

Colloquium

Roll and Stumble: Granular self-organization by auto-tuning of friction and its possible analogies to Run-and Tumble chemotaxis of bacteria and stampede prevention in a moving crowd

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A monolayer of granular spheres in a cylindrical vial, driven continuously by an orbital shaker and subjected to a symmetric confining centrifugal potential, self-organizes to form a distinctively asymmetric structure which occupies only the rear half-space. Imaging shows that the regulation of motion of individual spheres occurs via toggling between two types of motion, namely, rolling and sliding. Experiments demonstrate and simulations confirm that the global features of the structure are maintained robustly by an auto-tuning of friction through internal dynamical states of rolling and sliding with widely varying friction which provides a protocol-insensitive route to self-organization of a many-body system. Recent results show that when the system is restricted to a quasi-2 D space, this self-organization leads to efficient crystallization. I will speculate on its relation to a more general scenario of autotuning of motion, as in chemotaxis of bacteria and prevention of stampede in crowd dynamics.

Monday, Feb 25th 2019

4:00 PM (Tea/Coffee at 3:30 PM)

Auditorium, TIFR-H