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Tuning the Response in Disordered Networks NIDHI PASHINE, Department of Physics, The University of Chicago, Chicago, IL, JASON W. ROCKS, Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA, IRMGARD BISCHOFBERGER, Department of Physics, The University of Chicago, Chicago, IL, CARL P. GOODRICH, School of Engineering and Applied Sciences, Harvard University, Cambridge, MA, SIDNEY R. NAGEL, Department of Physics, The University of Chicago, Chicago, IL, ANDREA J. LIU, Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA — The fact that amorphous materials are structurally different from crystals has important consequences for how the properties of a disordered structure can be tuned. We have used jamming as a method to create spring networks in both two and three dimensions. By selectively removing a small percentage of bonds, we can tune the network to have a desired response. For example, we can tune the network's Poisson ratio anywhere between the auxetic and incompressible limits. We can also produce a targeted response at a local scale; by perturbing the positions of pair of particles at one point we can tune in a desired response a large distance away. This response is similar to the allosteric regulation in proteins where a reaction at one site activates another site of the protein molecule. Experimentally, we have successfully demonstrated such mechanical networks in 2D (by laser cutting) or in 3D (3D printing).

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