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Low-resistive penetration in granular media BAPTISTE DARBOIS TEXIER, ALEJANDRO IBARRA, FRANSISCO MELO, Physics department, University of Santiago. — The quasi-static immersion of an intruder into a granular assembly requires a force that is several orders of magnitude larger than necessary in fluids under similar conditions. This occurs as a result of the progressive formation of a network composed of force chains, which simultaneously increase in size with intruder penetration. The present work shows that the resisting force for the immersion of an intruder into a granular material can be reduced by an order of magnitude with mechanical vibrations of small amplitude (A = 10 μm) and low frequency (f = 50-200 Hz). The effect of the vibrations characteristics and the intruder geometry on the drop of the resistive force were inspected experimentally. Thanks to flow visualizations, it has been shown that vibrations induce a local convection into the granular media leading to the modification of the network of force chains. Moreover, scaling arguments are developed in order to rationalize our observations and to predict under which circumstances the resistive force is reduced. Finally, the use of such a phenomenon in the animal kingdom and the technological world will be discussed.

Baptiste Darbois Texier
Physics department, University of Santiago.

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