Australian & New Zealand Society of Biomechanics

Newsletter, May 2015

ANZSB Committee

Contents

Note from the Editor.....1
Presidents Report 2
Travel Awards 3
ABC10 5
Upcoming Conferences 4
Meet a Member 6
Membership Update 7

Note from the Editor

Welcome to the second issue of the newsletter for 2015 (and I can't believe that no one pointed out that I left 2014 of the last newsletter). This month's newsletter features information on how we are changing our communication with members, travel award winners, ABC10 and a new feature profiling association members. Be aware that with the international conference season warming up that if you do well you may find yourself tapped on the shoulder to fill out a profile. The is also information on the last page about planned changes to how members can pay their fees.

From the next edition I would love to start a book review section. If anyone is happy to review a book that they either use for teaching or is their go to bible please let me know and I will give you the brief. I also welcome ideas for sections or stories from everyone. Please send them through.

Alasdair Dempsey
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Presidents Report

We are now well into our second quarter for 2015 and the ANZSB executive committee have already had our second meeting for the year. There is a great deal happening within our society and internationally in the biomechanics community in the near future, but I'd like to focus this particular report on some of the initiatives our committee have developed recently – in hopes of streamlining our processes, providing more benefits to current members and attracting new members.

First, you may have noticed that we haven't distributed logins this year for the **members section of our website**. We have decided to remove this area of the website and replace it with a Facebook group – called "**ANZSB Members**" (https://www.facebook.com/goups/ANZSB) The main goal is to foster communication and interaction amongst our members. As an example, the Facebook group has already facilitated a discussion about shared accommodation at the upcoming ISB. The advantages of this group over a members area of the website are that (1) it streamlines the process of granting access to members (approving member requests rather than creating secure logins), (2) it allows members to post notices for other members to comment on and follow (rather than members sending content to the communications officer to upload to our website), and (3) it provides the content in a Facebook newsfeed (rather than having to remember to go and check the website for new content). We realise that this may exclude some of our members who are not on Facebook but we hope that you can see the benefit in this style of interactive communication and we will continue to maintain updates in our newsletters and the public Facebook page (where you don't need to be a member to see posts). If you are an ANZSB member and would like to join this interactive group please contact Alasdair Dempsey with your Facebook name, or request membership within Facebook (but make sure your profile name matches one that we would have on our membership records). We will also post job and PhD opportunities in the group and the public page. If you have a job to advertise please send it through.

Second, we are underway with **transferring our bank accounts** to a different institution. This will open up a wider range of options to our society including online credit card payments for memberships. We hope that this will attract more memberships and make it easier to renew memberships. Rob Herbert will discuss this further in this newsletter.

Third, we have briefly discussed the possibility of starting up a **mentoring system** within our society. We would hope that senior members may be willing to mentor EMCR members, and in turn EMCR members may be willing to mentor junior members and students. The goal would be career-based mentoring, not technical biomechanics based mentoring. This initiative is still in the discussion phase so please contact me if you have any ideas to contribute, or if you think this is a good/bad idea.

Finally, we have introduced a **second category of travel awards** – opening up a second award category to our early and mid career researchers (EMCR), rather than just to students. This provides benefits to a wider range of our members. The first travel award recipients for 2015 are announced in this newsletter.

We hope you will find these initiatives of benefit and if you have other suggestions please don't hesitate to contact me.

Liz Clarke
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Did you know that as of the end of the ISB Congress in Glasgow this year Australian Andrew Creswell will take over as the president of ISB? Andrew was the president of ANZSB from 2009 until 2011. It would be great to see as many ANZSB members at the Presidents Lecture on the Thursday to see Andrew officially handed the gavel of office.

2015 Travel Awards

Congratulations to the following winners of the ANZSB travel awards to help them on their way to the 25th Congress of the International Society of Biomechanics in Glasgow

Student - **Brent Raiteri,** University of Queensland
ECMR - **Bart Bolsterlee**, Neuroscience Research Australia

Brent will be presenting "Feasibility and reliability of three-dimensional ultrasound for measuring human tibialis anterior muscle deformation during isometric contractions" on the Monday.

Bart will be presenting "Accuracy of ultrasound measurements of human medial gastrocnemius muscle architecture" on the Tuesday.

