1036-76-194 **Sung Joon Moon*** (moon@arnold.princeton.edu), **Sankaran Sundaresan** (sundar@princeton.edu) and **Ioannis G Kevrekidis** (yannis@arnold.princeton.edu). *A hybrid approach to simulating vibrated gas-fluidized beds of fine powders.*

Flows involving small-sized particles (e.g. mixtures of gas and nano-particles or fine powders, $\sim$100 μm) have received increased attention in advanced materials technology; however, their multi-phase and multi-scale nature poses many challenging issues in the modeling, and the understanding of their flow dynamics is still limited.

We use a hybrid model of three-dimensional particle dynamics simulations, coupled with volume-averaged gas phase hydrodynamics, to study (mechanically vibrated) gas-fluidized beds of fine, cohesive powders. We probe the mechanism fluidizing beds of highly cohesive powders, and demonstrate an inconsistency between the solid-phase constitutive relations obtained through ensemble-averaging in this model, and those which are widely used in the two-fluid continuum approach.

One difficulty of the current approach arises from its microscopic nature in the solid phase, limiting temporal and spatial scales of problems to be probed. The talk will conclude with a brief discussion and outlook of an equation-free approach [1] wrapped around this model [2], which opens a way to overcome this unfavorable aspect.

[1] Kevrekidis et al., Comm. Math. Sciences 1 (4), 715 (2003). [2] Moon, Sundaresan, and Kevrekidis, Phys. Rev. E 75, 051309 (2007). (Received January 22, 2008)