1135-70-1197 **Samuel B Heroy*** (sam.heroy@gmail.com), Dept of Mathematics, CB 3250, Phillips Hall, UNC Chapel Hill, Chapel Hill, NC 27599, and **Dane Taylor**, **F. Bill Shi**, **M. Gregory Forest** and **Peter J. Mucha**. *Rigidity Percolation in Composite Materials.*

In materials science, a challenge of engineering interest is to capture property enhancements using particle-scale models that both reflect the underlying randomness in particle distribution, and capture the inherent phase transitions in macroscopic behavior. Our particular interest is in using the graph theoretic property of rigidity to model mechanical reinforcement in composites with stiffening particles. We develop an efficient algorithmic approach called rigid graph compression (RGC) to capture rigidity in disordered fiber networks, which form the stiffening phase in many composite systems. To establish RGC on a firm theoretical foundation, we adapt rigidity matroid theory to identify primitive topological motifs as rules for composing interacting rigid particles into larger rigid components. Using numerical experiments, we demonstrate that RGC closely approximates the previously determined rigidity percolation threshold in 2D fiber networks (<1% relative error when 3 motifs are used), and predict the rigidity percolation threshold in 3D fiber networks (where no such study has been undertaken). (Received September 20, 2017)