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TUNABLE ALLOSTERIC BEHAVIOR IN RANDOM SPRING NETWORKS JASON W. ROCKS, Dept. of Physcs and Astronomy, University of Pennsylvania, NIDHI PASHINE, IRMGARD BISCHOFBERGER, Dept. of Physics, University of Chicago, CARL P. GOODRICH, School of Engineering and Applied Sciences, Harvard University, SIDNEY R. NAGEL, Dept. of Physics, University of Chicago, ANDREA J. LIU, Dept. of Physcs and Astronomy, University of Pennsylvania — Many proteins and other macromolecules exhibit allosteric behavior in which the binding of a ligand to one site affects the activity at a second distant site. Inspired by this biological process, we present an algorithm to tune disordered spring networks to exhibit allostery-like behavior. When the positions of a pair of nodes at one site in a network are perturbed, we can precisely tune the response of nodes located at another distant site in the system by removing only a small fraction of the bonds. This algorithm can be used to create a wide variety of different response types: response nodes can be located far away from each other, a large number of response sites can be simultaneously controlled, and even multiple independent responses can be tuned into the system. In addition, this algorithm can be generalized to account for bond bending, geometric nonlinearities and nonlinear bond potentials. However, even linear calculations match surprisingly well with macroscopic experimental realizations made by laser cutting or 3D printing.

Jason Rocks
Dept. of Physcs and Astronomy, University of Pennsylvania

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