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# Experimental and Modelling Insights into the Mechanics of Random Fibre Networks

Lecture of

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Random network structures on nano- to microscopic length scales represent a basic building principle of both natural and man-made soft matter. The properties of the single members of the network, say fibres or chains, their mutual interactions and the way they are disposed, combined and connected in space establish complex multi-scale behaviour. On a macroscopic level, this can lead to surprising properties of the resulting meta-material, very different from what would be expected of a homogeneous continuum.

In this talk, two examples of networks will be addressed: the collagenous network of soft biological tissues, and polymeric electrospun nano-fibrous membranes, which have increasing use in biomedical engineering. Dedicated experimental analyses and computational models are used in order to analyse the deformation and fracture behaviour of these materials at different length-scales, and to shed light on the peculiar macroscopic kinematics of these materials, including apparent Poisson's ratios from the large positive to the extremely negative range.