<sup>th</sup> of July.

Preparations are well underway with the Brisbane meeting being cohosted by three Universities in the Southeast Queensland region: The University of Queensland, Griffith University and Queensland University of Technology. I am sure most of you have been receiving promotional material about the congress but I can now confirm that the Congress Tutorial that ISB sponsors are confirmed and will be

held on the Sunday morning and afternoon of the 23<sup>rd</sup> of July. Our ISB Education Officers, Glen Lichtwark and Taija Finni have recruited a group of exceptional international presenters who I know will provide attendees with state-of-the-art knowledge and future directions in their respective fields. A BIG thanks goes to Prof. Peter Hunter (NZ), A/Prof. Greg Sawicki (USA), Prof. Lynne Bilston (AUS), Prof. François Hug (FRA) and Dr Dominic Farris (AUS) for accepting Glen and Taija's invitation to run the tutorials.

In regard to other ISB activities, the ISB Council will shortly be holding its annual meeting in Raleigh (NC) just prior to the American Society of Biomechanics Meeting. An agenda item will be the ISB budget, which has been a concern over recent years. Our budget is driven primarily through membership fees, sponsorship and a sharing of any conference profits. Currently we are highly dependent upon membership fees and sponsorships, so I would like to encourage all of you to pay your annual membership fees, encourage your colleagues and students to become members of ISB and let myself or any ISB officer know of possible sponsorship opportunities. As you probably know, ISB is a not-for-profit organisation and a significant proportion of our budget goes toward student travel scholarships, student grants and awards, and support to our technical groups, affiliated societies and economically developing countries.

In closing, with the Rio Olympics and Paralympics soon to take place, I would like to highlight a recent article in the Journal of Experimental Biology that may help you appreciate the complexity of running around a curved track.

Paolo Taboga, Rodger Kram, Alena M. Grabowski (2016) [Maximum-speed curve-running biomechanics of sprinters with and without unilateral leg amputations](#). *Journal of Experimental Biology* 219: 851-858; doi: 10.1242/jeb.133488.

Regards,

Andrew