

## **Understanding the Auxetic Response in Liquid Crystal Elastomers.**

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Liquid crystal elastomers are famed for their many exciting properties; actuation, shape changing, response to external stimuli and so on. Recently, we discovered an auxetic response in certain liquid crystal elastomers; the Poisson's ratio becomes negative beyond a certain strain threshold. Although such behaviour had been suggested for LCEs for many years, our material was the first to show the property, and we have since discovered several more such systems. There are many things that we know about the deformation of negative Poisson ratio liquid crystal elastomers: that they deform via a mechanical Freedericksz transition rather than continuous director rotation, but still show a semi-soft elastic response; that the threshold to auxetic behaviour coincides with the mechanical Freedericksz transition; and that the order parameters behave unusually on approaching this transition. Indeed the region where the auxetic response occurs has some features of a new phase. This talk will discuss what we know about this exciting new property of liquid crystal elastomers, what we know about how the materials deform under strain, and suggest some mechanisms whereby the auxetic response could come about.