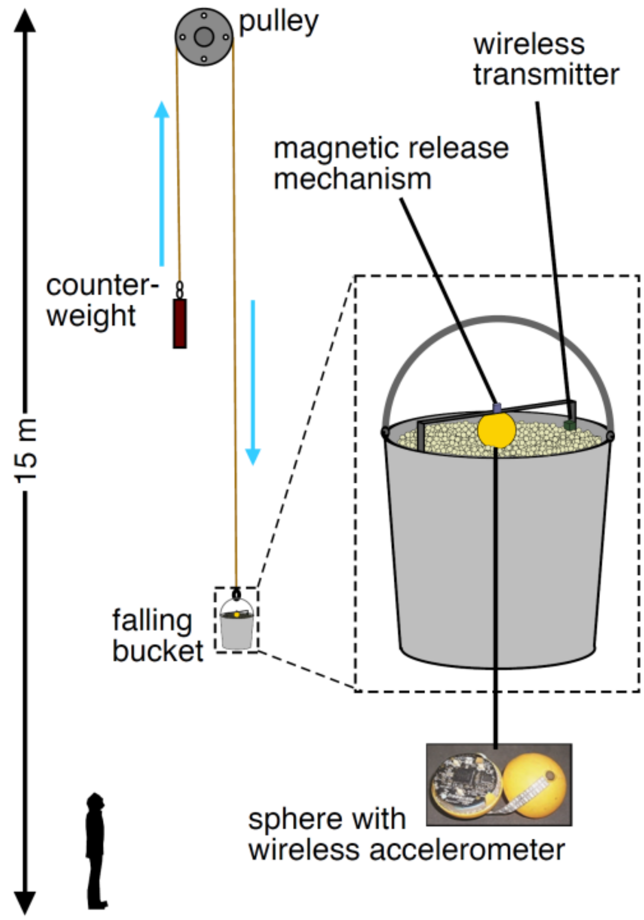
MSS-Seminar

Wednesday, Sept. 11th, 15:30, Nägelsbachstr. 49b

MSS

Extraterrestial sink dynamics in granular matter

Ernesto Altshuler
University of Havana



Lab-in-a-bucket: performing low-gravity experiments on a ridiculous budget. Left: Sketch of the experimental setup. Above: The *Lab-in-a-bucket* crew.

A loosely packed bed of sand sits precariously on the fence between mechanically stable and flowing states. This has especially strong implications for the exploration and development of extraterrestrial settings, such as planets or asteroids, whose geomorphology is predominantly granular owing to planetary formation processes and erosion. While the penetration dynamics of objects shot or sinking into granular media under Earth-like conditions is well-studied, there is no fundamental understanding of how the dynamics change in effective gravities, g_{eff} , different than that of Earth ($g = 9.8$ m/s^2). Here we describe systematic experiments of the sink dynamics of objects into granular media in different gravitational conditions. By conducting experiments in an accelerating frame, we explore geff ranging from 0.4g to 1.2g. With the aid of discrete element modeling simulations, we reproduce these results and extend this range to include objects as small as asteroids and as large as Jupiter. We find that the final sink depth is independent of geff , an observation with possible relevance to the design of future extraterrestrial structures and land-roving spacecraft.