

# Joint MSk MEC Seminar Series

First Keynote Speaker

**Dr Anne Silverman**

Colorado School of Mines



**Title: Low back biomechanics during activities of daily living in people with a Lower-Limb Amputation**

**Friday 7th December 2018    Talks - RSM 2.28, 15.00 - 17:00**

**Drinks & Networking - RSM 3.03 at 17:00**

**Abstract:** Neuromuscular impairment can result in numerous secondary conditions and mobility deficits. For example, people with a lower-limb amputation are characterised by asymmetry in movement kinematics, a greater metabolic cost of walking, a greater risk of falling, and a higher prevalence of joint disorders compared to people without amputations. Secondary conditions such as joint degeneration and pain that develop over time are likely at least partly due to changes in movement biomechanics after amputation. Specifically, lower-limb amputees have a high prevalence of low back pain relative to the general population, which often develops shortly after amputation and has been suggested to result from altered biomechanics. Using a musculoskeletal modelling and simulation approach, we have quantified low back kinematics and loading during movements that are important for mobility and independence. The results of these analyses suggest potential contributing factors to the degeneration of spinal tissues, which may result in the development of low back pain in this population over time. This approach can be extended to evaluate prosthetic device interventions and inform potential targets for movement retraining and rehabilitation.

**Bio:** Dr Anne Silverman is an Associate Professor in the Department of Mechanical Engineering at the Colorado School of Mines and also currently a Visiting Professor in the Department of Bioengineering at Imperial College London. She earned her B.S.E. from Arizona State University and M.S.E. and Ph.D. from the University of Texas at Austin, all in mechanical engineering. Dr. Silverman's research program in musculoskeletal biomechanics centers on understanding muscle function to develop effective treatment and device interventions. As director of the Functional Biomechanics Laboratory, she uses experimental movement analysis and computational whole-body modelling techniques to identify functional roles of individual muscles in pathological movement. These tools are applied to various motions and populations with the ultimate goal of improving mobility for people with disabilities. Her work has been funded by the U.S. National Institutes of Health and Department of Defense and has been published in the Journal of Biomechanics, Journal of Biomechanical Engineering and Gait & Posture. She is active in the American Society of Biomechanics and currently serves as an Associate Editor for Gait & Posture.

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pm	Seminar Schedule
15:00	<b>First Keynote:</b> “Low back biomechanics during activities of daily living in people with a Lower-Limb Amputation” - <b>Dr Anne Silverman</b>
15:40	Jonathan Jeffers’ Group: “Intervertebral Disc Biomechanics: summary of postdoc work and fellowship plan” - <b>Nic Newell</b>
15:55	Julian Jones’ Group: “Hybrid materials with graded mechanical properties for cartilage replacement” - <b>Gloria Young</b>
16:10	Anthony Bull’s Group: “Orthopaedic research in the low to middle-income settings” - <b>Michael Berthume &amp; Spencer Barnes</b>
16:25	<b>Second Keynote:</b> “Surgeons fuse the subtalar joint rather than replace it. Why?” - <b>Mr Andy Goldberg OBE</b>
17:00	Networking and drinks reception

## Abstracts for Other Short Talks

### Intervertebral Disc Biomechanics: Summary of Postdoc Work and Fellowship Plan - Nic Newell



**Abstract:** Intervertebral discs (IVDs) are pads of fibrocartilage which lie between vertebra in the spine. They allow the vertebral column to bend and twist, and to distribute compressive loading on adjacent vertebral bodies. Motivations to study IVD mechanics include: understanding degenerative changes that increase vulnerability to injury and chronic back pain; developing and testing surgical implants; obtaining accurate material properties for input into finite element models of the spine; and characterising high strain-rate injuries, such as those experienced in vehicle accidents, airplane ejections, or blast-related events. This talk will cover the work undertaken in my postdoc to characterise the material properties of the IVD across strain rates, and the development of finite element models of the IVD. I will also summarise the work I plan to undertake during my fellowship which includes high resolution MRI imaging of IVDs under loading, and the assessment of nucleus replacement technologies.

