

WELCOME

The committee welcomes you to Auckland, and the 11th Australasian Biomechanics Conference. After 10 years, this important regional meeting for our field of research is held in Auckland again. It has been an exciting time for us in preparation for this meeting and we look forward to an excellent three days of science and building new collaborations.

Besides the encouraging participation from our Australian colleagues we are pleased to note the significant international presence representing countries such as Japan, Finland, Indonesia, Canada, and USA. We proud to have a total of thirteen invited speakers, and over the next three days, we will have a series of high-quality presentations on Clinical, Sports, Orthopaedics, Computational, Cell and Tissue, and Multiscale Biomechanics. We also have a special session by the Clinical Gait and Motion Analysis Group, and on the last day, we have the combined meeting day with the Matrix Biology Society who begin their three-day meeting. This combined day also commemorates the University of Auckland's 10th annual Mechanobiology Symposium. A carefully 'curated' program has been developed for that day and we hope you will enjoy the strongly interdisciplinary science that will feature then.

There are also two prominent Award sessions, one for the 'New Investigator award' and the other for the 'Young Investigator award'. Another two awards, one for the best Oral presenter and the best Poster will also be awarded. The results for this competition will be announced at the Conference Dinner that will close our meeting on Day Three.

We extend our thanks to all those who helped in the scientific review of the papers, and we are also indeed grateful to our sponsors and supporters: the Faculty of Engineering University of Auckland, Australia New Zealand Society of Biomechanics, the Auckland Bioengineering Institute, the Royal Society New Zealand, the MedTech CoRE, IMeasureU, LOGEMAS, and INSTRON. Funding is always important for such meetings, as we hope to create an environment that is conducive for networking, meeting old friends and making new ones.

We wish all participants a fruitful and enjoyable three days of great biomechanics!

Conference Chair – A/Prof Ashvin Thambyah

And on behalf of

Co-chairs: A/Prof Thor Besier, A/Prof Justin Fernandez

Honorary Secretaries: Dr Julie Choisne (also ANZSB Liaison), Dr Geoffrey Handsfield (Publicity)

ABC 11 - Program – DAY 1

Lecture theatre 505-011, Grafton Campus

3rd Dec 2018	
8.00am	Registration open
8.30am to 9.00am	Opening Ceremony
9.00 am to 10.30 am Session Chairs: A/Prof Sam Veres and Dr Geoff Hansfield	<p>CLINICAL BIOMECHANICS I</p> <p>Invited Speaker – Prof Peter Hunter University of Auckland - ABI</p> <p>On: MAPPING THE AUTONOMIC NERVOUS SYSTEM</p> <p>Scientific Presentations</p> <ul style="list-style-type: none"> • Hip muscle activation in femoroacetabular impingement syndrome – Laura Diamond (Griffith University) • Validation of automated clinical gait assessment using a smart knee brace – Andrew McDaid (University of Auckland) • How pelvic tilt influences modes of spinal motion segment failure under direct compression - Nurul Haiza (Zaza) Sapiee (University of Auckland) • The effects of heel lifts on lower limb biomechanics – Chantel Rabusin (La Trobe University) • Combined EMG-informed neuromusculoskeletal and surrogates of finite element models estimate localised Achilles tendon strain in real-time – Claudio Pizzolato (Griffith University)
10.30 am – 11.00 am	MORNING TEA
11.00 am to 12.30 pm Session Chairs: Dr Elizabeth Clarke and A/Prof Niels Hammer	<p>CLINICAL BIOMECHANICS II</p> <p>Invited Speaker - A/Prof Sam Veres Saint Mary's University</p> <p>On: MEETING THE IN VIVO LOADING REQUIRMENTS OF COLLAGENOUS TISSUES THROUGH STRUCTURAL SPECIALIZATION OVER MULTIPLE LENGTH SCALES: INSIGHTS FROM THE STUDY OF FUNCTIONALLY DISTINCT TENDONS</p> <p>Scientific Presentations</p> <ul style="list-style-type: none"> • Can 3-dimensional motion analysis and fuzzy entropy detect movement differences in general movement assessment categories in the normative infant population? – Michelle McGrath (Queensland Health) • Effect of ankle push-off haptic biofeedback on lower-limb kinetics and gait symmetry – Duncan Bakke (University of Auckland) • Why are certain discs vulnerable to herniation? – Kelly Wade (Ulm University) • The influence of feedback and engagement on pedaling performance in stroke patients – Mukesh Soni (University of Melbourne)

