Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Flocking through disorder ALEXANDRE MORIN, NICOLAS DESREUMAUX, JEAN-BAPTISTE CAUSSIN, DENIS BARTOLO, ENS de Lyon — How do flocks, herds and swarms proceed through disordered environments? This question is not only crucial to animal groups in the wild, but also to virtually all applications of collective robotics, and active materials composed of synthetic motile units. In stark contrast, appart from very rare exceptions, our physical understanding of flocking has been hitherto limited to homogeneous media. Here we explain how collective motion survives to geometrical disorder. To do so, we combine experiments on motile colloids cruising through random microfabricated obstacles, and analytical theory. We explain how disorder and bending elasticity compete to channel the flow of polar flocks along sparse river networks akin those found beyond plastic depinning in driven condensed matter. Further increasing disorder, we demonstrate that collective motion is suppressed in the form of a first-order phase transition generic to all polar active materials.

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Date submitted: 09 Nov 2016 Electronic form version 1.4