Title: New developments in Granular Statistical Mechanics

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Abstract: In a recent paper [1], the largely accepted statistical mechanics for granular matter has been shown to be flawed. The reason is that it was based on the volume function, which depends only on a minute fraction of all the structural degrees of freedom and is unaffected by most of the configurational microstates. A new formulation is proposed, replacing the volume function with a connectivity function that depends on all the structural degrees of freedom and accounts correctly for the entire entropy. We tested the formalism by calculating the entropy of an experimental two-dimensional system, as a function of system size, and showing that it is an extensive variable.

In this presentation, we summarise these results and extend them to include the stress ensemble for finite boundary stresses. We thus derive the general equation of states, which relates the volume, the boundary stress and the measures of structural and stress fluctuations. The general calculation involves some mathematical complexities, and we explain how these are overcome. The general formulation is tested by calculating the entropy of an experimental two-dimensional system.


Bio: I started my PhD at Imperial college in 2013; got my MSc from the Weizmann Institute in 2012; got my BSc from the Hebrew University in 2010.