	<ul style="list-style-type: none"> The use of feedback and video engagement on exercise performance during pedaling - Mukesh Soni (University of Melbourne)
12.30 pm to 1.30 pm	<p>LUNCH <i>With:</i></p> <ul style="list-style-type: none"> Poster Viewing Student Round Table
1.30 pm to 3.00 pm Session Chairs: A/Prof Thor Besier and Dr Geoff Handsfield	<p>SPORTS BIOMECHANICS Invited Speaker - Professor Patria Hume Auckland University of Technology On: HOW SPORTS BIOMECHANICS HELPS IMPROVE PERFORMANCE AND REDUCE RISK</p> <p>Scientific Presentations</p> <ul style="list-style-type: none"> Characterizing stress patterns in the brains after traumatic brain injury– Vickie Shim (University of Auckland) Inter- and intra-day reliability of common injury screening measures in rugby league is variable – Tim Doyle (Macquarie University) Foot pronation is associated with increased knee joint loading rate and adduction after long distance running – Justin Fernandez (University of Auckland) Lower limb impact accelerations vary with sensor placement – Daniel Glassbrook (Macquarie University) Stride length, thorax and pelvic positioning during lawn bowls deliveries – Jodie McClland (La Trobe University)
3.00 pm to 3.30 pm	AFTERNOON TEA
3.30 pm to 5.00 pm Session Chairs: Dr Hossein Mokhtarzadeh and Dr Eng Kuan Moo	<p>ORTHOPAEDIC BIOMECHANICS Invited Speaker - Dr Marcos Domingos University of Manchester On: 3D BIOPRINTING: CURRENT AND FUTURE TRENDS IN SKELETAL TISSUE REGENERATION</p> <p>Scientific Presentations</p> <ul style="list-style-type: none"> Understanding the scaphoid kinematics after sectioning of scapholunate ligament - Ita Suzana Mat Jais (Singapore General Hospital) Exploring lesser known mechanisms of structural failure in mechanically-induced disc herniations - Vonne van Heeswijk (University of Auckland) Effects of lower limb anthropometry on gait stability - Sandro Mhradi (Institut Teknologi Bandung) Bone microarchitecture damage due to press-fit femoral knee implantation quantified using HR-pQCT and digital volume correlation- Egon Perilli (Flinders University)

	<ul style="list-style-type: none"> Comparing Cartilage thickness and subchondral bone microarchitecture in varus- and valgus-aligned osteoarthritic tibiae with controls – Sophie Rapagna (Flinders University)
<p>5.00 pm to 6.30 pm Session Chair: Dr Anna Murphy and Dr Chris Carty</p>	<p>Special Session of the CLINICAL MOTION ANALYSIS GROUP (CMAG): TRANSLATING TECHNOLOGY INTO THE CLINICAL GAIT LABORATORY</p> <ul style="list-style-type: none"> Invited Speaker: The use of patient specific neuromusculoskeletal modelling in clinical motion analysis - Dr Chris Carty Gait model results are sensitive to impaired muscle size profiles in cerebral palsy – Geoffrey Hansfield (University of Auckland) Invited Speaker: Assumptions in foot modelling: what are we ignoring - Dr Luke Kelly Personalised 3d printing ankle-foot orthoses for children with charcot-marie-tooth disease – Elizabeth Wojciechowski (University of Sydney) PANEL DISCUSSION on: “How well are we translating technology into the clinical gait laboratory?”
<p>6.30 pm till late</p>	<p>OFFICIAL WELCOME EVENT Student group Event – Details TBA ECR group Event – Details TBA</p>

END DAY 1 of 3

Sponsors

ABC11 is proudly sponsored by:



ABC 11 - Program – DAY 2
Lecture theatre 505-011, Grafton Campus

4 th Dec 2018	
8.00 am to 9.00 am	<p>WOMEN'S BREAKFAST All registered women are invited!</p>
9.00 am to 10.30 am Session Chairs: Prof Simo Saaraakala and A/Prof Egon Perilli	<p>Invited Speaker - Dr Elizabeth Clarke University of Sydney/ Kolling Institute On: IN VIVO AND IN VITRO EXPERIMENTAL MODELS OF INJURY</p> <p>AWARDS SESSION I Scientific Presentations</p> <ul style="list-style-type: none"> • Wearable Sensors: Towards Evaluating Knee Joint Replacement Recovery – Shasha Yeung (University of Auckland) • Effect of neuromuscular exercise on joint contact forces in people following partial meniscectomy: secondary analysis of a randomised controlled trial – Scott Starkey (University of Melbourne) • Development of a virtual reality acetabulum reaming simulator and the need for biomechanical data - Mario Lorenz (Chemnitz University Of Technology) • The mechanical significance of the articular cartilage surface layer on tissue swelling. – Emma Brown (University of Auckland) • Imaging of structural and molecular transport compartmentalisation in an in vivo osteoarthritis model – Lucy Ngo (University of New South Wales)
10.30 am to 11.00 am	MORNING TEA

