COLLOQUIUM

Nonlinear Waves in Granular Crystals: Theory, Computation, Experiments and Applications

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In this talk, we will provide an overview of results in the setting of granular crystals, consisting of beads interacting through Hertzian contacts. We will start from the simplest setting of one-dimensional, monoatomic chains where highly localized traveling waves exist and we will also examine states in the form of (dark) discrete breathers and shock waves therein. Wherever possible, we will corroborate these considerations with recent experimental results. We will then extend our considerations to the case of diatomic chains and examine how the properties of traveling waves and also of discrete breathers are modified in the latter setting. More highly heterogeneous chains will be briefly examined as well. In addition to considering the purely Hamiltonian case, select examples of the damped-driven variant of the system and its rich phenomenology, including chaotic response and bistability/hysteresis will also be shown. In the last part of the talk, time-permitting, a number of recent aspects will be touched upon including:

(a) formation of traveling waves with non-vanishing tails in elastic woodpile periodic structures;

(b) super-diffusive transport in disordered granular chains;

(c) applications of these lattices for the demonstration of switching and acoustic logic gates;

(d) prototypical examples of extensions to two dimensions in hexagonal, as well as square arrays.

The lecture will take place in Thackeray 704 at 3:30pm.
Refreshments will start at 3:00pm.