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# Self-organized flight formations disrupted by self-amplifying waves

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## Abstract

The idea that schools, flocks, and other forms of collective locomotion are like states or phases of matter is appealing and yet largely unsubstantiated. In this talk, I'll show that indeed flapping flyers tend to order up into well-organized formations or lattices, much like crystalline solids. We document these structures through lab experiments on "mock flocks" of self-propelling and hydrodynamically coupled robotic flyers. But we also observe a new type of traveling wave that amplifies as it propagates on the group, upsetting the lattice positions and destabilizing the group. We call these flow-induced excitations "flonons" as a nod to phonons in material lattices. A simplistic but informative model is able to reproduce the novel behaviors and helps to identify the key ingredients and causes. I'll end by thinking about implications for animal groups and why they may have properties never before seen in conventional physical systems.

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