### Hybrid materials with graded mechanical properties for cartilage replacement - Gloria Young



**Abstract:** Current solutions to the problem of intervertebral disc (IVD) degeneration do not maintain the biomechanics of the spine. To meet this need, a material is required that can mimic the natural structure and properties of the IVD. A novel hybrid system of silica/poly(tetrahydrofuran) (SiO<sub>2</sub>/PTHF) with tuneable mechanical properties is proposed. Increasing the ratio of inorganic to organic component produces a stiffer material. Hybrids with different ratios between organic and inorganic components may be joined during gelation, forming a continuous structure without an interface. Thus, bulk structures with graded mechanical properties can be produced, imitating the structure of the natural IVD.

### Orthopaedic research in the low to middle-income settings - Michael Berthume & Spencer Barnes



**Abstract:** Traumatic injuries in Low and Middle Income Countries (LMICs) predominantly affect the young, resulting in a dramatic loss of productive years. In Sri Lanka, lower limb traumas were previously caused by blast injuries, but are now predominantly due to road traffic accidents. Common injuries include open and closed fractures which require realignment. Unfortunately, the lack of medical expertise and cost of medical devices makes it difficult to receive proper medical care. Professional medical aid can be helpful, but the inherent risk of LMICs becoming dependent on aid can leave these countries worse off. In this project, we aim to design a temporary external bone fixator which can be easily manufactured in LMICs so that when our project is complete, this device can continue to be manufactured and used.

To attend the seminar — **Register for free** on [Eventbrite](#) (MSk MEC Seminar Series)

# Joint MSk MEC Seminar Series

Second Keynote Speaker

**Mr Andy Goldberg OBE**

The Royal National Orthopaedic Hospital



**Title: Surgeons fuse the subtalar joint rather than replace it. Why?**

**Friday 7th December 2018    Talks - RSM 2.28, 15.00 - 17:00**  
**Drinks & Networking - RSM 3.03 at 17:00**

**Abstract:** The subtalar joint is a complex tri-faceted joint essential for gait and function of the foot and ankle, in particular balancing on uneven surfaces. Instability in patients with flat foot, and after ankle sprains is common. Arthritis following trauma or prolonged deformity leads to pain and dysfunction and impacts quality of life as much as end stage heart failure. The mainstay of treatment for disorders of the subtalar joint is arthrodesis or fusion of the joint to remove any motion. In 1970, one hundred patients were treated in France with a conceptual joint replacement with 100% failure rate. Until now, all studies trying to establish the function and biomechanics of this joint have been non weight bearing. In this talk the complexity of the joint, its clinical relevance and reasons for historic failure of joint replacements for this joint will be discussed. New research to study weight bearing motion of the joint using conebeam bipedal weight bearing CT scanning will be presented as well as digital volume correlation techniques used for the first time in human patients, in hope of creating a new era of treatment hope in this challenging clinical area.

**Bio:** Andy Goldberg graduated from St Mary's Hospital Medical School (Imperial College) in 1994 before completing his specialist training in trauma and orthopaedics in London with a specialist fellowship in complex foot and ankle disorders in Oxford, as well as overseas in centres of excellence across the USA and Europe. In 2009 he was appointed as a Consultant Orthopaedic Surgeon in Northampton, and in 2010 he was appointed as an Honorary Consultant at the Royal National Orthopaedic Hospital NHS Trust in Stanmore and a Clinical Senior Lecturer at UCL where he has been involved in more than £10m of research grants into health informatics; first in man studies into stem cell therapies (ASCAT); and NIHR HTA multicentre RCTs comparing ankle replacement against ankle fusion (TARVA); many as chief investigator. In 2011 he was awarded an OBE for services to medicine. He sits on the outcomes committee for BOFAS, the NJR Research & Editorial Subcommittees as well as the Medical Advisory Boards representing BOFAS on the Ankle Replacement Joint Registry. He wrote the best-selling textbook "Surgical Talk" and is series editor for the Clinical Talk series for World Scientific. He is a reviewer for many research bodies and peer reviewed journals, and sits on the AOFAS editorial board for Foot and Ankle Orthopaedics (FAO) as well as AOFAS OFAR Managerial Board.

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