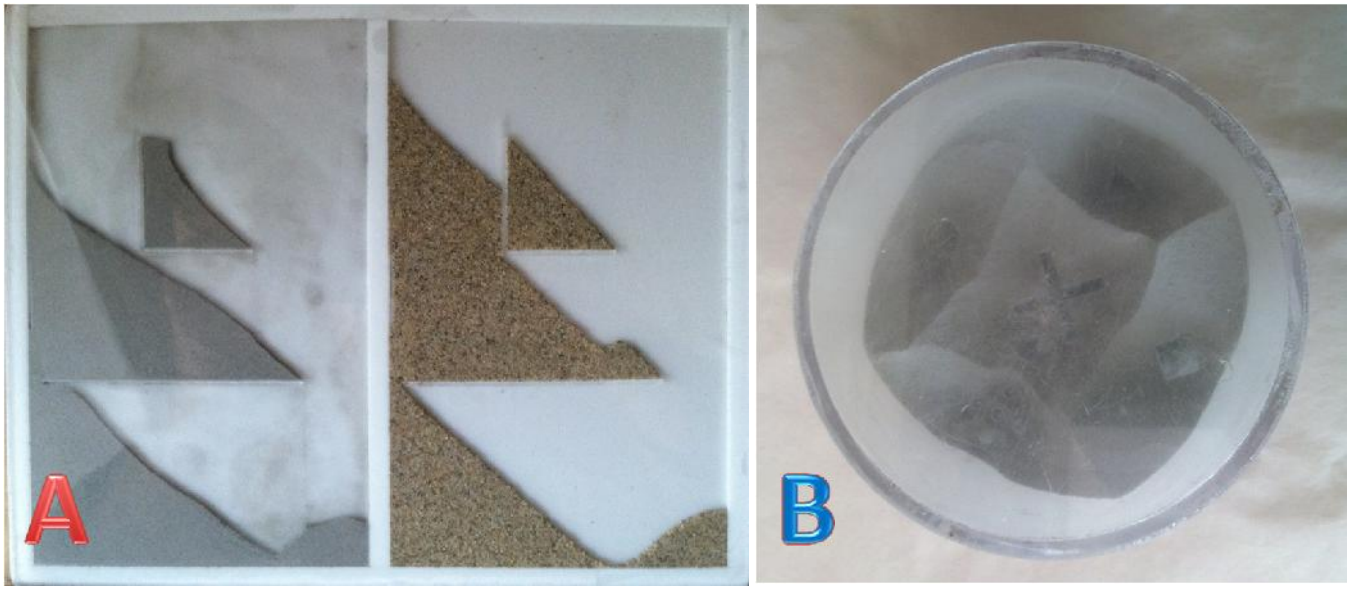
Visual Delights IV: Interactive Granular Flow



Objective: Demonstrate Angle of Repose, Avalanching, and Eruption

What:

A. Thin enclosure contains beach sand & ceramics microspheres (CMS) in separate sections; the rest is air. This is to compare flows of coarse and fine granular materials. Several identical rods provide obstacles in each section.

B. Cylinder contains CMS and air. It is made of two equal chambers separated by a disk, which has different shaped holes.

How:

A. Turn the enclosure upside down or in 90^{o} steps. The contents flow due to gravity and pile up on surfaces below. Once the flow comes to rest angle of repose, i.e., the slope of the pile, is demonstrated (more clearly for sand than CMS). The angle seen here is more than the reported angle for free flowing case due to additional friction with enclosure walls. Clumping is also exhibited in CMS, while no clumping is seen in sand. Furthermore, entrapped air (2-phase) in CMS is occasionally observed.

B. Turn the cylinder upside down. Flow starts with a series of erratic avalanching and eruptions (venting due to pressure build up in the lower chamber). Notice the order in which holes are cleared, usually square hole first and always cluster of five small holes last. Occasionally jamming occurs above the five holes. *Also, tried sand instead of CMS. The sand flow was steady and quick, i.e., much less complex.*

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