Abstract Submitted
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Living liquid crystal: collective bacteria motion in anisotropic viscoelastic media[1] SHUANG ZHOU, Liquid Crystal Institute, Kent State University, Kent, OH 44242, ANDREY SOKOLOV, Materials Science Division, Argonne National Laboratory, Argonne, IL60439, OLEG D. LAVRENTOVICH, Liquid Crystal Institute, Kent State University, Kent, OH 44242, IGOR S. ARANSON[2], Materials Science Division, Argonne National Laboratory, Argonne, IL60439 — By transducing energy stored in the environment to drive systematic movements, bio-mechanical hybrids can move and reconfigure their structure and properties in response to external stimuli. Here, we create a fundamentally new class of bio-mechanical hybrid – living liquid crystals (LLCs), by combining two seemingly incompatible concepts, living swimming bacteria and inanimate but orientationally ordered lyotropic liquid crystal. The coupling between the activity-triggered flows and director reorientations results in a wealth of phenomena, including: (a) a characteristic length ξ to describe the coupling between the orientation of LLC and the bacterial motion, (b) periodic stripe instabilities of the director in surface-anchored LLCs, (c) director pattern evolution into an array of disclinations with positive and negative topological charges as the surface anchoring is weakened or when the bacterial activity is enhanced. Our study provides an insight in understanding hierarchy of spatial scales in other active matter systems, as well as providing basis for devices with new functionalities, including specific responses to chemical agents, toxins, or photons.

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