**YPLC South East Regional Heat Abstracts**

**SCMMMS winner**

Camilla Dondi

*Insights into cell-scaffold interactions: combining the strength of multi-modal imaging*

Hydrogel based scaffolds are broadly used for in vitro disease modelling and regenerative medicine. They are preferred platforms for these applications as they can be tailored in their properties, such as material composition or stiffness, and have been shown to be biocompatible. Nonetheless, it remains unclear how scaffolds instruct cell development and fate and how cell behaviour can be controlled through biomaterial design. Obtaining structural, chemical, and functional properties of scaffolds and cells cultured within is crucial in order advance understanding of cell-scaffold interactions. Our proposed solution is the creation of a synthetic material with controllable properties. To investigate physicochemical properties of the systems, we have developed a multimodal imaging pipeline that exploits information accessible via different techniques to create a comprehensive framework of cell-scaffold interactions.

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**LMS winner**

Omar Shafi

*Mechanical Engineering and Materials Science for Obstetrics and Gynaecology*

Progesterone, a steroidal hormone, is proactively used for the management of various illnesses in the field of Obstetrics and Gynaecology. There are currently a variety of different routes to deliver the medication, all containing different dosages and delivery periods. Although each drug delivery method is successful, they all come with different clinical constraints ranging from practical inconveniences to social taboos. In order to address these issues, this lecture examines this section of the specialty and focusses on the fabrication of a discrete, sustainable polymeric transdermal progesterone patches using two engineering techniques including electrospinning and crosslinking. We will explore the uses of polysorbate and its effects on each polymeric patch, using characterizations including SEM, FTIR and Mathematical Modelling.

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**CAMS Winner**

Georgina Burgoyne Morris

*Stimuli-Responsive Polymers as Self-Healing Materials*

The ability to autonomously repair damage can lead to significant improvements in lifetime and recyclability of polymeric materials, reducing both waste and production costs. This may be achieved either extrinsically, through the release of healing agents encapsulated in the polymer matrix, or intrinsically, as a result of dynamic interactions between the polymer chains themselves. The latter systems have the advantage that their healing ability is not reliant upon the presence of a secondary reactive species, giving potential to repair more extensive or repeated damage. This talk will discuss how, through tuning their chemistry, polymers can be made to intrinsically self-heal under ambient conditions, or in response to external stimuli such as heat or light. It will also explore the variety of applications for these materials, from healable protective coatings to recyclable thermoset resins.

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**MinSouth Winner**

Lara Tritton

*Sourcing critical metals Te, Bi and W as by-products from Björkdal Gold Mine,
Sweden*

Te, W and Bi are on many critical metals lists, and my work aims to source these metals as by products from gold mining using environmentally-benign, low-cost Deep Eutectic Solvents (DESs), with Björkdal as a feasibility study.
Gold deposits are often enriched in other rare metals, and Björkdal produces gold concentrates and waste (tailings) variably rich in Te, Bi and W-bearing minerals. Currently, there are few economical options by which to extract these additional metals. Developing a method for their recovery on site would be ideal for meeting demand without opening new mines.
Tracing the flows of Te, Bi and W through the processing plant, and mineralogically characterising feed, tailings and concentrates reveals some promisingly high enrichments. The next steps are to test the feasibility of inserting DES leaching stages and/or altering the processing procedures.

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**OMS Winner**

Emily Milan

*Glass Electrolytes for Lithium-Metal Batteries*

Batteries will be an essential technology in transitioning to a society run by clean energy. To meet these demands, we will need to move away from Li-ion batteries to alternative chemistries such as Li-metal batteries. Batteries with solid-state electrolytes are viewed as a potential method to achieve this, however the polycrystalline nature of most candidate materials is known to have detrimental effects on battery performance. In this talk, I suggest glasses as a potential ‘grain-boundary-free’ solution to this problem and will present some of my initial work on the area.