<p>11.00 am to 12.45 pm Session Chairs: A/Prof Justin Fernandez and Prof Rami Korhonen</p>	<p>Invited Speaker - Professor Neil Broom University of Auckland On: EXPLORING SOFT-HARD JUNCTIONS IN THE MUSCULOSKELETAL SYSTEM: AN EXPERIMENTAL APPROACH</p> <p>AWARDS SESSION II Scientific Presentations</p> <ul style="list-style-type: none"> • Structural Integration Across the Endplate Cement Line - Nurul Haiza (Zaza) Sapiee (University of Auckland) • Muscle architecture in the medial gastrocnemius of stroke patients: a diffusion tensor imaging investigation – Arkiev D'Souza (Neuroscience Research Australia) • Sub-critical knee injury: a risk factor for critical injury and osteoarthritis in mice - Carina Blaker (University of Sydney) • Speed-adaptive myoelectric ankle exoskeleton to improve post-stroke walking performance – Taylor Dick (University of Queensland) • Assessment of thorax and rib cage joint rigidity on spinal loading - Hossein Mokhtarzadeh (Harvard Medical School) • Pericellular matrix thickness distribution around chondrocytes is orientation-dependent - Eng Kuan Moo (University of Calgary)
<p>12.45 pm to 1.30 pm</p>	<p>LUNCH and POSTER VIEWING</p>
<p>1.30 pm to 3.00 pm Session Chairs: Dr Vickie Shim and Dr Marcos Domingos</p>	<p>COMPUTATIONAL MODELING I Invited Speaker – Professor Tim David University of Canterbury On: PARALLEL INTEGRATED MODELS OF NEUROVASCULAR COUPLING AND BOLD SIGNALS</p> <p>Replaced by A/Prof Thor Besier</p> <p>Scientific Presentations</p> <ul style="list-style-type: none"> • Effects of pth treatment in osteoporosis – insights from a mechanistic pk-pd model - Maxence Lavail (Queensland University of Technology) • Can humeral fractures occur spontaneously in infant while rolling? A finite element study - Zainab Altai (University of Sheffield) • Time-course changes of lower limb kinematics during military load-carriage - Jodie Wills (Macquarie University) • Development of a deep neural network for automated electromyographic pattern classification – Riad Akhundov (Griffith University and University of Newcastle) • Hip arthokinematics determined using subject-specific mri and mesh contact theory – David Saxby (Griffith University)
<p>3.00 pm to 3.30 pm</p>	<p>AFTERNOON TEA</p>

<p>3.30 pm to 5.15 pm Session Chairs: Dr Fatemeh Malekipour and Dr Julie Choisne</p>	<p>COMPUTATIONAL MODELING II Invited Speaker - Dr Alys Clarke University of Auckland/ Auckland Bioengineering Institute On: BIOMECHANICS OF PREGNANCY: FROM CONCEPTION TO DELIVERY</p> <p>Scientific Presentations</p> <ul style="list-style-type: none"> • Biomechanical role of anterolateral ligament in ACL-deficient knee: a 3D finite element study - Duraisamy Shriram (Singapore University of Technology and Design) • Image-driven Modelling and Simulation of Micro-scale Articular Cartilage Mechanics - Scott Sibole (University of Calgary) • Identifying the unloaded shape and stiffness of the breast - Thiranjha Prasad Babarenda Gamage (University of Auckland) • How to estimate the friction coefficient of articular cartilages using in-vivo imaging of the joints? - Saeed Miramini (University of Melbourne) • Rapid prediction of personalized achilles tendon tissue strains with a machine learning technique – Vickie Shim (University of Auckland) • Influence of the reference state on estimators of cardiac contractility – Mario Habenbacher (Graz University of Technology)
<p>5.15 pm to 6.00 pm</p>	<p>Poster Viewing with Reception</p>
<p>6.00 pm onwards</p>	<p>Join Larry Sherman in his TEDx-style talk: From Music to the Matrix: How Music Influences the Developing and Aging Brain <i>(This is a Matrix Biology Society of Australia and New Zealand event and is open to all ABC11 registrants.)</i></p>

