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Effects of Shape on Diffusion and Shear Flows ROBERT SHAW, NORMAN PACKARD, ProtoLife, Inc. — Diffusion of point particles is well-understood, likewise the motion of simple particles under shear flow. However if the particles are extended objects with shape, more complicated behavior can occur. For example, objects might enter a shaped channel in a configuration that requires them to back up a finite distance in order to proceed further. A configuration that blocks flow through the channel might be statistically preferred, an attracting metastable state of the system. In the bulk, the configuration space of a set of closely packed rigid objects can become convoluted, with many dead-end alleys. If such a system is subjected to a shear, it may naturally tend to settle in such a dead-end, and have to retrace its path in order to continue further, a configuration can become locally locked. The requirement that the system backtrack to unlock distinguishes this process from ordinary jamming, there need be no dissipation or friction per se. We have a number of computer simulations of the motions of closely packed shaped objects, under both Hamiltonian and Monte Carlo dynamics. In addition we will present a simple analytic model, describing the entry and escape of the system from the attracting locked metastable states.

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