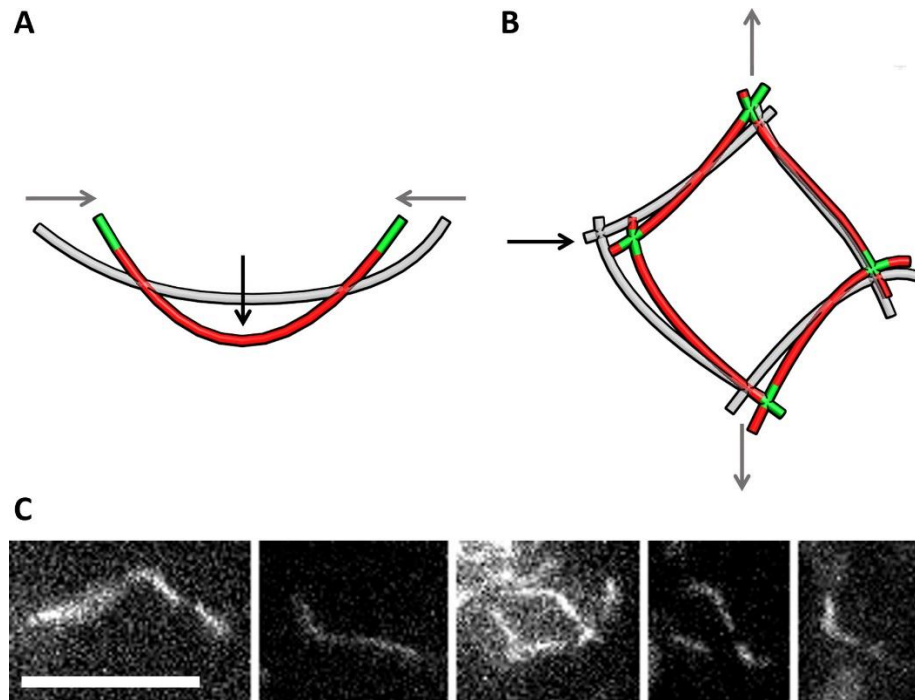


Supplementary Information

Single-crosslink microscopy in a biopolymer network dissects local elasticity from molecular fluctuations

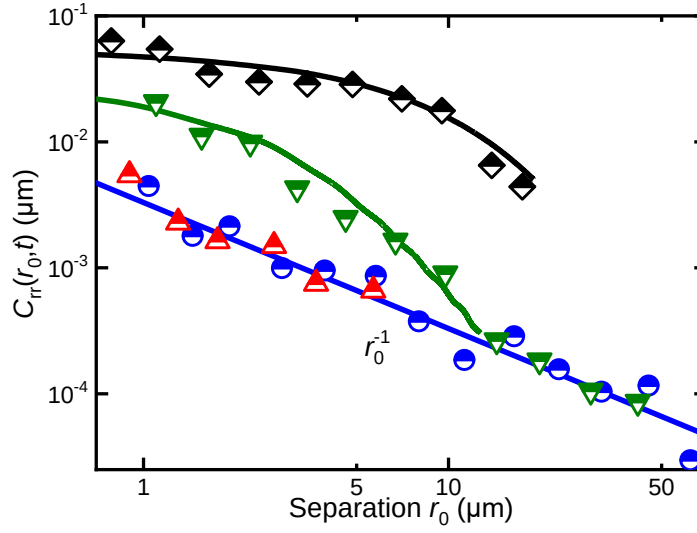
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Supplementary Figure 1. Possible causes for anticorrelations.

A, Bending modes may cause two crosslinks move against (or away from) each other. **B**, In a rhombus configuration, motion of the left crosslink may cause the upper and lower crosslinks to move against (or away from) each other. **C**, Examples of actin filaments with unrelaxed or kinked configurations. Scale bar: 10 μm .



Supplementary Figure 2. Cross-correlation C_{rr} compared in crosslinked and uncrosslinked actin systems. For pairs of labeled actin segments, their separation r_0 and cross-correlation C_{rr} (defined in eq. 15) are recorded and binned per r_0 values. In an entangled, uncrosslinked network (actin concentration 0.5 mg ml^{-1}), intra-filament correlation (black points) is strong and drops little as a result of stiff single-filament mechanics; inter-filament correlation (green points) decays in a nonhydrodynamic way (deviating from $1/r_0$) due to the emergence of inter-filament structural forces up to the filament length ($\sim 15 \text{ }\mu\text{m}$) and subsequently transitions to hydrodynamic continuum behavior due to vanishing of the structural forces. For details, please refer to our earlier publication.¹⁷ In the current case of crosslinked actin networks, the situation is drastically different, where inter and intra-filament correlations (blue and red points) collapse onto a single $1/r_0$ line over the entire measurable range, up to $50 \text{ }\mu\text{m}$.