END DAY 2 of 3

ABC 11 - Program – DAY 3
Lecture theatre 505-011, Grafton Campus

5th Dec 2018 MBSANZ18 & ABC11 Shared Day on Mechanobiology AA	
8.00am	Registration opens – Atrium of Building 505
8.30am to 9.00am	Mihi - a traditional Maori welcome MBSANZ18 and 10th Annual Mechanobiology Symposium Opening
9.00am to 11.05am Session Chairs: Dr Sue McGlashan and A/Prof Ashvin Thambyah	<p>MECHANOBIOLOGY AND THE MATRIX</p> <p>Invited Speakers:</p> <p>Professor Toshiro Ohashi – Hokkaido University, Hokkaido, Japan INVESTIGATION OF ENDOTHELIAL MECHANOTRANSDUCTION MECHANISM: MECHANICAL PROPERTIES OF PRIMARY CILIA</p> <p>Professor Peter Torzilli – Cornell University & Hospital for Special Surgery, NY, USA SOFT TISSUE BIOMECHANICS AND MECHANOBIOLOGY OF ARTICULAR CARTILAGE</p> <p>Scientific presentations</p> <ul style="list-style-type: none"> • A model of bone mechanostat directed by osteocytes mechanosensation – Madge Martin (Queensland University of Technology) • Ultrastructural characterisation of the osteocyte lacunar-canalicular network during aging – mechanobiological implications – Peter Pivonka (Queensland University of Technology) • Towards cellular epidemiology of degenerative diseases using geographic information systems, multisem and machine learning approaches – Anton Nathanson (University of New South Wales) • The impact of joint injury on the development of meniscal pathology and its association with OA in ACL deficient knees – Carina Blaker (University of Sydney) • The extracellular matrix facilitates mechanical activation of epithelial Na⁺ channel in response to shear force to regulate blood pressure – Martin Fronius (University of Otago) • Tenocyte shape, and the expression of cytoskeleton and matrix remodelling genes, are altered when cells are cultured on degenerated ECM – David Musson (University of Auckland)
11.05am to 11.35am	<p>MORNING TEA</p> <p>10th University of Auckland Mechanobiology Symposium Celebration</p>

<p>11.35am to 1.15pm Session Chairs: Dr Kathryn Stok and Dr Sophia Leung</p>	<p>MECHANOBIOLOGY TOOLBOX Invited Speakers Associate Professor Tim Woodfield – University of Otago, Christchurch, New Zealand 3D BIOPRINTING AND BIOASSEMBLY FOR REGENERATIVE MEDICINE OF MUSCULOSKELETAL TISSUES</p> <p>Associate Professor Kris Kilian – University of New South Wales, Sydney, Australia HYDROGEL MICROENGINEERING TO DECIPHER ‘MATRIX STRUCTURE-CELL FUNCTION’ RELATIONSHIPS</p> <p>Scientific presentations</p> <ul style="list-style-type: none"> • Quantifying birefringence in the bovine model of early osteoarthritis using polarisation-sensitive optical coherence tomography and mechanical indentation – Matthew Goodwin (University of Auckland) • Stiffness gradient GelMa hydrogel for 2D and 3D stem cell mechanobiology – Yu Suk Choi (University of Western Australia) • Improving chondrogenesis of equine umbilical cord blood-mesenchymal stem cell in three-dimensional hydrogel by synergistic control of chemical and mechanical cues – Xiaolin (Stephen) Cui (University of Otago) • Renal fibrosis in human kidney organoids – Veronika Sander (University of Auckland)
<p>1.15pm to 2.15pm</p>	<p>LUNCH ANZSB General Assembly</p>
<p>2.15pm to 3.55pm Session Chairs: Dr Khoon Lim and Dr Carina Blaker</p>	<p>CELL AND TISSUE MECHANICS Invited Speaker Professor Rami Korhonen – University of Eastern Finland, Finland BIOMECHANICAL RESPONSES OF CHONDROCYTES IN HEALTHY AND MENISCECTOMIZED RABBIT KNEE JOINTS</p> <p>Scientific Presentations</p> <ul style="list-style-type: none"> • A XRD study of biomimetically recalcified bovine bone tissue – Lei Zhao (Hokkaido University) • How much force is required to perforate a colon during colonoscopy? – Niels Hammer (University of Otago) • Mildly degenerative structural changes in the fibrillar matrix of cartilage influences the extent of chondrocyte death following impact loading – Joshua Workman (University of Auckland) • Application of 3D printing technology to facilitate and standardize the testing soft tissues – Niels Hammer (University of Otago) • Shock-absorbing ability of damaged vs undamaged equine cartilage-bone – Fatemeh Malekipour (University of Melbourne)

