Two-dimensional (2D) materials like graphene are highly deformable due to their atomically thin structure. To fabricate deformable devices (e.g. flexible and wearable electronics) that capitalize on their ultrasoft nature, it is critical to assess the bending stiffness of graphene.

The Illinois MRSEC team has developed a platform for measuring the intrinsic bending stiffness of monolayer and multilayer graphene at the nanoscale. With the combined efforts of electron microscopy and atomistic simulations, we present a model of the bending mechanism in multilayer graphene that unifies previously conflicting bending stiffness results of multilayer graphene over the past decade. Our findings show that 2D multilayers can be orders of magnitude softer than previously thought, and are among the most flexible electronic materials currently known.