Meet Our Travel Award Winners

Name
Brent J. Raiteri

Current Job
PhD candidate, The University of Queensland, Brisbane, QLD, Australia

Training
Bachelor of Exercise and Sports Sciences (Honours Class 1) at The University of Queensland

What made you want to work in Biomechanics
I enjoyed the Biomechanics and Neuromechanics subjects in my undergraduate course thoroughly, and after undertaking a Summer Project in Biomechanics it increased my interest in the field further

Research area
Muscle mechanics

Favourite paper I have written and why
Raietri, BJ et al (In Press) Ultrasound reveals negligible co-contraction during isometric plantar flexion and dorsiflexion despite the presence of antagonist electromyographic activity. J Apply Physiol. doi: 10.1152/japplphysiol.00825.2014

I have one paper in the Journal of Applied Physiology and it demonstrated that co-contraction during isometric plantar flexion and dorsiflexion was negligible.

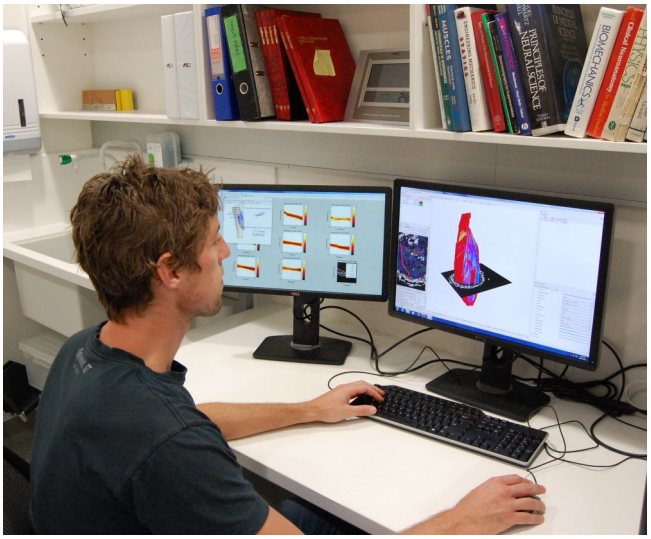
Favourite all time paper and why
Because my PhD is based around it and I refer to it so often I am going to say:
Azizi E & Roberts TJ (2009) Biaxial strain and variable stiffness in apponeuroses. J Physiol 587: 4309-18

Where would we find you when not in the lab
You would find me playing or watching sport.

What food or drink should students bring when asking you a favour
I don't ask my students for bribes… but beer will do.

What is your ideal conference location:
Anywhere on the coast.

Favourite or most hated equation:
This question… I honestly can't think of an answer.



Name
Bart Bolsterlee

Current Job
Research Officer at Neuroscience Research Australia (NeuRA) in Sydney, Australia

Training
Bachelor of Science in Mechanical Engineering at Delft University of Technology, Netherlands

Master of Science in Biomedical Engineering at Delft University of Technology, Netherlands

PhD in Biomedical Engineering at Delft University of Technology, Netherlands

What made you want to work in biomechanics?
That was mainly my personal interest in understanding the complex mechanisms behind performing seemingly simple tasks with our body. I am often impressed by how much we already know about these mechanisms. Yet there is still much more to discover, evidenced by that each study seems to raise more questions than it answers. I am happy that I can contribute to answering some of these questions by applying my engineering knowledge to one of the most amazing products of millions of years of evolution.

What is your research area?
I do research into measuring the three-dimensional architectural properties of muscles with diffusion tensor imaging (an MRI protocol). The ultimate goal is to gain insight into the mechanisms that cause muscle and/or joint contracture, which some patients develop after experiencing a stroke.

Favourite paper you have written and why?
Bolsterlee et al., 2015. Comparison of measurements of medial gastrocnemius architectural parameters from ultrasound and diffusion tensor images. Journal of Biomechanics 48, 1133-1140.

This is my favourite paper because it is (in my opinion) the best validation thus far of ultrasound measurements of muscle architecture. Ultrasound measurements have been used by many researchers to derive mechanical properties of muscles and draw conclusions about muscle function. Errors in the measurements will influence these findings, but not much was known about the magnitude of these errors. Also, we further developed techniques to reconstruct three-dimensional muscle architecture from diffusion tensor imaging, which will have many applications in a field where two-dimensional ultrasound measurements are still the standard.

