PHYSICAL MATHEMATICS SEMINAR

BUILDING DESIGNED GRANULAR TOWERS ONE DROP AT A TIME

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ABSTRACT:

In this talk I will present the growth of surprisingly slender granular structures that we call granular towers. They are created drop by drop by dripping a dense suspension of grains on a liquid absorbing surface such as blotting paper or a dry granular bed. The same suspension poured on a solid substrate will spread like an effective viscous fluid or form a pile with an angle of repose. However, an absorbing substrate can have a tremendous effect on their spreading because it can quickly drain the liquid from the suspension, rapidly causing the solidification of the structure. The imbibition strength and the viscous drag on the excess liquid as it drains through the structure set the tower height whereas its width is controlled by the drop velocity upon impact. Further, the detailed shape of the tower appears to depend on the free fall time of the drop and its volume fraction. We show that these facts can be manipulated to give rise to a rich array of delicate structures using granular suspensions. Besides the application for surface patterning, the tower building might be a new kind of rheometer where the shape of the tower is the response of the suspension and the impact velocity the forcing parameter.

TUESDAY, SEPTEMBER 27, 2011
2:30 PM
Building 2, Room 105

Reception at 3:30 PM in Building 2, Room 290
(Math Dept. Common Room)

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