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Building designed granular towers one drop at a time
JULIEN CHOPIN, ARSHAD KUDROLLI, Clark University — The impact of a drop on a surface leads to beautiful dynamical shapes that result from a subtle interplay between inertial effects, fluid properties and substrate characteristics. In this talk, we will present an experiment where the successive impacts of drops lead to surprisingly slender mechanically stable structures that we called granular towers. They are created by dripping a dense granular suspension on a liquid absorbing surface such as a blotter paper or a dry granular bed. These towers formed by rapid solidification of the drop upon impact are analogous to many natural structures found in nature including frozen lava flows, icicles and stalagmites. We find that the height can be determined by balancing the excess liquid flux and the drainage through the granular tower. The velocity impact, the free fall time and the density of the suspension are found to control the tower width and its detailed morphology. We show that these facts can be manipulated to obtain various symmetric, smooth, corrugated, zigzag, and chiral structures. Further, the shape of the tower can be used as a quick diagnostic tool to characterize the rheology of a granular suspension. [J. Chopin and A. Kudrolli, Phys. Rev. Lett. 107, 208304 (2011)]

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