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Michael F Thorpe* (mft@asu.edu), Department of Physics, Arizona State University, Tempe, AZ 85287-1504. *What makes Materials Flexible or Rigid?*

Have you ever wondered why some materials are more flexible than others? Many interesting phenomena occur in material structures that are poised between rigid and flexible. In this talk, we describe the modern theory of rigidity and show how it can be used to analyze networks of constraints. These results can be used as input to geometrical simulation, where the various rigid parts of a system are moved, while maintaining all the constraints; both equalities and inequalities. These concepts can be introduced in high school by using popsicle sticks and cotter pins to construct frameworks in an interesting new approach involving hands-on self discovery. On a research level, this approach has led to important insights in both in zeolites that are important for cracking petroleum, manganites that exhibit colossal magnetoresistance, and proteins and protein complexes (like viruses) where flexibility is often associated with function. (Received February 22, 2009)