

MM 29: Invited talk Dunlop

Time: Wednesday 9:30–10:00

Location: TC 006

Invited Talk

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The role of geometric boundaries on shape changes in biology — ●JOHN DUNLOP — Department of Biomaterials, Max Planck Institute of Colloids and Interfaces, Potsdam, Germany

Biological materials, can change shape and volume allowing organisms to form new tissue during growth and morphogenesis, as well as to repair and remodel old tissues. In addition such changes can also lead to useful motion or force generation (actuation) that may even still function in the dead organism, as seen in the example of the pine cone. Both growth and actuation of tissues are mediated by the physical constraints of the surrounding environment and the architecture of the underlying tissue. We explore the role of these geometric

constraints by combining theoretical approaches with physical models made using advanced 3D printing technology, that can be tested either in cell-culture or in mechanical testing. This presentation will give an overview of this approach, highlighted by one example on growth and another on actuation. We will first show that by controlling the shape of pores inside scaffolds for tissue engineering it is possible to control the rate of new tissue formation [1]. Secondly we demonstrate how the pore shape in swellable honeycombs, can control macroscopic actuation behaviour [2]. Finally we hope to give an insight in how physical ideas stemming from such studies can be used to design new materials for medicine and robotics. [1] Bidan, C. M., et al (2013). *Adv Healthcare Mater*, 2, 186*194. [2] Guiducci, L., et al (2014). *J Roy Soc Int* 20140458.