Abstract Submitted for the MAR17 Meeting of The American Physical Society

Managing lifelike behavior in a dynamic self-assembled system CHAD ROPP, NICOLAS BACHELARD, YUAN WANG, XIANG ZHANG, University of California, Berkeley — Self-organization can arise outside of thermodynamic equilibrium in a process of dynamic self-assembly. This is observed in nature, for example in flocking birds, but can also be created artificially with non-living entities. Such dynamic systems often display lifelike properties, including the ability to self-heal and adapt to environmental changes, which arise due to the collective and often complex interactions between the many individual elements. Such interactions are inherently difficult to predict and control, and limit the development of artificial systems. Here, we report a fundamentally new method to manage dynamic selfassembly through the direct external control of collective phenomena. Our system consists of a waveguide filled with mobile scattering particles. These particles spontaneously self-organize when driven by a coherent field, self-heal when mechanically perturbed, and adapt to changes in the drive wavelength. This behavior is governed by particle interactions that are completely mediated by coherent wave scattering. Compared to hydrodynamic interactions which lead to compact ordered structures, our system displays sinusoidal degeneracy and many different steady-state geometries that can be adjusted using the external field.

> Chad Ropp University of California, Berkeley

Date submitted: 10 Nov 2016

Electronic form version 1.4