Jamming in 2-D Prolate Granular Material Systems

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A two dimensional pile of long rods is one of the Simplest systems in which jamming can occur. In our experiment, a test object is pushed through a 2D array of 2.5"x0.125"x0.125" brass rods. We can vary the aspect ratio(length:width) of the rods. We are investigating the packing fraction (fraction of total area covered by particles) at which the system experiences a transition from only a few rods moving to a large cluster moving as a whole. We are attempting to measure the force needed to move through the pile and its dependence on initial packing fraction. Through video analysis we quantify the disturbance induced by the moving test object, measuring its spatial extent. We also look at how particles that are disturbed become more aligned. Preliminary results indicate the increase in jamming as a function of packing fraction to be exponentially dependent.