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Bristle-Bots: a model system for locomotion and swarming LUCA GIOMI, NICO HAWLEY-WELD, L. MAHADEVAN, Harvard University — The term *swarming* describes the ability of a group of similarly sized organisms to move coherently in space and time. This behavior is ubiquitous among living systems: it occurs in sub-cellular systems, bacteria, insects, fish, birds, pedestrians and in general in nearly any group of individuals endowed with the ability to move and sense. Here we address the problem of the origin of collective behavior in systems of self-propelled agents whose only social capability is given by aligning contact interactions. Our model system consists of a collection of Bristle-Bots, simple automata made from a toothbrush and the vibrating device of a cellular phone. When Bristle-Bots are confined in a limited space, increasing their number drives a transition from a disordered and uncoordinated motion to an organized collective behavior. This can occur through the formation of a swirling cluster of robots or a collective dynamical arrest, according to the type of locomotion implemented in the single devices. It is possible to move between these two major regimes by adjusting a single construction parameter.

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