The Brunel University’s Centre for Sports Medicine and Human Performance (CSMHP) is proud to invite you to the research seminar series ‘Frontiers in Sport and Exercise Science and Medicine.’ The series consists of 4 themed seminars highlighting some of the fundamental questions that need to be answered to advance our current understanding of the functioning of the human body during exercise. The seminars will be held at the Heinz Wolff Building, Uxbridge Campus, and will take place from January to June 2013. The programme for the 2nd seminar on 13th March 2013 is included below. Everyone is welcome.

Seminar 1. Mechanisms of cardiovascular control in the resting and exercising human

Seminar 2. Musculoskeletal system function across the lifespan

Seminar 3. Mechanisms underlying improvements in exercise tolerance following inspiratory muscle training

Seminar 4. Mechanisms and processes underlying sport expertise

CSMHP focuses on integrative aspects of human physiology, biomechanics and psychology of sport and exercise. Our aim is to further the understanding of the regulation and adaptation of the cardiovascular, respiratory and neuromuscular systems to exercise and training, as well as the physiological, biomechanical and psychological limitations to human sport performance and exercise tolerance.
Seminar 2: Musculoskeletal system function across the lifespan
Wednesday 13 March, Heinz Wolff Building Rm 223

This seminar will focus on the biomechanics of the musculoskeletal system and more specifically on some key biomechanical and physiological mechanisms of muscle-tendon and joint function that affect performance, control and coordination of movement as well as loading and the associated injuries. The seminar will have a particular focus on in vivo muscle-tendon biomechanics during growth in children to understand the effects of changing body dimensions on human movement efficiency and performance and the modelling of in vivo muscle-tendon and joint function to understand loading in the musculoskeletal system and prevent injuries. The seminar will be of interest to academics in muscle physiology and biomechanics, motor control and coordination, pediatric exercise science, sports medicine and rehabilitation, as well as sport and exercise scientists and coaches with multidisciplinary interests working with young athletes.

Programme

09:30  Dr Thomas Korff and Dr Charlie Waugh, CSMHP, Brunel University
      ‘Muscle-Tendon mechanics and neuromotor control during childhood’

10:00 Prof. Dieter Rosenbaum, Institute for Musculoskeletal Medicine, University of Münster
      ‘The development of the child’s foot: Longitudinal evaluation of foot loading patterns between one and ten years of age’

10:30 Dr Tom O’Brien, Bangor University
      ‘Musculoskeletal System Scaling: Is a child a scaled-down version of an adult?’

11:00 Prof. Costis Maganaris, RISES, Liverpool John Moores University
      ‘Adaptations of human tendon to disuse’

11:30 Coffee Break

11:50 Prof. Markus Heller, University of Southampton
      ‘Towards an understanding of musculoskeletal load-function relationships in injury and degenerative disease’

12:20 Dr Andrew Spence, Structure & Motion Laboratory, Royal Veterinary College
      ‘Neuromechanics and optogenetics: Dissecting the neural and musculoskeletal contributions to locomotor control’

12:50 Prof. Bill Baltzopoulos, CSMHP, Brunel University
      ‘In-vivo biomechanics of the musculoskeletal system: The need for individualised approaches and Closing Remarks’
Speakers’ Short Biographies

**Thomas Korff** is a Senior Lecturer in Biomechanics in the Centre for Sports Medicine and Human Performance at Brunel University and since 2012, an Associate Editor for the Journal of Applied Biomechanics.

Thomas is an expert in developmental biomechanics with a strong interest on using biomechanical techniques to answer questions related to motor skill acquisition during childhood. He received the equivalent of a Master of Science in Mathematics and Physical Education from the University of Münster, Germany in 2000. In 2005 he received his PhD in paediatric biomechanics from the University of Texas at Austin where he developed a biomechanical model for differentiating between the effects of segmental growth and maturation of the neuro-motor system on muscular force production during cycling. His main research interests are the biomechanics of child development and the biomechanics of cycling. He has been investigating the mechanical determinants of movement in children and, more specifically, the effect of developmental changes in segmental growth as well as the mechanical structure of muscles and tendons on muscular force production and movement performance in children. Thomas also co-edited the first book on paediatric biomechanics that specifically focuses on biomechanical aspects of childhood motor development.

**Charlie Waugh** is a post-doctoral Research Fellow in Developmental and Musculoskeletal Biomechanics in the Centre for Sports Medicine and Human Performance at Brunel University.

Dr Charlie Waugh’s research interests broadly include muscle and tendon physiology and mechanics in relation to movement performance. Charlie gained a strong and broad physiological background from studying a BSc in Veterinary Sciences at the Royal Veterinary College, London before completing her PhD in musculoskeletal biomechanics at Brunel University in 2011. Her thesis investigated how age- and training-related changes in Achilles tendon stiffness influence the outcomes of force development, movement performance and muscle-tendon interactions in a paediatric population. She used advanced imaging and in vivo measurement techniques to demonstrate that the maturation of the mechanical properties of the human body play a vital role in explaining improvements in motor skill performance during childhood and provides an alternative to the view that motor skill acquisition can be explained by nervous system maturation. She continues to research the developmental and maturational influences of musculoskeletal biomechanics at Brunel University on a part-time basis whilst expanding her research portfolio on tendon physiology at Queen Mary, University of London.
**Dieter Rosenbaum** is a Professor of Experimental Orthopedics and Biomechanics at the *Institute of Experimental Musculoskeletal Medicine* at the University Hospital Münster. He is the director of the *Movement Analysis Lab* which provides clinical service for patients of various clinical departments such as General Orthopedics, Traumatology, Neurology, and Oncology.

