



SOFT MATERIALS
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**Microscopic origins of anisotropic active stress in
motor-driven nematic liquid crystals**

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The cytoskeleton, despite comprising relatively few building blocks, drives an impressive variety of cellular phenomena ranging from cell division to motility. These building blocks include filaments, motor proteins, and static crosslinkers. Outside of cells, these same components can form novel materials exhibiting active flows and non-equilibrium contraction or extension. While dipolar extensile or contractile active stresses are common in nematic motor-filament systems, their microscopic origin remains unclear. Here we study a minimal physical model of filaments, crosslinking motors, and static crosslinkers to dissect the microscopic mechanisms of stress generation in a two-dimensional system of orientationally aligned rods. We demonstrate the essential role of filament steric interactions which have not previously been considered to significantly contribute to active stresses. With this insight, we are able to tune contractile or extensile behavior through the control of motor-driven filament sliding and crosslinking. This work provides a roadmap for engineering stresses in active liquid crystals. The mechanisms we study may help explain why flowing nematic motor-filament mixtures are extensile while gelled systems are contractile.

Wednesday, November 16 at 1:30 p.m. in Duane Physics G126



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