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**The origins of strain stiffening in fibrin networks** LOUISE JAWERTH, Harvard Univeristy, STEFAN MUENSTER, University of Erlangen, Nuremberg, DAVID WEITZ, Harvard University — Fibrin networks form the structural scaffold of blood clots; their nonlinear mechanical properties are crucial to stem the flow of blood at a site of vascular injury. A hallmark of these networks is strain stiffening: a stiffness that increases non-linearly as a network is strained. Deformations of the fibers and the network combine to control the mechanical properties of the bulk and must lead to the strain stiffening behavior of the networks; however, the details of this process are unknown. Here, we study fibrin networks undergoing shear on a confocal microscope and compare this to bulk rheological measurements. We track individual fiber branchpoints as function of system strain. We characterize the non-affinity of the motion and show that the low strain, linear regime corresponds to highly non-affine motion while the high strain, nonlinear regime corresponds to affine motion. Moreover, we show that the non-linear bulk response can be well approximated by considering the fibers to be linear elastic elements with soft compressive behavior and, therefore, is a result of the topology of the network itself rather than nonlinearity of its constituents.

Louise Jawerth
Harvard University

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