Dieter Rosenbaum leads a research team in the area of human movement analysis which carries out basic and applied research projects in clinical biomechanics and human movement analysis with respect to lower extremity investigations. A major research focus has been the investigation of the child’s foot development with a long-term investigation of healthy feet as well as various projects related to foot deformities. Another area of interest is physical activity assessment with body-worn sensors which help to gain deeper insights into the daily-life behavior of different patient groups with limited activity levels or mobility impairments caused by musculoskeletal problems, neurologic or oncologic diseases.

**Thomas O'Brien** has a dual appointment as a Senior Lecturer in Musculoskeletal Biomechanics at Liverpool John Moores University and Bangor University.

Tom obtained his undergraduate degree from Brunel University, before completing his PhD at Manchester Metropolitan University. Tom’s research utilises in vivo assessments of muscle and tendon structure and function in order to explain the performance of whole joints and the body. This work has most commonly been applied to understand the maturation-induced changes in muscle strength and power, and includes the paper on “In vivo measurements of muscle specific tension in adults and children”, which was awarded first place in the 2010 Experimental Physiology early Career author prize. Tom’s current paediatric research continues to strive to understand the normal biological process of maturation and has also taken a clinical direction, which is funded by the Welsh Government NISCHR, to develop evidence-based exercise interventions for children with mobility impairments.

**Costis Maganaris** is a Professor of Musculoskeletal Biomechanics at Liverpool John Moores University where he leads a group of researchers studying the biomechanics of the human musculoskeletal system.

Costis pioneered experimental techniques and protocols based on ultrasound scanning that are currently being used all over the world for the study of the mechanical properties of human muscles and tendons in vivo. His ground-breaking studies on the behaviour of muscles and tendons during “controlled” contractions in the lab, and more importantly, during daily activities, such as walking and stair negotiation, have shown that joint position changes cannot predict muscle length changes, because the in-series tendons have *in vivo* viscoelastic properties, which alter the operating range of the muscles. Equally important has been the finding that the mechanical
properties of human muscles and tendons are adaptable to chronic and acute exercise, but also to disuse and ageing, and that exercise is an effective means for mitigating the negative effects of ageing on the mechanical and functional properties of muscle and tendon. His research is focused on the structure, function and adaptations of the musculoskeletal system, including adaptations to loading with eccentric contractions in old age. He has received several national and international honours and awards and grants for musculoskeletal mechanics research into disuse, ageing and exercise interventions in old age.

Markus Heller is full Professor of Biomechanics at the University of Southampton.

After receiving an MSc degree in aeronautical & astronautical engineering (University of Stuttgart), Markus subsequently obtained a PhD in human biology (University of Ulm) and a lecturer ship in experimental surgery (Charité Berlin, Germany) while focussing his career on understanding the key drivers of the loads acting within the musculoskeletal system. His work aimed at improving the practice and care of joint and trauma surgery is highly cited and has been recognized by numerous prestigious international awards from e.g. the Orthopaedic Research Society (ORS) and the European Society of Biomechanics (ESB). More recently, his work developed new methods to capture skeletal kinematics for unravelling critical load-function relationships and characterizing functional status across disease stages in osteoarthritis and osteoporosis alike.

Andrew Spence is a Lecturer in Biomechanics, leading a research group within the Structure & Motion Laboratory at the Royal Veterinary College, near London.

Andrew's group as a whole is interested in both how and why animals move, with a focus on the neuromechanical basis of legged locomotion: dissecting how the nervous and musculoskeletal systems work together to produce movement. Andrew's group is currently involved in comparative work on the control strategies used by insects, dogs, and humans to handle soft terrain, that is shedding light on why humans adapt to soft surfaces in the way that they do. His group takes an integrative approach to locomotion, and employs legged robots to answer questions that are difficult or impossible in animals. Andrew's group was recently funded to begin using optogenetics in mice to dissect the contributions of the nervous and musculoskeletal systems to locomotion, which represents an exciting frontier. With optogenetics, targeted subsets of neurons can be genetically modified with light responsive ion channels; shining light on these neurons makes them fire, or silences them. Through the integration of these powerful new molecular genetic tools, especially optogenetics, with the latest bioengineering technologies and approaches to mathematical modelling, Andrew's group aims to tease apart the role of nervous feedback from feedforward musculoskeletal action.
Bill Baltzopoulos was appointed to a Chair in Biomechanics at the School of Sport and Education of Brunel University and he is the leader of the biomechanics group in the Centre for Sports Medicine and Human Performance and Research Director in Sport Sciences.

The main research interests of our group are focused on the biomechanics of the musculoskeletal system for both performance and injury prevention purposes. We are interested in the basic mechanisms of muscle-tendon and joint function across the life-span but in particular during growth and development in children and young athletes. His team have unique expertise in using an innovative combination of modern imaging techniques that include X-Ray video, MRI and ultrasound for studying in vivo muscle-tendon and joint function and mechanical parameters such as moment arms. This allows the development of accurate and subject-specific biomechanical models of the musculoskeletal system to study joint and muscle forces and the loading of different tissues during various movements and sports activities. They are the only group in the world that combined isokinetic dynamometry with X-Ray video to examine knee joint and muscle in-vivo function in both static and dynamic conditions. He is the author of several book chapters on general muscle function and assessment of muscle strength, and the author of the Isokinetic Dynamometry section of the British Association of Sport and Exercise Science (BASES) guidelines for biomechanical assessment and the lead author of the recent BASES expert position statement on assessment of muscle strength with Isokinetic Dynamometry.