

Falling inside a superlight granular medium

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Daily experience tells us that a projectile impacting into a granular medium, invariably stops at some finite depth. Chain forces acting against the projectile and the energy dissipation due to friction are responsible for such stopping effect. Here we challenge such phenomenon by doing penetration experiments and Molecular Dynamics Simulations in 2 and 3D superlight granular systems. Two counterintuitive behaviours are observed: 1) above a critical mass, a projectile impacting into a granular medium endlessly sinks with a terminal velocity as if the medium were a simple fluid [1]; 2) several projectiles fall through the medium in a collective way following a cooperative dynamics, whose complexity resembles flocking phenomena in living systems [2]. We claim that the observed dynamics might give a clue for advancing the idea that hydrodynamics have an important role in granular systems.

References

- [1] F. Pacheco-Vazquez, G. A. Caballero-Robledo, J. M. Solano-Altamirano, E. Altshuler, A. J. Batista-Leyva, and J. C. Ruiz-Suarez, *Phys. Rev. Lett.* **106**, 218001 (2011).
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