

AVALANCHES AND GRANULAR DYNAMICS

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When you drop sand on top of a sand pile, initially the mound will become steeper and steeper. But finally, the slope will stop increasing and the falling particles will tend to roll far down the mound. The equations for any realistic model of such a process would be much too complicated to glean substantial analytic insight from. We therefore develop a paradigm for this kind of dynamics. We give a mathematical treatment of the dynamics of a particle falling down an inclined slope with a simple periodic profile (a “staircase”). The idea is to develop new insights about the dynamics of individual particles in an “avalanche” motion. Such motions happen in granular material when it is poured on a pile. This is a currently very active area of research with many applications. Our basic question is: What causes an avalanche, and what are the circumstances under which it stops?