	<ul style="list-style-type: none"> • Three-dimensional bulging of the human medial gastrocnemius muscle during isometric contractions in vivo – Robert Herbert (Neuroscience Research Australia)
3.55pm to 4.20pm	AFTERNOON TEA
4.20pm to 6.15pm Session Chairs: Dr Lei Zhao and Dr Kelly Burrowes	<p>IMAGING AND MECHANOBIOLOGY</p> <p>Invited Speakers</p> <p>Professor Simo Saaraakala - Oulu University, Oulu, Finland IMAGING OF JOINT TISSUES: IMPLICATION FOR BETTER UNDERSTANDING, DIAGNOSTICS AND PREDICTION OF OSTEOARTHRITIS</p> <p>Professor Martyn Nash – University of Auckland, Auckland, New Zealand REMODELLING OF HEART MUSCLE STRUCTURE AND FUNCTION DUE TO HYPERTENSION</p> <p>Scientific presentations</p> <ul style="list-style-type: none"> • Geometric shape fitting of the tibia and femur in the development of a coordinate system for the knee – Stuart Millar (University of South Australia) • Raman imaging of calcified cartilage and subchondral bone for osteoarthritis research – Shuvashis Das Gupta (University of Oulu) • Parameterisation of diffusion weighted magnetic resonance images of the heart to extract fibre and sheet orientations – Bianca Freytag (University of Auckland) • Investigation of spectral CT for use in bone mineral density assessment and association with histopathological grade – Kenzie Baer (Christchurch Regenerative Medicine and Tissue Engineering Group) • An <i>in-silico</i> model of the extracellular matrix of the lung – Kelly Burrowes (University of Auckland)
6.15pm to 6.30pm	ABC11 event: Announcement of ABC12 – 2020 – Prof Rob Herbert and Dr Egon Perilli
7.00pm till late	ABC 11 Conference Dinner and Awards Presentation followed by Closing Ceremony

END DAY 3 of 3

POSTERS

1. Fascia stress patterns are highly dependent on tissue structure. - Vickie Shim (University of Auckland)
2. Design and manufacturing of a low-cost robotic ankle for Indonesian trans-tibial amputees. – Ferryanto Ferryanto (Institut Teknologi Bandung)
3. Reliability and sensitivity of radiographic outcome measures for hip dysplasia in paediatric Charcot-Marie-Tooth disease. – Leanne Purcell (Sydney Musculoskeletal, Bone & Joint Health Alliance)
4. Right-to-left shape differences in the ulna – Desney Greybe (University of Auckland)
5. Clustering healthy runner based on 3-d kinematics patterns of pelvic during running using hierarchical method – Davood Khezri (University Of Mazandaran)
6. Kinematic study of clean and jerk lift in the 69-kg category weightlifting – Ferryanto Ferryanto (Institut Teknologi Bandung)
7. The effect of strengthening the muscles of the foot on common ligament injury mechanism in females participating in court sports. – Carla Van Der Merwe (Massey University)
8. Rapid quadrupedal locomotion – Hasti Hayati (University Of Technology Sydney)
9. Non-invasive estimate of left ventricular pressure using ultrasound – Amila Perera (University of Auckland)
10. Safe Lifting Ergonomics Program for Truck-Loaders: A Multi-site Case Study with Qualitative and Econometric Analyses - Hezekiah Oluwole Adeyemi (Olabisi Onanbanjo University)
11. Sensor validation of a smart knee brace – Andrew McDaid (University of Auckland)
12. Impact of walking speed on joint angular velocity Benjamin Mentiplay (La Trobe University)
13. A network model for lung parenchyma for describing the interplay between the crucial components of the extracellular matrix – Amin Iravani (University of Auckland)
14. Multivariate splines to estimate muscle-tendon length and moment arms in the upper limb - Thorben Pauli (University of Auckland)
15. Probing the Mechanisms of Muscle Degeneration in Cerebral Palsy using Agent-Based Modelling - Stephanie Khoo (University of Auckland)
16. Validation of three workflows to obtain bone and cartilage meshes for computational human knee modelling – Nynke Rooks (University of Auckland)
17. The effect of splint type on the stress distribution of bruxism patient's teeth – Satrio Wicaksono (Institut Teknologi Bandung)
18. MAP-OpenSim model hip muscles' pathways determined using optimized wrapping surfaces – Simao Brito Da Luz (Griffith University)
19. Opensim-compatible library for kinematic reconstruction using inertial measurement units – Ted Yeung (University of Auckland)
20. A comparison of four factorization methods for muscle synergy extraction – Mohammad Rabbi (Griffith University)
21. Magnetic resonance imaging and freehand 3d ultrasound methods provide similar estimates of free achilles tendon geometry - Daniel Devaprakash (Griffith University)