
How to appear elastic when you are liquid: emergent mechanical properties of living cells

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Abstract

Living cells adapt and respond actively to the mechanical properties of their environment. In addition to biochemical mechanotransduction, evidence exists for a purely mechanical sensitivity to the stiffness of the surroundings at the cell-scale. Using a minimal model that describes the collective behaviour of actin, actin crosslinkers and myosin, we show that the mechanosensitive response of cells spreading between distant elastic microplates is entirely and quantitatively predicted by the behaviour of the actomyosin cortex as a contractile viscoelastic fluid. The result is that a material which is intrinsically liquid has an elastic response to its environment, thanks to the constant influx of biochemical energy.

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