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The central role of the effective non-local spring constant in disordered networks DANIEL HEXNER, James Franck Institute, University of Chicago, ANDREA J. LIU, Department of Physics, University of Pennsylvania, SIDNEY R. NAGEL, James Franck Institute, University of Chicago — Deforming an amorphous solid leads to an inhomogeneous stress response. To understand this behavior, we show that each bond has an inherent aptitude to carry stress, which we call its effective non-local spring constant. This quantity enables us to understand the response to the removal of a single bond. Here we focus on the resulting change of the bulk and shear moduli in several different ensembles of disordered networks. We find that the change in shear modulus with removal of a single bond has a universal distribution, and that the change in the bulk modulus asymptotically approaches the same distribution. Additionally, in jammed networks the change in shear and bulk modulus due to removal of a bond each have correlations that become long-ranged at the jamming transition. For any given bond, however, the change in the bulk and shear moduli due to its removal are virtually uncorrelated.

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