What is your favourite all time paper and why?
There is not one paper that I consider to be my favourite. For a paper to be good, it is not only important that the research behind it is good, but also that it is easy to read and not unnecessarily complex. I think the following paper is a good example of how a complex topic is well explained:

Erdemir et al., 2007. Model-based estimation of muscle forces exerted during movements. Clin Biomech 22, 131-154.

Where would we find you when not in the lab?
Most likely you'll find me playing beach volleyball on one of Sydney's beautiful beaches.

What food or drink should students bring you when asking a favour?
Black coffee and dark chocolate.

What is your ideal conference location?
A location I have never been before but I would like to go to, for example Patagonia.

Favourite or most hated equation?
Force = mass × acceleration

This simple formula (and all its variants) explains the interaction between movements and forces in an elegant and applicable way.

ABC10 is Coming

ABC10 will be hosted by School of Medicine Dentistry and Health Science at The University of Melbourne in early December 2016 at the Parkville campus just north of the Melbourne CBD. The conference theme is "Mechanobiology across the scales" looking to bring together researchers working from the cellular level to the entire organism. The organising committee is listed below and reflect research backgrounds across the breadth of human biomechanics. More details will follow in the coming months.

Organising Committee

A/Prof Peter Pivonka

Prof Peter Choong,

A/Prof Adam Bryant

Prof John Clement

Prof Peter Lee

Dr David Ackland

THE UNIVERSITY OF MELBOURNE

aimss Australian Institute for Musculoskeletal Science

Upcoming Conferences

Computational and Mathematical Biomedical Engineering, Paris, France, 29 June—1 July. Abstracts Closed

European Society of Biomechanics, Prague, Chech Republics, 5-8 July. Abstracts closed

International Society for Biomechanics, Glasgow UK, 12-16 July 2015. Abstracts closed.

International Research Council on Biomechanics of Injury, Lyon France, 9-11 September 2015, Abstracts closed

American Society of Biomechanics, Columbus, USA, 5-8 August 2015, Abstracts closed

Sport and Exercise Science New Zealand Queenstown, New Zealand, 31 August—2 September, Abstracts close July

Computer Methods in Biomechanics and Biomedical Engineering, Montreal, Canada, 1-5 September 2015 Abstracts closed

Asian-Pacific Conference on Biomechanics, Sapporo Japan, 16-19 September 2015. Abstracts closed.

ANZ Orthopaedic Research Society, Auckland NZ, 2 -4 October 2015. Abstracts due 19 June 2015

Sports Medicine Australia, Sanctuary Cove, Australia, 21-24 October, Abstracts closed

Orthopaedic Research Society, Orlando Florida USA, 5-8 March 2016. Abstracts not yet open.

Exercise and Sports Science Australia, Melbourne Australia, 14-16 April 2016. Abstract not yet open

International Conference of Computational Biomechanics, Paris, France, 17-20 November. Abstracts not yet open

Australasian Biomechanics Conference, Melbourne Australia, date TBC 2016. Abstracts not yet open

Meet a Member

One of the objectives of ANZSB is to facilitate communication between those actively engaged in the scientific study and application of biomechanics. As it is hard to communicate when you don't know who is around the traps we have decided to introduce a "Meet a Member" section to the newsletter. Each newsletter we will profile a couple of members. Hopefully in this newsletter already you will have read the profiles of our two Travel Award winners. We also profile the conference chair for ABC10 A/Prof Peter Pivonka below. Hope you enjoy the profiles and see how diverse our membership is.

Alasdair

Name:
Peter Pivonka

Current Job and Workplace/Place of Study:
Associate Professor of Musculoskeletal Science, School of Medicine, Dentistry and Heath Sciences, The University of Melbourne

Training, Undergraduate, Postgraduate (Where and What):
1996: M.Sc., Institute for Theoretical Mechanics, Vienna University of Technology, Civil Engineering (graduation to Dipl.-Ing.)

2001: Ph.D., Institute for Mechanics of Materials and Structures, Vienna University of Technology, (graduation with distinction to Dr. techn.)

2007: D.Sc., Institute for Mechanics of Materials and Structures, Vienna University of Technology, Habilitation (*Venia Docendi*) for Continuum Mechanics and Biomechanics.

What made you want to work in biomechanics?
My passion for engineering and mathematics lies in how it provides a logical understanding of complex physical and biological processes. I feel that scientific research and education foster one another and feel passionate about passing on my knowledge to the next generation scientists working on the interface of biology and engineering.

What is your research area?
Over the past fifteen years I have worked on a broad range of engineering problems ranging from classical materials engineering applications, such as the formulations of constitutive material models, to the description of reactive transport processes in porous materials, and in the last 10 years on biomedical engineering applications with special emphasis on modeling different aspects of bone and cartilage biology using innovative methodologies. The major focus of my current research is to understand bone tissue regulation in health and disease with emphasis on action of bone remodeling on mechanical properties of bone. Current projects include i) investigation of endocortical bone loss with aging; ii) interpretation of bone formation data using tetracycline labelling; iii) estimation of changes of mechanical properties of bone due to aging and use of different drug treatments; iv) investigation of atypical fractures; v) utilizing high-resolution imaging for assessment of age-related changes in bone.

Research areas:
Computational and experimental assessment of bone and cartilage; mechanobiology; integrating high-resolution imaging with estimation of bone mechanical properties; multiscale modeling; Finite Element analysis; complex systems modeling .

Favourite paper(s) you have written and why?
P. Pivonka, J. Zimak, D.W. Smith, B.S. Gardiner, C.R. Dunstan, N.A. Sims, T.J. Martin, G.R. Mundy. Model Structure and Control of Bone Multicellular Units: A Theoretical Study. *Bone*, **43**(2), 249-263, 2008.

S. Scheiner, **P. Pivonka** and Ch. Hellmich. Coupling systems biology with multiscale mechanics, for computer simulations of bone remodeling, *Computer Methods in Applied Mechanics and Engineering*, **254**, 81-196, 2013.

My major contribution to mathematical modeling in bone biology has been the formulation of a bone cell population model which takes into account biochemical and biomechanical regulatory mechanisms. In particular, major signaling pathways and regulatory factors between bone cells such as the RANK/RANKL/OPG pathway and TGF-β together with the formulation of changes in bone volume over time [J.01]. This approach was further extended to account for biomechanical feedback using a micromechanical approach which allows investigation of the influence of hormonal factors and therapeutic interventions on bone diseases such as osteoporosis in a systematic way [J.02]. It represents a milestone in the development of multiscale models which recognize different aspects of bone biology. It allows coupling of fundamental bone biology research (which is focused on bone cellular aspects such as identification of signaling pathways between bone cells) with biomechanical aspects which focus on the structural estimate of bone failure under mechanical loading.

What is your favorite all time paper and why?
Difficult questions there are quite a few …

Z. Hashin and S. Shtrikman, A variational approach to the theory of the elastic behaviour of multiphase materials, Journal of the Mechanics of Physics and Solids, **11**(2), pp127-140, 1963.

Very elegant paper deriving upper and lower bounds of effective elastic moduli of multiphase materials with arbitrary phase geometry.

Where would we find you when not in the lab?
Probably at home …

What food or drink should students bring you when asking a favor?
This won't work ;-(… much better strategy is to directly ask me ;-).

What is your ideal conference location?
Somewhere with a park nearby to get some fresh air in the breaks.

Favorite or most hated equation and why?
Favorite "Maxwell's equations": one of the most elegant equations which provides the foundation of electrodynamics, optics and electric circuits.

Membership

All memberships of the ANZSB expired at the end of 2014. Only people who have paid their subscription fees this year are current members of the ANZSB. If you are unsure about whether your membership is current email Rob Herbert, Secretary/Treasurer of ANZSB, at austnzbiomech@gmail.com.

Some changes have been made to procedures for joining the ANZSB. Starting in 2015, a term of membership is two years rather than just one. So people who become members in 2015 will receive membership for 2015 and 2016. Join now to get the best value for your membership fees! Membership for two years is AUD $100 for full membership and $50 for student membership.

The ANZSB executive has been exploring mechanisms to simplify payment of membership fees. In the next few months it will become possible to pay membership fees with a secure credit card or PayPal transaction from the ANZSB web site. That should make payment of fees easier, especially for members from outside of Australia. We will let members know when the facility for credit card payment of membership fees becomes available.

Rob Herbert